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Compendium of Commercial Thinning Operations and Equipment in Western Canada



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has been provided by
Forest Renewal BC*

Compendium of Commercial Thinning Operations and Equipment in Western Canada

Compiled by

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Forest machines, Forest operations,
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Acknowledgments

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FERIC acknowledges the funding contributed by Forest Renewal BC.¹

¹ Forest Renewal BC is a partnership of workers, forest companies, environmental groups, communities, First Nations and government.

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Introduction

The landscape pattern of forest harvesting and wildfire, the history of forest management and recent land removals from the working forest have resulted in both fibre shortages and large localized areas of immature forest. With this combination of circumstances, commercial thinning may be a means of obtaining fibre while maintaining forest cover and productivity.

Although specific locales and individuals have been active in commercial thinning for decades, overall, Western Canadian operators are new to the techniques, equipment, and products associated with implementing this silvicultural and harvesting practice.

Traditionally, commercial thinning has been practiced most frequently on high productivity, easily accessed sites in times of high fibre prices. However, with market downturns, thinning became uneconomical and was then curtailed. Fibre supply shortages may now be the norm and consequently commitment to commercial thinning operations is expected to be more consistent over time. The desire for information on commercial thinning operations, trials, and equipment is greater than ever before, from all players – agency, industry and contractor.

The Forest Engineering Research Institute of Canada (FERIC) determined its members' need for information in late 1994, and approached Forest Renewal BC for funding for a compendium of commercial thinning information. Developing the format for this material and gathering the information began in the summer of 1995 and will continue until the need has been met. Forest Renewal BC has funded the production of the material to date and will be approached for continuation of this project.

Using the Compendium

The compendium is organized into two sections: Operations and Equipment. Each is further subdivided into harvesting system and equipment type categories, respectively. Articles in the Operations section are developed from a variety of sources: summaries of FERIC reports, short-term productivity studies, field visits, and telephone contacts. The objective is to describe the key features and parameters of the operation. The reader is then referred to contacts for further details and critical comment.

The Equipment section focuses on identifying equipment that may be suitable for commercial thinning operations. The equipment may be in use currently for thinning and/or may be available locally, or it may simply have potential in commercial thinning applications. Information on equipment specifications, manufacturer, distributor and cost (if available) will be included. Although western users of the equipment will be identified in some cases, this will be limited to situations where the equipment is relatively uncommon, and the list may not be complete. In most cases, the distributors of equipment can identify new or local purchasers to any interested persons.

When significant changes occur, either Operations or Equipment articles will be updated and re-released. However, initially FERIC will concentrate on adding to the information base rather than updates because readers can easily obtain more information from the contact persons identified for each article.

The binder format allows the reader to insert other information as well to supplement that provided as part of the compendium. For best results, a D-ring binder is recommended.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Mechanical Item: #1

Region

Interior British Columbia

Author

Janet Mitchell, RPF

Date

June 1995

Source

FERIC short-term study completed in 1993, Special Report SR-94

Contractor

Bren Kar Logging, Galloway, B.C.

Equipment

- Morbark Wolverine feller-buncher with chainsaw head (Figure 1)
- Caterpillar 518 rubber-tired grapple-skidder
- Steyr processor mounted on a Link Belt 2207 C-series excavator

Location

In Galloway Lumber Co. Ltd. operating area on Crown land near Cranbrook in the East Kootenays.

Objective of study

- To compare productivity and costs of commercial thinning and clearcut harvesting.
- To describe the operating practices associated with the thinning.

Site and stand

- Dry Cool Montane Spruce (MSdk) ecosystem
- 88-year-old unmanaged stand
- lodgepole pine with western larch and Engelmann spruce
- area harvested in three treatment units: clearcut, 4-m residual spacing and 5-m residual spacing
- average preharvest - 700 to 1400 trees/ha, 230 to 270 m³/ha
- flat to gentle slopes with occasional pitches to 55%
- coarse-textured well-drained soil
- little understory vegetation or slash



Figure 1. Morbark Wolverine feller-buncher.

Prescription

- remove stems to leave 4 m by 4 m spacing, or 5 m by 5 m spacing on the two thinning treatment units
- leave larch trees <17.5 cm and >35 cm diameter as seed trees in all treatment units including the clearcut

Operating procedure

- trails located prior to thinning, at approximately 30-m spacing
- tree selection was made by the feller-buncher operator
- feller-buncher worked a double-shift, with night felling in the clearcut unit
- grapple skidder and processor single shift only
- trails were cut in first pass and then skidded
- the between-trail wood was then cut and bunched on the trail, in two more passes

Equipment description and specifications

See Table 1. Additionally, the Wolverine is a three-wheel feller-buncher, available with a shear or a chainsaw felling head; in this case, the machine was equipped with a chainsaw head. Two hydrostatically-driven wheels are located at the front of the machine, powered independently of each other, and a freewheeling small tire is positioned at the rear. The machine is skid-steered and can turn in its own length. The machine is highly manoeuvrable within

Table 1. Wolverine Feller-Buncher Specifications

Feller-buncher	
Engine power (kW)	123
Power transmission (kW)	99
Head capacity (cm)	48-cm diameter
Approx. weight (kg)	6700
Width (m)	2.5
Ground clearance (m)	0.50

the stand. However, it has limited capability on sloped or rough ground because it is light in weight, and with only three wheels it loses stability quickly.

Study results

The productivity observed during the FERIC study in 1993 is summarized in Table 2. As well, the cost of harvesting, based on FERIC's costing formula, is presented.

The feller-buncher handled 101 trees/PMH on the 4-m spacing block, and 124 and 123 trees on the 5-m and clearcut units respectively. The clearcut unit had the highest stem volume ($0.47 \text{ m}^3/\text{stem}$, compared to 0.41 and 0.35 m^3 for the 4-m and 5-m spacing, respectively).

The overall harvesting costs (on the truck) were \$11, \$12, and $\$8/\text{m}^3$ for the 4-m, 5-m, and clearcut units respectively.

Post-harvest surveys showed 460 and 350 trees/ha remaining on the 4-m and 5-m units respectively. Residual tree damage surveys showed scarring on 19 and 25% of the trees in the 4-m and 5-m units, respectively.

Equipment suppliers

The Morbark Wolverine is available through local Finning distributors, for example, Finning Ltd, 555 Great Northern Way, Vancouver, B.C. V5T 1E2 Tel.: 604-872-4444.

Approximate price of the Wolverine chainsaw feller-buncher is \$172,000. The Caterpillar 518 grapple-skidder and the Steyr processor on a Link Belt excavator are approximately \$200,000 and \$350,000, respectively.

Table 2. Summary of Productivity and Cost of Harvest

	4-m	5-m	Clearcut
Productive machine hours (PMH)	10.9	8.7	2.5
Average volume/tree (m^3)	0.41	0.35	0.47
Feller-buncher productivity (trees/PMH)	101	124	123
Cost ($\$/\text{m}^3$)	11.03	12.12	8.09

References

Evans, C. M. 1993. *Morbark Wolverine Feller-Buncher: Observations*. FERIC, Vancouver. Field Note Felling-17. 2p.

Mitchell, J. L. 1994. *Commercial Thinning of Mature Lodgepole Pine to Reduce Susceptibility to Mountain Pine Beetle*. FERIC, Vancouver. Special Report SR-94. 20p.

For further information, contact:

Randy Byford, Galloway Lumber, General Delivery, Galloway, B.C., V0B 1P0 Tel.: 604-429-3496, Fax: 604-429-3600

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #1

Region

Coastal British Columbia

Author

Jim Hunt, RPF

Date

June 1995

Source

FERIC short-term study completed in 1994,
Technical Note TN-235.

Contractor

Shortlog Thinning Inc., Victoria, B.C.

Equipment

- Timberjack FMG 1270 harvester with a Koehring Waterous 762B single-grip harvesting head (Figure 1)
- Timberjack FMG 910 forwarder with an FMG 120-62 grapple loader (Figure 2)

Location

Pacific Forest Products Limited, private land near Lake Cowichan on southern Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm) ecosystem
- 55-year-old unmanaged stand with Douglas-fir, western hemlock (grand fir, western red cedar)
- preharvest Block 1 - 700 trees/ha, 775 m³/ha, average dbh - 35.6 cm
- preharvest Block 2 - 950 trees/ha, 1020 m³/ha, average dbh of 33.2 cm
- flat to gentle slopes with occasional pitches to 30%
- coarse-textured well-drained soil
- numerous obstacles to machine travel - old-growth stumps, windfall and logs

Prescription

- remove stems less than 30 cm dbh, and diseased or damaged trees (thin from below)
- in commercial thinned areas (Block 1), final harvest will be in 10 years



Figure 1. Timberjack FMG 1270 harvester.

- in pre-logged areas (Block 2), final harvest in 2-3 years

Operating procedure

- tree selection is made by harvester operator
- generally, harvester operator also selected the forwarding trails although occasionally the main trails were marked and constructed with an excavator
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail, with some sorting by species and grade (pulp and sawlog)
- forwarder loaded pulp and sawlogs in the same trip, but separated species
- forwarder worked from the end of the trails towards the main trail

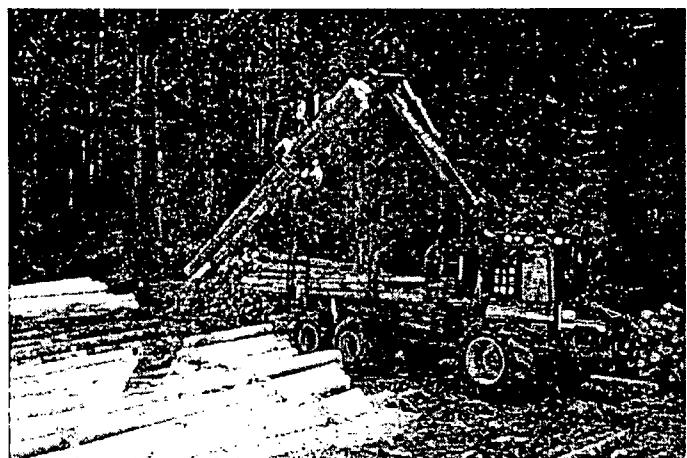


Figure 2. Timberjack FMG 910 forwarder.

Table 1. Timberjack FMG 1270 Harvester and 910 Forwarder Specifications

	Harvester	Forwarder
Engine power (kW)	114	82
Power transmission	6-wheel drive hydrostatic	6-wheel drive power-shift
Head capacity (cm)	60-cm diameter	n.a.
Carrying capacity (t)	n.a.	11 - t
Approx. weight (kg)	16,410	13,330
Width (m)	2.68	2.68
Crane reach (m)	8.3	6.8
Ground clearance (m)	0.59	0.71

Equipment description and specifications

See Table 1. Additionally,

- the carriers are rubber-tired but the front bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure
- log specifications provided by the on-board computer were based on a minimum log length of 6.25 m and top diameters of 6 and 10 cm for pulp and sawlogs respectively; however, the operator can override the computer
- the forwarder bunk stakes were reinforced because longer logs were produced in this operation than the stakes were designed for

Study results

The productivity observed during the FERIC study in 1994 is averaged for the two blocks and summarized in Table 2. As well, the cost of harvesting, based on FERIC's costing formula, is included.

Clearing unmerchantable stems and obstacles consumed a significant portion of the harvester's time - approximately 30% of each work cycle. Understandably, productivity of the harvester was closely linked to stem size, with 4.3 m³/PMH for stems with less than 15-cm butt diameter, 13.1 m³/PMH for 20-cm median butt diameters, and 21.2 m³/PMH for 30-cm median butt diameters.

Post-harvest surveys showed 300-350 trees/ha remaining, and approximately 25% volume removal. Trails occupied 20% of the area, and average trail width spacing was 17 m. Residual tree damage surveys showed scarring on 18% of the trees, with 5% having major damage.

Table 2. Summary of Productivity and Cost of Harvesting

	Harvester	Forwarder
Productive machine hours (PMH)	313.5	336.4
Productivity (m ³ /PMH)	13.7	12.8
Cost (\$/m ³)	14.11	9.14

Equipment suppliers

The Timberjack FMG equipment is available through local Timberjack distributors, for example, Terratech Equipment Ltd., Campbell River, B.C. Tel.: 604-286-0694.

Approximate price of the 1270 harvester is \$600,000. The 910 forwarder is no longer available and the comparable model is the 1010 forwarder, at an approximate price of \$345,000.

References

Araki, Dennis. 1994. *Thinning Second-Growth with a Timberjack FMG System*. FERIC, Vancouver. Field Note No. Processing-40. 2p.

Hunt, J.A. 1995. *Commercial Thinning of Coastal Second-Growth Forest with a Timberjack FMG Harvester and Forwarder: An Evaluation*. FERIC, Vancouver. Technical Note. TN-235.

For further information, contact:

Ken Donkersley, Pacific Forest Products Limited, Cowichan Woodlands, Box 589, Lake Cowichan, B.C. V0R 2G0 Tel.: 604-749-3796

Mike Steeves or Jim Lambrick, Shortlog Thinning Inc., 1480 Fort St., Victoria, B.C. V8S 1Z5 Tel.: 604-370-2667.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #2

Region

Interior British Columbia

Author

Janet Mitchell, RPF

Date

July 1995

Source

FERIC field visit June 1995

Contractor

Brookside Select Logging, Kelowna, B.C.

Equipment

- Timberjack FMG 1270 harvester with a Koehring Waterous 762B single grip harvesting head (Figure 1)
- Timberjack FMG 1010 forwarder (Figure 2)

Location

Riverside Forest Products Limited, Gaudie Plateau near Kelowna, B.C.

Site and stand

- Montane Spruce (Msdm1) ecosystem
- 160-year-old fire-origin lodgepole pine stand
- preharvest - 700-800 trees/ha, average size of 0.47 m³/tree, average dbh of 27 cm
- flat to gentle slopes with occasional pitches to 30%
- minimal obstacles to machine travel

Prescription

- salvage of mortality in second-entry blocks
- leave 350 - 400 well-spaced trees/ha, representing the profile of the stand
- final harvest will be in approximately 15 to 20 years, when adjacent areas have reached free growing status

Operating procedure

- tree selection is made by harvester operator
- the trails were spaced 15 m apart and marked, but

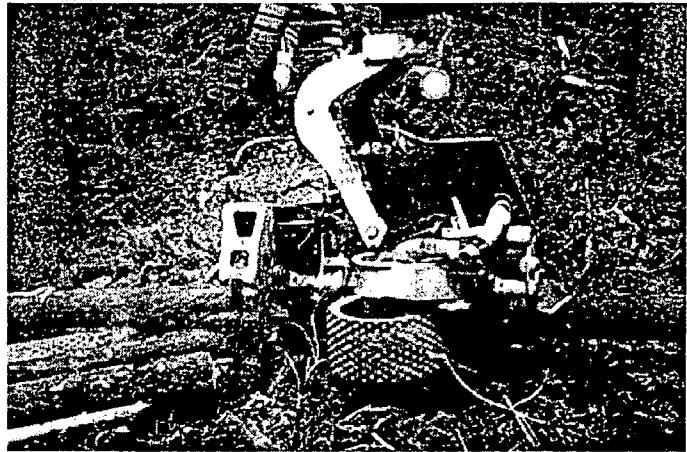


Figure 1. Koehring Waterous 762B single-grip head.

the harvester could deviate around rough or wet ground and then return to the original trail

- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail
- forwarder worked from the end of the trails towards the road
- sorting was done at the mill after debarking

Equipment description and specifications

See Table 1. Additionally,

- the carriers are rubber-tired but the front bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure



Figure 2. Timberjack FMG 1010 forwarder.

Table 1. Timberjack FMG 1270 Harvester and 1010 Forwarder Specifications

	Harvester	Forwarder
Engine power (kW)	114	82
Power transmission	6-wheel drive hydrostatic	6-wheel drive power-shift
Head capacity (cm)	60-cm diameter	n.a.
Carrying capacity (t)	n.a.	11 - t
Approx. weight (kg)	16,410	13,330
Width (m)	2.68	2.85
Crane reach (m)	8.3	6.8
Ground clearance (m)	0.60	0.60

- log specifications provided by the on-board computer were based on a minimum log length of 5.2 m and top diameter of 9 cm; however, the operator can override the computer

Study results

The estimated production of the harvester over the 12 months of operations for Riverside Forest Products, is 15 m³/h and for the forwarder is 17 m³/h. Estimated cost at roadside is \$18/m³. (Source: Riverside Forest Products)

Equipment suppliers

The Timberjack FMG equipment is available through local Timberjack distributors, for example, Terratech Equipment Limited, Kamloops, B.C. Tel.: 604-374-6961.

Approximate price of the Timberjack 1270 harvester and the 1010 forwarder is \$600,000 and \$345,000 respectively.

References

Araki, Dennis. 1994. *Thinning Second-Growth with a Timberjack FMG System*. FERIC, Vancouver. Field Note No. Processing-40. 2p.

Hunt, J.A. 1995. *Commercial Thinning of a Coastal Second-Growth Forest with a Timberjack FMG Harvester and Forwarder: An Evaluation*. FERIC, Vancouver. Technical Note. TN-235.

For further information, contact:

Bob Harrison, Riverside Forest Products Limited, 820 Guy Street, Kelowna, B.C. V1Y 7R5. Tel.: 604-762-3411 Fax: 604-861-6915

Larry Layden or Randy Spencer, Brookside Select Logging, 815 Kitch Road, Kelowna, B.C. V1X 5V8.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #3

Region

Coastal British Columbia

Date

September 1995

Author

Janet Mitchell, RPF

Source

FERIC short-term study completed in July 1995

Operators

TimberWest employees

Equipment

- Timbco T445 excavator with a Keto 500 feller-processor head (Figure 1)
- Caterpillar D4H tracked skidder with ESCO 210 grapple (Figure 2)

Location

TimberWest Forest Limited, private land near Campbell River on Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm) ecosystem
- 50-year-old unmanaged Douglas-fir stand
- preharvest - 800-1300 trees/ha, 450 m³/ha, average dbh of 21.4 cm
- some *Phellinus weiri* in the smaller stems
- flat to gentle slopes (5 to 15%)
- coarse-textured well-drained soil
- minimal obstacles to machine travel - some old-growth stumps, windfall and logs

Prescription

- remove smaller stems, and dead and diseased trees (thin from below)
- leave trees at 5 m by 5 m spacing
- final harvest will be in 15 to 20 years

Operating procedure

- conventional forwarder trails were not used
- tree selection and harvesting trails were made by

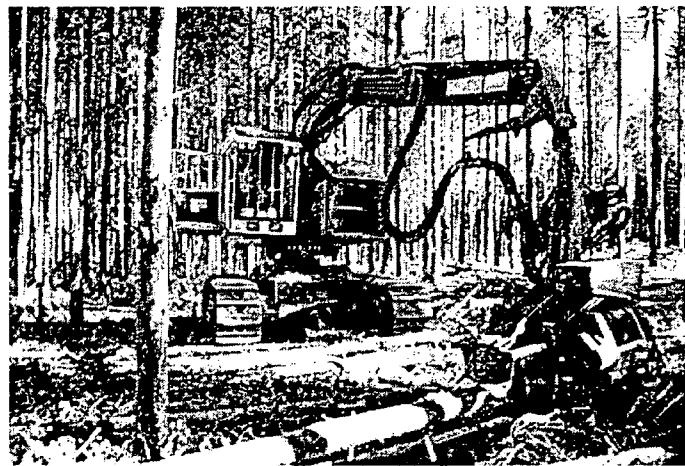


Figure 1. Timbco T445 excavator with Keto head.

- harvester operator. Trees on the previous block were marked to calibrate the operator
- harvester worked parallel to road, from the back of the block towards the road
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail, with no sorting
- skidder worked perpendicular to the road with random skid trails
- skidder sorted logs at roadside based on diameter at the base, into pulp, and small and large peeler

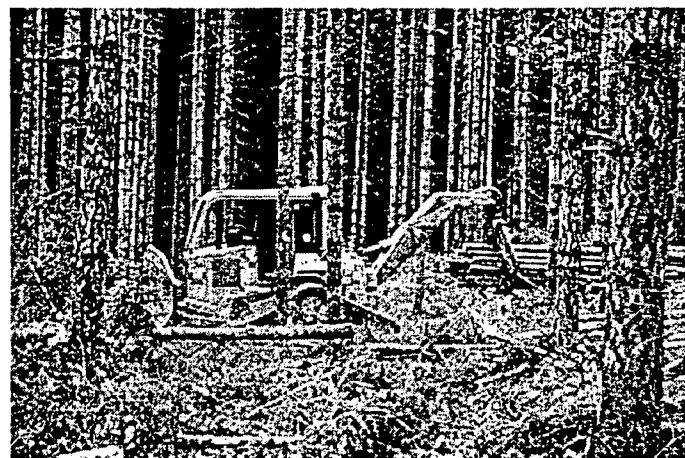


Figure 2. Caterpillar D4H tracked skidder with ESCO 210 grapple.

Table 1. Timbco T445 Excavator with Keto Head and Caterpillar D4H Tracked Skidder with Grapple Specifications

	Timbco T445 with Keto head	Caterpillar D4H tracked skidder with grapple
Engine power (kW)	128	67
Power transmission	2-speed drive motors	power-shift
Approx. weight (kg)	25,000	13,600
Width (m)	3.15	2.46
Length (m)	4.6	5.4
Height (m)	3.6	3.2
Crane reach (m)	5.1	n.a.
Grapple reach (m)	n.a.	2.5
Ground clearance (m)	0.50	0.56

Equipment description and specifications

See Table 1. Additionally,

- log specifications provided by the on-board computer were based on four log lengths: 5.30, 8.10, 10.80, and 13.25 m with a top diameter of 8 cm for sawlogs. However, the operator can override the computer
- Timbco T445 excavator has 4-way, 2-cylinder cab leveling system for working on slopes up to 55%
- Keto head can cut trees up to 55 cm in diameter

Study results

The productivity observed during the FERIC study in 1995 is summarized in Table 2, with the cost of harvesting, based on FERIC's costing method.

Post-treatment assessment found 41% of the residual trees had some damage, but only 6% of the residual trees had major damage (scar girdled more than 33%

Table 2. Summary of Productivity and Cost of Harvesting

	Timbco T445 with Keto head	Caterpillar D4H tracked skidder with grapple
Productive machine hours (PMH)	15.7	16.6
Productivity (m ³ /PMH)	13.5	10.2
Cost (\$/m ³)	11.10	10.10

of the tree circumference). Damage was caused during the felling and processing phase, by the cutting head, and the back of the excavator rubbing trees.

Approximate price of the Timbco T445 excavator is \$378,000 and the Keto head is \$159,000. The Caterpillar D4H tracked skidder with ESCO 210 grapple is approximately \$290,000. Based on FERIC costing formula, the hour cost of the harvester and skidder are \$150 and \$103/SMH respectively.

Equipment suppliers

The Timbco T445 excavator is available through Parker Pacific 20329 Logan Ave., Langley, B.C. V3A 4L8 Tel.: 604-534-8511. The Caterpillar D4H tracked skidder with ESCO 210 grapple is available from local Fanning dealers, such as Fanning Ltd. 1604 Willow Road, Campbell River, B.C., Tel.: 604-287-7494.

For further information, contact:

Barry Gibson, TimberWest Forest Limited, Oyster River Operation, North Island Region, P.O. Box 2500, 5705 North Island Hwy., Campbell River, B.C. V9W 5C5 Tel.: 604-287-8118.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #4

Region

Coastal British Columbia

Author

Jim Hunt, RPF

Date

October 1995

Source

FERIC field visit September 1995

Contractor

Shortlog Thinning Inc., Victoria, B.C.

Equipment

- Norcar 490 harvester with a Ponsse - Norcar H60 head (Figure 1)
- Norcar 600H forwarder (Figure 2)

Location

Texada Logging Limited's quota volume from Crown land near Qualicum Beach on south-central Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm) ecosystem
- 55-year-old unmanaged and spaced stands
- predominantly Douglas-fir, with minor western hemlock, grand fir, western red cedar and alder
- preharvest (unmanaged) - 923 trees/ha, 488 m³/ha, average dbh of 29 cm
- preharvest (spaced) - 683 trees/ha, 367 m³/ha and average dbh of 30 cm
- flat to gentle slopes (15%)
- sandy loam soils with moderate hazards for compaction and erosion
- numerous obstacles to machine travel - old-growth stumps, and old cedar logs

Prescription

- remove smaller stems, and dead and diseased trees (thin from below)
- leave 300 well-spaced trees/ha
- final harvest will be in 40 years



Figure 1. Norcar 490 harvester.

Operating procedure

- initial tree marking to calibrate the harvester operator, then trees selected by the operator and periodically checked by BC Ministry of Forests
- all trails selected and marked by Texada forester
- one 6-m wide, excavator-built main trail
- forwarding trails, 4 m wide and 60 m apart, were designated as permanent access
- total disturbed area was planned to be <7% of total area
- access trails up to 25-30 m long, were marked between forwarding trails, these had a maximum of 2 forwarder passes and were not considered serious disturbance.

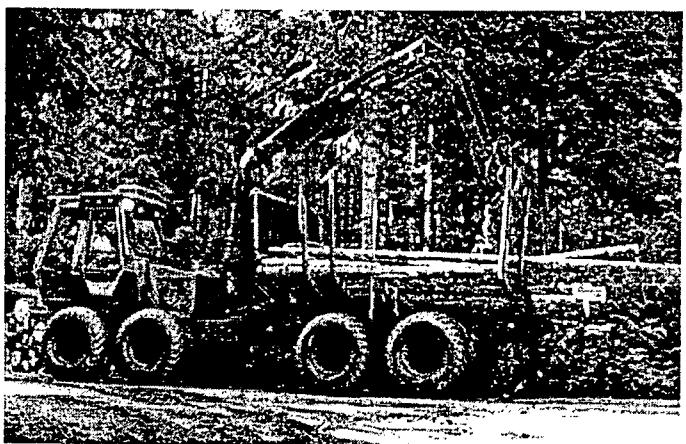


Figure 2. Norcar 600H forwarder.

- stems were processed on the trail in front of the harvester to provide a debris mat for machine travel
- forwarder loaded pulp and sawlogs in the same trip, but separated species, and worked from the end of the trails towards the main trail

Equipment description and specifications

See Table 1. Additionally,

- log specifications provided by the on-board computer were based on top diameters of 15.2 cm and 7.6 cm for sawlogs and pulp. Log lengths for sawlogs are 4.2 - 6.0 m, and 3.0 - 6.0 m for pulp.
- harvester and forwarder were built in 1990 and purchased used by the contractor
- the original harvester boom was replaced by a larger and heavier boom with longer reach

Study results

The post-harvest (unmanaged) stand had a density of 383 trees/ha, volume of 345 m³/ha and an average dbh of 37 cm. The post-harvest (spaced) stand had a density of 329 trees/ha, volume of 237 m³/ha and an average dbh of 34 cm. The contractor reports productivity in the range of 6 - 14 m³/PMH depending on the size of the trees. In larger timber as observed, the processor should be more productive than the forwarder, while in smaller wood, the harvester is less productive than the forwarder. Residual tree damage is expected to be relatively high in the dense, unmanaged stand, and low in the spaced stand. Estimated production costs range from \$19 to \$32/m³ (at roadside). (Source: Shortlog Thinning Inc.)

Table 1. Norcar 490 Harvester and 600H Forwarder Specifications

	Harvester	Forwarder
Engine power (kW)	81	81
Power transmission	8-wheel drive hydrostatic	8-wheel drive hydrostatic
Head capacity (cm)	52-cm diameter	n.a.
Carrying capacity (t)	n.a.	9.5 t
Approx. weight (kg)	10,800	10,500
Width (m)	2.5	2.5
Crane reach (m)	10.0	8.7
Ground clearance (m)	0.70	0.70

Equipment suppliers

Norcar equipment is manufactured and distributed by OY Logset AB, Hännisentie 2, 66530 Koivulahti, Finland, Tel.: 961-3463-234, Fax: 961-3460-603

The approximate prices of new equipment models comparable to the Norcar 490 harvester and 600H forwarder are \$Cdn 420,000 and \$Cdn 280,000, respectively.

For further information, contact:

Mike Steeves or Jim Lambrick, Shortlog Thinning Inc., 1480 Fort St. Victoria, B.C. V8S 1Z5 Tel.: 604-370-2667 Fax: 604-370-2611.

Dave Robinson, Texada Logging Ltd., Horne Lake Division, 470 Warder Crescent, Qualicum Beach, B.C., V9K 2A4, Tel.: 604-752-5020

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #5

Region

Alberta

Author

Janet Mitchell, RPF

Date

October 1995

Source

FERIC short-term study completed in October 1995

Contractors

Kenmatt Logging, Whitecourt, Alberta

Equipment

- Timberjack FMG 608 feller buncher with a Koehring Waterous 762B single-grip harvesting head, 2 months old (Figure 1)
- Rottne 6WD single-grip harvester with EGS 85 feller-processor head, purchased in 1989
- Rottne 6WD forwarder with Hultdins Supergrip 260 grapple, purchased in 1989 (Figure 2)

Location

Millar Western Industries Ltd., near Whitecourt, Alberta

Site and stand

- 63-year-old lodgepole pine/white spruce stand
- preharvest: low density - 1300 trees/ha, average dbh of 21.2 cm; high density - 3100 trees/ha, average dbh of 14.6 cm.
- average volume for both areas was 423 m³/ha
- flat to gentle slopes (5 to 15%)
- loam to sandy loam
- few obstacles to machine travel

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- leave 625 trees/ha at 4 m by 4 m spacing, leave all advanced spruce regeneration
- Millar Western will monitor the block and schedule either a second thinning, or final harvest



Figure 1. Koehring Waterous 762B single-grip harvesting head on Timberjack FMG 608 feller buncher.
depending on the growth response of the stand

Operating procedure

- initially crop trees were pre-marked to calibrate the harvester operator, and later, were selected by the operator and checked by Millar Western
- harvesting trails were selected by harvester operator
- land occupied by trails was minimized by using the full reach of the harvester when possible
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail, sorted into conifer and deciduous
- forwarder followed the harvesting trails

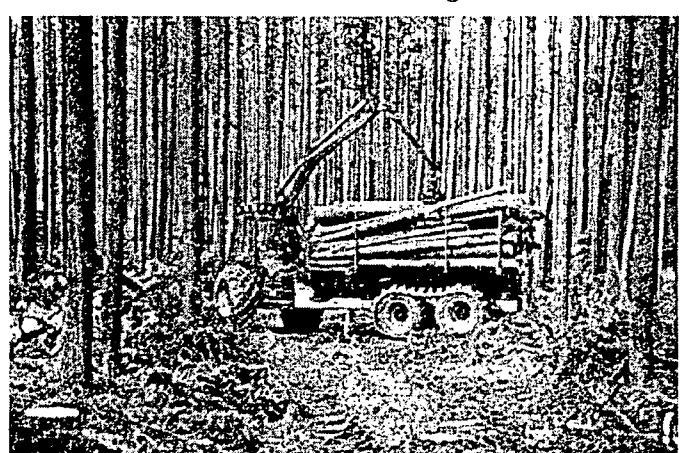


Figure 2. Rottne forwarder.

Table 1. Timberjack Feller-buncher and Rottne Harvester and Forwarder Specifications

	Timberjack 608 feller- buncher with 762B head	Rottne 6WD harvester with EGS 85 head	Rottne 6WD forwarder with Hultdins 260 grapple
Engine power (kW)	125	125	125
Power transmission	2-speed drive motors	6-wheel drive, hydrostatic	6-wheel drive, hydrostatic
Head capacity (cm)	55-cm diameter	50-cm diameter	n.a.
Carrying capacity (t)	n.a.	n.a.	10
Approx. weight (kg)	27,000	17,000	13,700
Width (m)	2.9	2.4	2.4
Length (m)	4.0	8.5	8.5
Height (m)	3.0	3.5	3.5
Crane reach (m)	7.0	8.1	6.0
Ground clearance (m)	0.50	0.56	0.56

Equipment description and specifications

See Table 1. Additionally,

- on the Timberjack harvester, log specifications provided by the on-board computer were 5.03 m, 4.38 m, and 3.79 m lengths for sawlog, and random lengths for pulplog
- minimum top and butt diameters were 7 and 11 cm respectively; however, the operator can override the computer

Study results

The harvesting productivity and cost, based on

Table 2. Summary of Productivity and Cost of Harvesting at Roadside

	Timberjack 608 feller- buncher with 762B head	Rottne 6WD harvester with EGS 85 head	Rottne 6WD forwarder with Hultdins 260 grapple
Productive machine hours	27.2	25.0	12.0
Productivity (m ³ /PMH)			
- Low density	17.6	23.5	
- High density	9.4	11.3	
- Average	12.9	17.0	23.5
Cost (\$/m ³)	11.50	9.10	5.80

Table 3. Post-Treatment Stand Conditions

Equipment Unit	Timberjack		Rottne	
	low density	high density	low density	high density
Density (trees/ha)	600	950	550	1133
Dbh (cm)	24.6	18.2	24.8	14.4
Species (%)	Pl - 100	Pl - 95	Pl - 82	Pl - 76
	Sw - 5	Sw - 18	Sw - 18	Sw - 24

FERIC's costing method are summarized in Table 2. This was the first thinning operation for the crew, and as the crew gains experience, it may be possible to increase productivities and to achieve lower overall costs. Productivity has been given for both the low- and high-density portions of the stand. Post-treatment stand conditions are listed in Table 3. Post thinning assessment found 45% of the trees had some damage, but only 2% of the trees had major damage (>900 cm² in area). Damage was caused during the felling and processing phase, by the cutting head, the processed stem and the back of the harvester rubbing trees.

Approximate price of the Timberjack 608 with a 762B head is \$495,000. The newer versions of the Rottne harvester and forwarder are larger and more powerful and cost \$565,000 and \$425,000 respectively.

Equipment suppliers

Timberjack: Coneco Equipment Inc., 16116 - 111 Avenue, Edmonton, Alberta T5M 2S1. Tel.: 403-451-2630. Rottne: ROCAN Forestry B.C. Ltd., Prince George, Tel.: 604-962-8244.

For further information, contact:

Dan Smith, Millar Western Industries Ltd., 5004 - 52 Street, Whitecourt, Alberta, T7S 1N2 Tel.: 403-778-2221.

Ken van Gundy and Matt Curtis, Kenmatt Logging, Box 2134, Whitecourt, Alberta, T7S 1M8 Tel.: 403-778-0278.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable Item: #1

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

October 1995

Source

FERIC field visit April 1995

Contractor

Enviro-Harvesting Inc., Courtenay, B.C.

Equipment

- hand falling
- Kubota KH191 excavator with home-made collapsible extension on the arm for light cable yarding (Figure 1)
- forwarder consisted of Nokka 36 loader and trailer pulled by a Massey Ferguson farm tractor (Figure 2)
- free-standing bunks for transportation on commercial refuse trucks (Figure 3)

Location

Crown land in the Sayward Forest, near Campbell River on central Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 45-year-old plantation, juvenile spaced in 1983
- Douglas-fir, western hemlock (grand fir, western red cedar)
- preharvest - 540 trees/ha, 320 m³/ha, average dbh of 34.3 cm
- hummocky slopes with occasional pitches to 30%
- coarse-textured well-drained soil
- numerous obstacles to machine travel - old growth stumps, windfall, logs, and juvenile spacing slash

Prescription

- leave 300 well-spaced trees/ha, leave all understory cedar and white pine



Figure 1. Kubota KH191 excavator.

- favour Douglas-fir over hemlock as final crop trees
- remove all diseased and damaged trees
- final harvest will be in 20 - 30 years
- minimize site disturbance to less than 2%

Operating procedure

- residual trees were marked by silvicultural contractors for the BC Ministry of Forests
- forwarding trails were located by the Forest Officer and the thinning contractor
- hand falling and bucking in the woods by two fallers
- 4.2 m length, 8 cm top

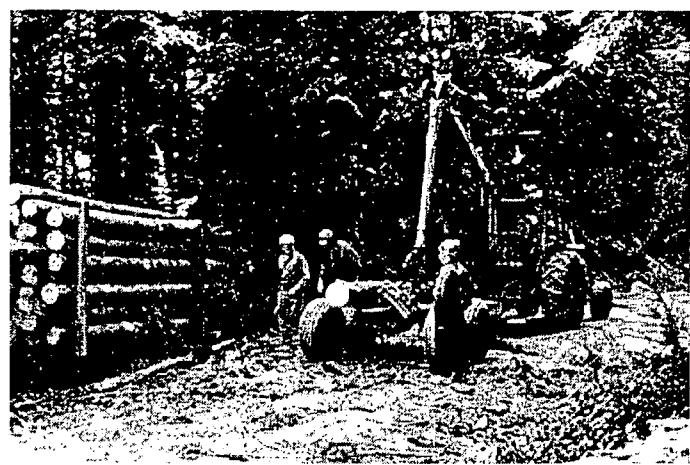


Figure 2. Nokka 36 loader and trailer pulled by a Massey Ferguson farm tractor.



Figure 3. Empty free-standing bunks being unloaded from commercial refuse truck.

- trails were made by an excavator using old juvenile spacing slash and tops to provide a debris mat for machine travel
- logs were yarded to the forwarding trails by the excavator and forwarded to roadside by the forwarder
- logs were then sorted and loaded into free-standing bunks and hauled to Campbell River, on a commercial refuse truck

Equipment description and specifications

See Table 1. Additionally,

- loader and trailer requires a 45 kW-tractor
- approximate price of the Kubota KH191 is \$105,000, including the modifications for the tower and the winches
- approximate price of the Nokka 36 loader and trailer is \$23,000
- bunks are available for \$5500

Study results

The productivity and costs, based on 4 months production, is summarized in Table 2. The yarding and forwarding system has produced an average of 40

Table 1. Machine Specifications

	Yarder	Loader and trailer
Engine power (kW)	44	n.a.
Carrying capacity (m^3)	n.a.	12
Approx. weight (kg)	6000	950
Width (m)	2.15	2.13
Maximum yarding distance (m)	150	n.a.
Crane reach (m)	n.a.	7.1
Ground clearance (cm)	35	35

Table 2. Summary of Productivity and Cost of Harvest

	Yarder/ Loader	Bunks
Productivity (m^3 /shift)	40	25
Harvesting cost (at the mill) (\$/ m^3)		38.50

m^3 /shift. The forwarding distance ranged from 200 - 700 m, because road construction was not allowed within the block. The trucks, using the free-standing bunks, hauled an average of 25 m^3 /shift. (Source: BC Ministry of Forests, Campbell River Forest District)

Productivity was dependent on piece size and forwarding distances. The cost for this system was \$38.50/ m^3 (at the mill) (Source: Bob Woods, Enviro-Harvesting Inc.)

Total stand damage was 5.6%, but only 0.5% was in the unacceptable category.

Equipment suppliers

The Kubota yarder, Nokka trailer and loader, and bunks are available through Cougar Pacific Equipment, Duncan, B.C. Tel: 604-748-2809, and Enviro-Harvesting Inc., 4262 Cotton Road, Courtenay, B.C. V9N 5X9. Tel./Fax: 604-334-3554.

For further information, contact:

Bob Woods, Enviro-Harvesting Inc., 4262 Cotton Road, Courtenay, B.C. V9N 5X9. Tel./Fax: 604-334-3554

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, B.C. V6W 6Y7 Tel.: 604-286-9344.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #2

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

October 1995

Source

FERIC field visit April 1995

Contractor

Art Graham, Campbell River, B.C.

Equipment

- hand falling
- Washington 78-40 swing yarder (Figure 1)

Location

Crown land in the Sayward Forest, near Campbell River on Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm2) ecosystem
- 50-year-old unmanaged stand
- Douglas-fir, western hemlock
- preharvest - 812 trees/ha, 220 m³/ha, average dbh of 21.3 cm for cut trees and 24.4 cm for crop trees
- flat to gentle slope (5 - 30%)
- coarse-textured well-drained soil (Sandy loam, 0 - 10% coarse fragments)

Prescription

- leave 300 well-spaced dominant and codominant trees/ha of suitable form, with 30% minimum crown
- intermediate harvest, clearcut at final rotation

Operating procedure

- leave trees were selected and marked by silvicultural contractors for the BC Ministry of Forests



Figure 1. Washington 78-40 swing yarder.

- yarding corridors, selected and marked by Forest Officers, were 2.5 m wide and 40 m apart (Figure 2)
- hand falling
- cable system restricted during high sap flow
- utilization: 3-m log, 12.5-cm top, and 30-cm stump height



Figure 2. Yarding corridor

Table 1. Yarding Specifications

	Washington 78-40 swing yarder
Engine power (kW)	147
Power transmission	power shift
Haulback	690 m - 16 mm
Mainline and skyline	366 m - 16 mm
Maximum line speed (m/min)	380-460
Maximum line pulls (kg)	22,136
Approx. weight (kg)	36 900
Width (m)	4.30
Height (m)	15.0
Swing radius (m)	2.32
Ground clearance (m)	0.47

Equipment description and specifications

See Table 1. Additionally,

The Washington 78-40 swing yarder observed by FERIC was built in 1978 and is no longer available, but a comparable model would cost approximately \$650,000 - \$700,000.

Study results

The contractor has 15 years commercial thinning experience. The Washington 78-40 Swing yarder produced 40 m³/day in this study. (Source: BC Ministry of Forests, Campbell River Forest District)

Equipment suppliers

Washington yarders are available through Trican Machinery Ltd., 455 Brunette Street, New Westminster, B.C. V3L 3G1 Tel.: 604-540-0826

For further information, contact:

Art Graham, 152 Lennea Place, Campbell River, B.C. V9W 5T7, Tel.: 604-923-5087.

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, B.C. V6W 6Y7, Tel.: 604-286-9344.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable Item: #3

Region

Coastal British Columbia

Author.

Janet Mitchell, RPF

Date

October 1995

Source

FERIC field visit April 1995

Contractor

R. J. Timber Products Ltd., Merville, B.C.

Equipment

- hand falling
- Igland Jones Trailer Alp yarder (Figure 1)
- Belaris Tractor

Location

Crown land in the Sayward Forest, near Campbell River on Vancouver Island.

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 53-year-old unmanaged stand
- Douglas-fir, western hemlock
- preharvest - 1050 trees/ha, 230 m³/ha, average dbh of 25 cm for cut trees and 36 cm for crop trees
- flat to gentle slope (0 - 30%)
- coarse-textured well-drained soil (loamy sand, 10 - 50% coarse fragments)

Prescription

- heavy low thinning, clearcut at rotation
- leave 300 well-spaced trees/ha, predominantly Douglas-fir

Operating procedure

- leave trees were selected and marked by silvicultural contractors for the BC Ministry of Forests



Figure 1. Igland Jones Trailer Alp yarder.

- yarding corridors, selected and marked by Forest Officers, were 2.5 m wide and 40 m apart
- hand falling
- utilization: 3-m log, 10-cm top, 30-cm stump height

Equipment description and specifications

See Table 1. Additionally,

- Igland Jones Trailer Alp yarder observed by FERIC was built in 1979.

Table 1. Yarding Specifications.

	Yarder
Engine power (kW)	49
Power transmission	drive shaft, and chain, and worm-gear drives
Skyline	800 m - 16 mm
Mainline and haulback	550 m - 10 mm
Line speeds (m/min)	183 - 274
Tower height (m)	7.2
Trailer length (m)	4.4

- yarder consists of winches and a tower mounted on a trailer, pulled by a farm tractor.
- originally a Norwegian design, but modified in Scotland for use in Scotland before being imported into Canada

Study results

The yarder produced 40 m³/day in commercial thinning in this study. (Source: BC Ministry of Forests, Campbell River Forest District)

Equipment suppliers

The Igland Jones yarder is not available through local distributors, and originally came from James Jones and Sons, Lambert, Stirlingshire, Scotland, United Kingdom.

References

Peters, P.A.; Kellogg, L.D. 1980. "Smallwood Harvesting Using a Trailer Alp Cable Yarding System" in Transactions of the ASAE. Vol. 23, No. 5, pp. 1080-1083. American Society of Agricultural Engineers, St. Joseph, Michigan.

For further information, contact:

Rick Shellink, R.J. Timber Products Ltd., P.O. Box 4, Merville, B.C., V0R 2M0

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, B.C. V6W 6Y7 Tel.: 604-286-9344.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #4

Region

Chile

Author

Jim Hunt, RPF

Date

November 1995

Source

FERIC field visit June 1995

Operators

Bosques Arauco S.A. employees

Equipment

- hand falling
- South African-manufactured Urus I-Uni yarder (Figure 1)
- Austrian-manufactured Stuefer HSK 2000 carriage

Location

Bosques Arauco S.A., private land near Arauco, in south-central Chile

Site and stand

- 8-year-old radiata pine stand, managed for pulp production (Figure 2)
- preharvest - 1200 trees/ha, 91 m³/ha, average height of 16 m.
- average tree volume 0.09 m³
- 50-70% slope

Thinning regime for sawlog stands

Radiata pine is usually managed on a 20- to 25-year rotation for clear sawlogs. Typically,

- plant 1100 seedlings/ha
- age 5, 6-m height, prune 600 trees/ha to 3-m clear height
- age 6, 9-m height, commercial thin to 600 trees/ha and prune to 4.5 m
- age 7, prune to minimum clear height of 5.2 m
- fourth pruning may be applied on better sites
- age 10, 16-m height, second thinning to reduce density to 300 trees/ha

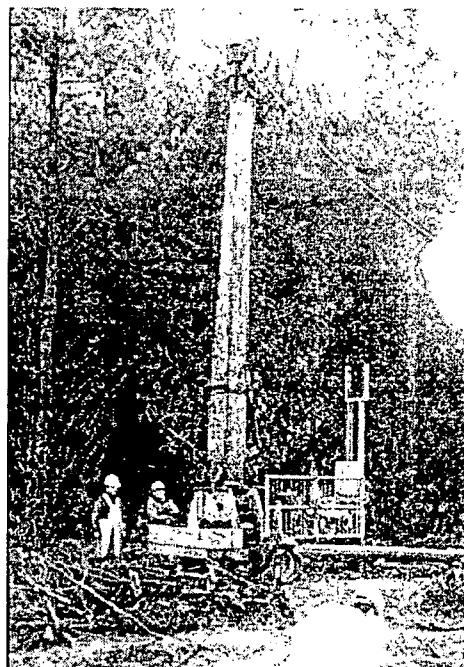


Figure 1. South African-manufactured Urus I-Uni yarder.

Prescription

- favourable economic and technological developments shifted the stand management objective from pulp production to sawlog production
- leave 500 trees/ha, removing 50 m³/ha



Figure 2. Eight-year-old radiata pine stand.

Table 1. Yarder Specifications

Yarder	
Engine power (kW)	54
Power transmission	automatic
Skyline	320 m - 16 mm
Mainline	330 m - 10 mm
Haulback	660 m - 8 mm
Line speed (haulback) (m/sec)	2.1 - 6.4
Maximum load capacity (kg)	1500
Approx. weight (kg)	1900
Tower height (m)	7.0

Operating procedure

- each crew consists of 4 chainsaw operators, 3 chokersetters and 1 yarder operator
- trees are selected by the faller and felled parallel to the contour
- yarding corridors spaced 40-60 m apart, with an average width less than 3 m, average length is 218 m, and maximum length of 300 m.
- 2-3 intermediate supports along span
- tree-length logs, 6 m, transported to the log yard with self-loading logging trucks

Equipment description and specifications

See Table 1. Additionally,

- Urus I-Uni is a mobile 7-m tower mounted on a trailer with a 3-point hitch.
- commonly used for uphill yarding, but it is equipped with 3 drums and can yard downhill.
- tower is hydraulically raised.
- purchase price is \$Cdn 80,000 (fob Vancouver)
- yarder is powered by a trailer-mounted 54-kW diesel engine, but tractor PTO powered versions are also available (\$Cdn 40,000).
- a hydraulic timing device activates the skyline clamps on the Stuefer HSK 2000 carriage
- skyline clamps released when the mainline pulled the chokers into the carriage
- carriage (and turn) traveled to the landing upon clamp release.

Study results

Damage was tallied if 25% of the bole circumference was exposed. On this basis, damage levels did not exceed 3% of all residual trees. The observed productivity of 4.9 m³/SMH was influenced by the small stem volume (Table 2). Productivity of 6.5

Table 2. Summary of Productivity and Cost of Yarder

Yarder	
Productivity (m ³ /SMH)	
small stems (0.09m ³ /tree)	4.9
large stems (0.36 m ³ /tree)	6.5
Cost (\$US/m ³)	12.10
(\$Cdn/m ³)	16.95

m³/SMH was reported with larger pieces (0.36 m³).

Harvesting cost at roadside was \$US 12.10/m³ (approximately \$Cdn 16.95/m³). However, it is difficult to make cost comparisons with North America due to differences in standards of living in Latin America.

Equipment suppliers

Hinteregger S.A. (Pty) Ltd.
P.O. Box 1557
Kempton Park 1620
South Africa
Tel.: 27-738-3505, Fax: 27-738-3508

For further information, contact:

Humberto Aicón Perez, Thinning Manager, Bosques Arauco S.A., Casilla 147, Arauco, Chile. Tel.: 56-41-571-941, Fax: 56-41-571-944

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INSTITUT CANADIEN
DE RECHERCHES
EN GÉNIE FORESTIER
Division de l'ouest

June, 1996

FERIC Members and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment — Second Release (SR-108)

The enclosed material comprises the second issue of ten, 1-page descriptions of commercial thinning operations. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you did not receive the first issue, please complete the form below and send it to the address given.

The equipment component of the compendium is being developed and will be released shortly. If you have comments on the content of the attached items or suggestions for future material in the compendium, please contact me, or Ingrid Hedin.

This project is funded in 1996/97 by Forest Renewal BC.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink that appears to read "J. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — FIRST RELEASE (DECEMBER 1995) (SR-108)

Please return completed form to:

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid Item: #1

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

February 1996

Source

FERIC visit to field demonstration

Contractor

West Coast Logging Shows, Squamish, B.C.

Equipment

- hand falling
- Iron Horse mini-skidder (Figure 1)

Location

MacMillan Bloedel Limited's woodlot, private land near Sechelt, B.C.

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- fire-origin Douglas-fir
- age class 5 (100-120 years)
- preharvest density - 650 trees/ha
- flat to gentle slopes with occasional pitches to 15%
- coarse-textured well-drained soil

Prescription

- reduce density to 400 trees/ha
- minimize soil disturbance and damage to residual trees

Operating procedure

- the Iron Horse mini-skidder was demonstrated as part of an operator training program
- trees were hand-felled, bucked and delimbed at the stump
- the Iron Horse operator set the choker around the log, then winched the log to the trail and onto the bunks on the back of the Iron Horse mini-skidder
- hand-held hooks were not used by the operator to



Figure 1. Iron Horse mini-skidder.

move the stems into position, but these are available

- once the Iron Horse was loaded a binding strap was wrapped around the logs to keep them in place during skidding
- the Iron Horse then skidded the stems to the landing
- the operator walked in front of the Iron Horse and controlled the speed and direction of the mini-skidder with levers on the steering arm
- the Iron Horse is steered by disconnecting one track and applying its brake
- at the landing, the operator removed the binder, and then released the folding bunks and dropped the load

Equipment description and specifications

See Table 1. Additionally,

- Iron Horse mini-skidder is equipped with two reinforced rubber drive-tracks, a winch, and a motor
- winch and tracks are driven by two belts and can run simultaneously
- speed is controlled by a throttle on the steering arm
- the Iron Horse has a load guard, a protective frame around the engine, a chain saw holder, a storage box, folding bunks, and hook to hold gas and oil

Table 1. Iron Horse Specifications

Iron Horse mini-skidder	
Engine power (kW)	6.7
Power transmission	2 speed, belt driven
Approx. weight (kg)	350
Width (m)	1.08
Length (m)	2.8
Height (m)	0.98
Maximum speed (km/h)	4.5
Mainline (length - diameter)	15 m - 10 mm
Ground pressure loaded (kPa)	10.0
Track width (cm)	38

- the Iron Horse mini-skidder can be transported in the box of a full-size pickup truck
- accessories include a hoist, one of several timber trailer designs, a tipper platform or a combi-platform with a folding tail board
- the Iron Horse is available in smaller models and a wheeled model (Figure 2) similar to a forwarder with a winch, a hoist and a trailer
- modifications have been made to recent models to improve the drive train and increase durability
- the Iron Horse can also be used to transport seedlings, fire suppression equipment or other heavy equipment

Observations

FERIC observed the Iron Horse during the one-day demonstration, working in a felled stand. Ideally, the operator of the Iron Horse would fell the tree along side of the Iron Horse, then buck and delimb it at the stump before loading the log onto the Iron Horse. During the demonstration, the operator spent time winching and maneuvering the logs before loading them onto the Iron Horse. When using the timber

trailer with a roller attachment, the operator fells the tree onto the roller and processes the stem on the Iron Horse.

Usually an operator would be responsible for the complete process (fall, buck, delimb, and skid) and production would depend on site and stand conditions and the products being produced.

Equipment suppliers

The Iron Horse mini-skidder is manufactured by J-TRAC AB in Sweden and distributed by Husqvarna and Jonsred throughout Fennoscandia and Europe. In Canada, the Iron Horse and Wheel Horse are available through West Coast Logging Shows, Box 1035, Squamish, B.C. V0N 3G0 Tel.: 604-898-9493 Fax: 604-898-9495.

The approximate price of the Iron Horse is \$15,000. The timber trailer with roller is approximately \$2,500.

References

Holmsen, S.D. 1988. *Selectively Logging Dry-Belt Douglas-fir with the Iron Horse Mini-Skidder*. FERIC, Vancouver. Field Note Silviculture-9. 2p.

For further information, contact:

Bryan Couture, West Coast Logging Shows, Box 1035, Squamish, B.C. V0N 3G0 Tel: 604-898-9493 Fax: 604-898-9495.

Paul Harper, B.C. Ministry of Forests, Sunshine Coast Forest District, Sechelt Field Office, 1975 Field Rd., Sechelt, B.C. V0N 3A0 Tel.: 604-885-5174 Fax: 604-885-3803.

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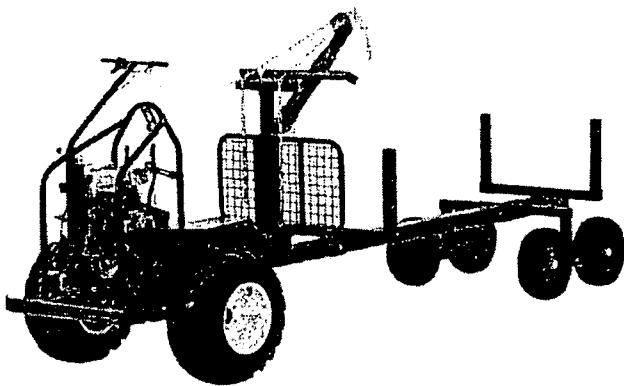


Figure 2. The Wheel Horse.

Harvesting System: Cut-and-Skid
Item: #2

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

February 1996

Source

FERIC visit to field demonstration

Contractor

Hyster Sales Company, Seattle, Washington.

Equipment

- hand falling
- ASV Posi-Track mini-skidder (Figure 1)
- Farmi JL 501 skidding winch (Figure 2)

Location

MacMillan Bloedel Limited's woodlot, private land near Sechelt, B.C.

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- fire-origin Douglas-fir
- age class 5 (100-120 years)
- preharvest density- 650 trees/ha
- flat to gentle slopes with occasional pitches to 15%
- coarse-textured well-drained soil

Prescription

- reduce density to 400 trees/ha
- minimize soil disturbance and damage to residual trees

Operating procedure

- The ASV Posi-Track mini-skidder was demonstrated as part of an operator training program
- the trees were hand-felled, delimbed, and bucked at the stump
- the ASV Posi-Track winched stems to the trail, and then skidded them to the landing



Figure 1. ASV Posi-Track mini-skidder.

Equipment description and specifications

See Table 1. Additionally,

- 45-cm molded rubber tracks made of Kevlar™*, nylon, polyester, and fiberglass rods (Figure 3)
- the ASV Posi-Track mini-skidder used in the demonstration included a Farmi JL 501 skidding winch and forks
- other attachments include 6-way blade, brush cutter, arched grapple, loader, snow blower, and bucket

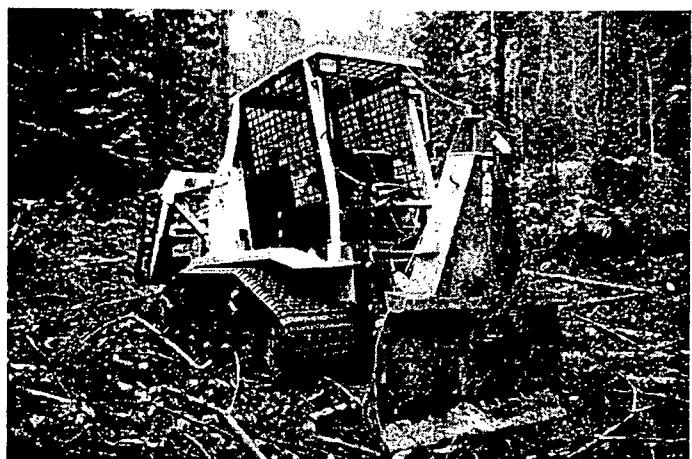


Figure 2. ASV Posi-Track with Farmi JL 501 skidding winch.

* Kevlar™ is a registered trademark of E.I. DuPont Co.

Table 1. ASV Posi-Track Specifications

	ASV Posi-Track mini-skidder	Farmi JL 510 skidding winch
Engine power (kW)	52*	30 - 45**
Power transmission	hydrostatic	PTO
Approx. weight (kg)	2545	286
Width (m)	1.63	1.40
Length (m)	2.87	n.a.
Height (m)	1.98	1.65
Pulling capacity (kg)	1800	5011
Maximum speed (km/h)	12.8	n.a.
Maximum line speed (m/min)	n.a.	90
Track width (cm)	45	n.a.
Ground pressure loaded (kPa)	10.0	n.a.

* 69 kW turbo charge optional

** minimum size of carrier required



Figure 3. Kevlar™ track.

Sechelt, B.C. V0N 3A0 Tel.: 604-885-5174
Fax: 604-885-3803.

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- the ASV Posi-Track mini-skidder can work on maximum slopes of 38% unloaded, and 33% loaded, if traction allows
- three point hitch for other agricultural and forestry equipment
- operator's seat is reversible
- transported on a trailer pulled by a pickup truck
- quick attachment system conforms to Bobcat mounting system

The ASV Posi-Track mini-skidder has only recently been used for commercial thinning and no production figures are available at this time.

Equipment suppliers

The ASV Posi-Track mini-skidder is manufactured by ASV Incorporated, Grand Rapids, Minnesota, U.S.A. and is available from Hyster Sales Company, 9892-40th Avenue South, Seattle, Washington 98118, U.S.A. Tel.: 206-722-5800 Fax: 206-722-3657.

Approximate price of the ASV Posi-Track mini-skidder equipped with the Farmi winch is C\$55,000.

For further information, contact:

John Parisi, Hyster Sales Company, 9892-40th Avenue South, Seattle, Washington 98118, U.S.A.
Tel.: 206-722-5800 Fax: 206-722-3657.

Paul Harper, B.C. Ministry of Forests, Sunshine Coast Forest District, Sechelt Field Office, 1975 Field Rd.,



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid
Item: #3

Region

Southern Interior British Columbia

Authors

Jim Hunt, RPF and Janet Mitchell, RPF

Date

November 1995

Source

FERIC field visit

Contractor

Strategic Silviculture Ltd., Cranbrook, B.C.

Equipment

- hand falling
- Tree Farmer C-7 line-skidder
- John Deere 544 rubber tired loader

Location

Crown land near Cranbrook, managed by the B.C. Ministry of Forests, Cranbrook Forest District under the Small Business Forest Enterprise Program.

Site and stand

- Interior Douglas-fir (IDF) ecosystem
- 70-year-old fire-origin lodgepole pine
- preharvest - 7000-9000 trees/ha, 16 m in height
- flat to gentle slopes
- coarse-textured well-drained soil

Prescription

- thin to 650-700 trees/ha
- do not remove trees >16 cm dbh, unless required for main trails
- leave larch
- space to 4 m, with 2 m spacing adjacent to trails
- minimize damage to residuals and soil disturbance

Operating procedure

- each worker manually felled, delimbed, and bucked stems into 8-foot lengths, and then piled the logs
- piles had to be made carefully to prevent



Figure 1. Minor forest products removed.

- disintegration and facilitate skidding
- piles contained 150-200 pieces and were elevated at one end to allow the choker to pass around the pile
- a 10 person crew worked on this operation
- skidding was random, except on some main trails

Equipment description and specifications

See Table 1. Additionally,

- the Tree Farmer skidder and John Deere loader were both approximately 25 years old
- the skidder was approximately 2 m wide.



Figure 2. Residual stand following removal of minor forest products.

Table 1. Tree Farmer Specifications

Tree Farmer C-7 line-skidder	
Engine power (kW)	97
Power transmission	4-speed power shift
Approx. weight (kg)	7940
Width (m)	2.1
Length (m)	5.6
Height (m)	2.8
Ground clearance (m)	0.46

Production

Approximately 8000 pieces per ha, or 80 m³/ha were removed (Figure 1). The average dbh of the 650-700 residual trees/ha was 12 cm (Figure 2). Fifty mandays, and one and one half skidder shifts were used to produce 80 m³/ha. Approximately 2-3% of residual trees were scarred, but no fines were levied on this sale. Minor forest products (e.g. orchard props, teepee poles, dynamite poles) were produced from a 20-ha area and sawlogs were removed from one 11-ha section (Source: Strategic Silviculture Ltd.).

Equipment suppliers

The skidder and loader used in this operation were purchased used and are readily available inexpensively. Tree Farmer skidders are available through Timberjack dealers.

For further information, contact:

Gaetan Effray, Strategic Silviculture Ltd., 329 Van Horne Street South, Cranbrook, B.C. V1C 1Z6
Tel.: 604-426-2525 Fax: 604-426-6273.

Denis Petryshen, B.C. Ministry of Forests, Cranbrook Forest District, 1902 Theatre Rd., Cranbrook, B.C. V1C 4H4 Tel.: 604-426-1700 Fax: 604-426-1449.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid
Item: #4

Region

Southern Interior British Columbia

Author

Ingrid Hedin, RPF, MF

Date

May 1996

Source

FERIC field visit

Contractor

C&D Contracting, Cranbrook, B.C.

Equipment

- hand falling
- John Deere 540 rubber-tired line skidder
- Nokka Processor 400, with a Nokka 3410 boom and grapple, mounted on Belarus tractor
- Hitachi EX 60 excavator

Location

In Crestbrook Forest Industries Ltd. operating area on Crown land south of Elko in the East Kootenays

Site and stand

- Interior Douglas-fir (IDFdm2) ecosystem
- 60-80 years of age
- lodgepole pine (90% by number) and western larch
- Larch dwarf mistletoe exists on the veteran larch
- preharvest - 4600 trees/ha, 105 m³/ha, 40% of trees in 5-cm stump diameter class, 50% in 10-cm class, with remainder up to 35 cm
- gentle slopes, 15% with occasional pitches to 35%
- soils - sandy to sandy loam

Prescription

- thinning in 1996 with final harvest in 15-20 years
- increase growing space, nutrient, moisture and light availability to the dominant stems in the stand by reducing tree density
- encourage grass establishment for mid-spring and fall habitat for ungulates during annual migration



Figure 1. Stand after thinning.

- extract small sawlogs, pulp and other minor products that would otherwise be lost through the natural thinning of the stand
- leave 700-900 well-spaced trees/ha, with intertree distance of 3.6 m, adjust spacing to 2.0 m where required to meet target density
- harvest codominant larch infested with mistletoe in overstory veteran canopy, retain veteran larch for wildlife trees until final harvest in 15-20 years

Operating procedure

The wood is hand felled with faller-selection of leave trees, and processed by the Nokka at the skid road. Logs are bucked as sawlog, pulplog, or grape stake (2.5 or 3.1 m length), sorted and decked (Figure 2). The logs are skidded to the landing as bunches or, in the case of the shortwood, using a sling.



Figure 2. Skid road with decked logs.



Figure 3. Grape stakes banded for transport.

During wet weather conditions, the rubber-tired skidder and tractor did not operate on the skid roads. The faller bucked and delimbed the wood, and the excavator was used to bunch on the skid roads. Several months ago, the contractor used a grapple skidder, but it was not cost-effective.

The wood for export is banded on the landing (Figure 3) and transported using a tridem highboy. The sawlogs and pulplogs are transported by self-loading logging truck to Crestbrook Forest Industries' mills.

The contractor operates with a three-person crew: faller, skidder operator, and excavator/processor operator. Depending upon the stand conditions, this crew produces 30 to 60 m³/shift.

Equipment description and specifications

The Nokka Processor 400 is manufactured by Nokka Koneet Oy in Finland. It can be mounted on a variety of carriers, and requires 40 kW of power and had a hydraulic pump capacity of 110 L/min. The processor consists of delimiting knives, spiked rollers and a chain saw for bucking and topping. Its maximum cutting diameter is 35 cm. The processor is used in combination with a loader (boom and grapple) or felling head (boom, grapple and felling head).

Products

Four products are obtained from this block. Sawlogs have a minimum butt diameter of 12.5 cm and 10 cm top, and comprise 5-10% of the volume. Pulplogs have 10-12.5 cm minimum butt diameter and 7 cm top, and are generally 70% of the volume. When pulp mills are not accepting pulplogs, these logs are sold in the U.S. for fence rails. The contractor sells other undersize material for grape stakes and dowels in the

U.S. (2.5 m length), blasting sticks for mining operations and teepee poles.

Equipment suppliers

Hakmet Ltd., P.O. Box 248, Dorion, Quebec J7V 7J5
514-455-6101

Agent: Jack MacLeod, Forest Harvesting Equipment,
466 Fisher St., New Westminster, B.C. V3L 3H9
604-524-6469

Approximate price for processor and loader, f.o.b. Vancouver, is \$60 000.

For further information, contact:

Gerry George, Planning Supervisor, Crestbrook Forest Industries Ltd., Box 998, Elko, B.C. V0B 1J0
Tel.: 604-529-7211

Dave Opper, C&D Contracting, Box 627, Cranbrook, B.C. V1C 4J2 Tel.: 604-489-5955

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: Mechanical Item: #2

Region

Interior British Columbia

Authors

Jim Hunt, RPF and Janet Mitchell, RPF

Date

September 1995

Source

FERIC field visit

Equipment

- Timbco T445 excavator with Quadco felling head
- Caterpillar D4H custom tracked skidder with Hydrawrap grapple

Location

In Pope and Talbot Ltd. operating area on Crown land near Midway in the central Kootenays.

Contractor

Reid Hedlund, Midway, B.C.

Site and stand

- Dry Mild Interior Douglas-fir (IDFdm1) ecosystem
- 100-year-old unmanaged stand
- Douglas-fir, western larch, lodgepole pine, and ponderosa pine, (75:24:1:<1 by volume)
- preharvest - 306 merchantable trees/ha, 127 m³/ha, average dbh of 35 cm
- gentle slopes, 17% with occasional pitches to 35%
- coarse-textured well-drained soil
- little understory vegetation or slash

Prescription

- single tree selection
- maintain uneven-aged stand structure for mule deer winter range
- produce sawlogs in 100-120 years
- remove half of the volume in the 20-cm diameter class, a third of the volume in the 25-cm diameter class and a fifth of the volume of larger diameter classes, to maintain an inverted J-curve

- leave 200 trees/ha
- second entry in 20-25 years

Operating procedure

- individual trees marked-to-cut to maintain an inverted J-curve
- skidding along designated trails to landings
- openings not to exceed 0.16 ha

Equipment specifications

See Table 1. Additionally,

- Timbco T445 excavator has 4-way, 2-cylinder cab leveling system for working on slopes up to 55%

Production

The Timbco T445 was more productive than the Caterpillar D4H skidder, and the operation produced approximately 4-5 loads/shift (36 m³/load). The volume of the stand was reduced by 47 m³/ha (or 37% of the stand was removed). Significant windthrow occurred in the year following thinning, but it has not yet been assessed. Disturbance on lower trails close to the main road was relatively high.

The cost of lay-out and tree marking was \$7.50/m³. The overall harvesting cost (on the truck) was \$18.40/m³. (Production and cost figures source: Pope and Talbot Ltd.)

Table 1. Timbco T445 Excavator with Quadco Felling Head and Caterpillar D4H Tracked Skidder with Grapple Specifications

	Timbco T445 with Quadco felling head	Caterpillar D4H tracked skidder with Hydrawrap grapple
Engine power (kW)	128	67
Power transmission	2-speed drive motors	power-shift
Head capacity (cm)	55	n.a.
Approx. weight (kg)	25,000	13,600
Width (m)	3.15	2.46
Length (m)	4.6	5.4
Height (m)	3.6	3.2
Ground clearance (m)	0.50	0.56

Equipment suppliers

The Timbco T445 excavator with the Quadco head is available through Inland Kenworth Ltd., 816 Industrial No. 1, Cranbrook, B.C. Tel.: 604-426-6205.

The Caterpillar D4H tracked custom skidder is available from local Finning dealers, such as Finning Ltd., 815 Cranbrook North, Cranbrook, B.C. Tel.: 604-489-6631 Fax: 604-426-8575.

Approximate price of the Timbco T445 excavator is \$378,000 and the Quadco felling head is \$160,000. The Caterpillar D4H tracked custom skidder with the Hydrawrap grapple is approximately \$290,000.

For further information, contact:

George Delisle, Pope and Talbot Ltd., P.O. Box 70, Midway, B.C. V0H 1H0 Tel.: 604-449-2212 Fax: 604-449-2388.

Reid Hedlund, Box 188, Midway, B.C. VOH 1MO Tel./Fax: 604-449-2322.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #6

Region

Washington, U.S.A.

Author

Janet Mitchell, RPF

Date

April 1996

Source

FERIC visit to field demonstration

Contractor

4 M Fibre, Sweethome, Oregon, U.S.A.

Equipment

- Timberjack 1270 harvester with 746 single-grip harvesting head (Figure 1)
- Timberjack 1210B forwarder (Figure 2)

Location

Washington State Department of Natural Resources, South Puget Sound Region, near Enumclaw, Washington.

Site and stand

- 16-ha study site
- 18-22 year-old Douglas-fir plantation
- preharvest - 839 trees/ha, average dbh of 22 cm, average height of 18 m
- stand was precommercially thinned approximately 5 years ago
- flat to gentle slopes
- well drained soils

Prescription

- leave 495 well-spaced trees/ha
- final harvest will be in 10 to 15 years

Operating procedure

- tree selection was made by harvester operator
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail
- forwarder followed the harvester trails

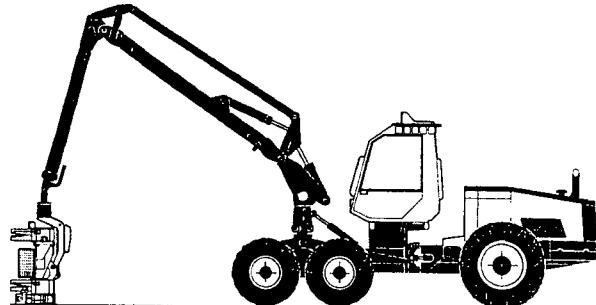


Figure 1. Timberjack 1270 harvester with 746 single-grip head. (Source: Timberjack 1270 brochure)

- forwarder made one pass for sawlogs and a second pass for the pulplogs

Equipment description and specifications

See Table 1. Additionally,

- the carriers are rubber-tired but the front bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure
- log specifications provided by the on-board computer were based on a minimum log length of 3.65 m and top diameter of 12.7 cm; however, the operator can override the computer
- harvester is equipped with high intensity halogen lights for night-time operation
- engine and cab tilt for easy service and maintenance

Production

The estimated production of the harvester is 100 trees/hour, not including slashing trees < 6 cm at dbh

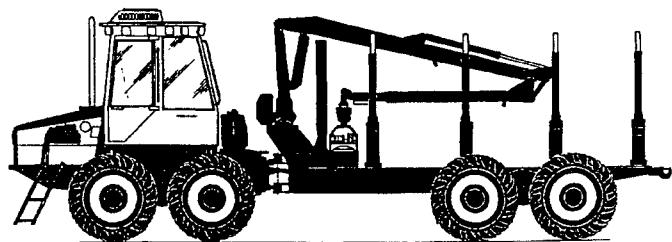


Figure 2. Timberjack 1210B forwarder. (Source: Timberjack 1210B brochure).

Table 1. Timberjack 1270 Harvester and 1210B Forwarder Specifications

	Timberjack 1270 harvester	Timberjack 1210B forwarder
Engine power (kW)	128	128
Power transmission	6-wheel drive hydrostatic	8-wheel drive hydrostatic*
Head capacity (cm)	60-cm diameter	n.a.
Carrying capacity (t)	n.a.	12 - t
Approx. weight (kg)	16,410	15,155
Width (m)	2.68	2.85
Maximum speed (km/h)	31.5	25.0
Crane reach (m)	8.3	7.2
Ground clearance (m)	0.60	0.60

* 6-wheel drive is also available

and noncommercial vegetation. The harvester thinned approximately 2 ha/day. (Source: 4 M Fibre).

Equipment suppliers

In Canada, Timberjack equipment is available through local Timberjack distributors, for example Terratech Equipment Inc., Langley, B.C. Tel.: 604-532-8324 Fax: 604-532-9853, or FMG Timberjack Inc., Box 160, 925 Devonshire Ave., Woodstock, Ontario N4S 7X1 Tel.: 519-537-6271.

Approximate price of the Timberjack 1270 harvester and the 1210 forwarder is C\$600,000 and C\$480,000 respectively.

References

Araki, Dennis. 1994. *Thinning Second-Growth with a Timberjack FMG System*. FERIC, Vancouver. Field Note Processing-40. 2p.

Hunt, J.A. 1995. *Commercial Thinning of a Coastal Second-Growth Forest with a Timberjack FMG Harvester and Forwarder: An Evaluation*. FERIC, Vancouver. Technical Note. TN-235. 14p.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street S.E., P.O. Box 47016, Olympia, Washington 98504-7016 Tel.: 360-902-1736 Fax: 360-902-1783.

Pacific North Equipment Co., 22431 83rd Avenue South, Kent, Washington 98032. P.O. Box 88000, Seattle, Washington 98138 Tel.: 206-872-3500 Fax: 206-872-3519.

Mike Melcher, 4 M Fibre, P.O. Box 600, Sweethome, Oregon 97386 Tel.: 541-367-3232 Fax: 541-367-7299.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #7

Region

Washington, U.S.A.

Author

Janet Mitchell, RPF

Date

April 1996

Source

FERIC visit to field demonstration

Contractor

Fibre Tech Inc., Stanwood, Washington, U.S.A.

Equipment

- Bell TH 120 tracked harvester (Figure 1)
- Bell T12B forwarder (Figure 2)

Location

Washington State Department of Natural Resources, South Puget Sound Region, near Enumclaw, Washington.

Site and stand

- 16 ha study site
- 18-22 year-old Douglas-fir plantation
- preharvest - 839 trees/ha, average dbh of 22 cm, average height of 18 m
- stand was precommercially thinned approximately 5 years ago
- flat to gentle slopes
- well drained soils

Prescription

- leave 495 well-spaced trees/ha
- final harvest will be in 10 to 15 years

Operating procedure

- tree selection was made by harvester operator
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail
- forwarder followed the harvester trails
- forwarder made one pass for sawlogs and a second pass for the pulplogs



Figure 1. Bell TH 120 harvester.

Equipment description and specifications

See Table 1. Additionally,

- the harvester has 40 cm-wide tracks with an elevated drive sprocket with hydraulic track adjusters and coil spring tensioners
- the forwarder is rubber-tired but the front bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure
- the harvester is equipped with high intensity halogen lights for night-time operation
- harvester and forwarder can work on maximum slopes of 35% (40% on dry ground)

Production

The estimated production of the harvester and



Figure 2. Bell T12B forwarder.

Table 1. Bell TH 120 Tracked Harvester and T12B Forwarder Specifications

	Bell TH 120 harvester	Bell T12B forwarder
Engine power (kW)	86	86
Power transmission	hydrostatic	hydrostatic
Head capacity (cm)	55-cm diameter	n.a.
Carrying capacity (t)	n.a.	12 - t
Width (m)	2.7	2.9
Crane reach (m)	5.3	6.5
Ground clearance (m)	65	65

forwarder in this operation, is 170 m³/day total, or 100 m³/day for sawlogs. Sawlogs are >12.5 cm in diameter and 4.9 m in length. (Source: Fibre Tech Inc.).

Equipment suppliers

The Bell equipment is available through Pacific North Equipment Co., 22431 83rd Avenue South, Kent, Washington 98032. P.O. Box 88000, Seattle, Washington 98138 Tel.: 206-872-3500.

Approximate price of the Bell TH 120 tracked harvester and the T12B forwarder are C\$315,000 and C\$276,000 respectively.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street S.E., P.O. Box 47016, Olympia, Washington 98504-7016 Tel.: 360-902-1736 Fax: 360-902-1783

Pacific North Equipment Co., 22431 83rd Avenue South, Kent, Washington 98032 P.O. Box 88000, Seattle, Washington 98138 Tel.: 206-872-3500 Fax: 206-872-3519.

Tom Foster, Fibre Tech Inc., 3325 256th Street N.W., Stanwood, Washington 98292 Tel.: 360-629-9725 Fax: 206-745-0131.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cut-to-Length
Item: #8**

Region

Washington, U.S.A.

Author

Janet Mitchell, RPF

Date

April 1996

Source

FERIC visit to field demonstration

Contractor

Pacific North Equipment Co., Kent, Washington,
U.S.A.

Equipment

- Komatsu PC 128UU (ultra urban) tracked thinning harvester with a HTH 14 PAN single-grip harvesting head (Figures 1 and 2)
- Timberjack 230A forwarder (Figure 3)

Location

Washington State Department of Natural Resources,
South Puget Sound Region, near Enumclaw,
Washington.

Site and stand

- 16-ha study site
- 18-22 year-old Douglas-fir plantation
- preharvest - 839 trees/ha, average dbh of 22 cm;
average height of 18 m
- stand was precommercially thinned approximately
5 years ago
- flat to gentle slopes
- well drained soils

Prescription

- leave 495 well-spaced trees/ha
- final harvest will be in 10 to 15 years

Operating procedure

- tree selection was made by harvester operator
- stems were processed on the trail in front of the
machine to provide a debris mat for machine travel

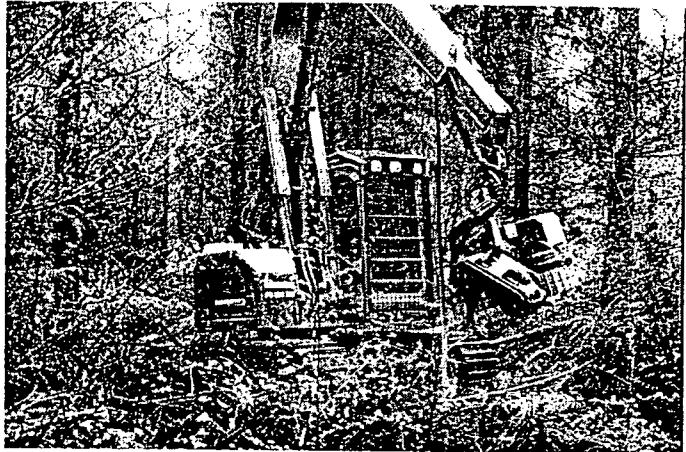


Figure 1. Komatsu PC 128UU harvester with HTH 14 PAN single-grip head.

- logs were piled at the side of the trail
- forwarder followed the harvester trails
- forwarder made one pass for sawlogs and a second pass for the pulplogs

Equipment description and specifications

See Table 1. Additionally,

- harvester is a Japanese excavator with a boom and harvesting head attached
- harvester carrier is 2.4 m wide and can turn within its width - no tail swing
- harvesting head has an auto measuring system
- all components are easily available
- forwarder is a converted Timberjack 230 skidder

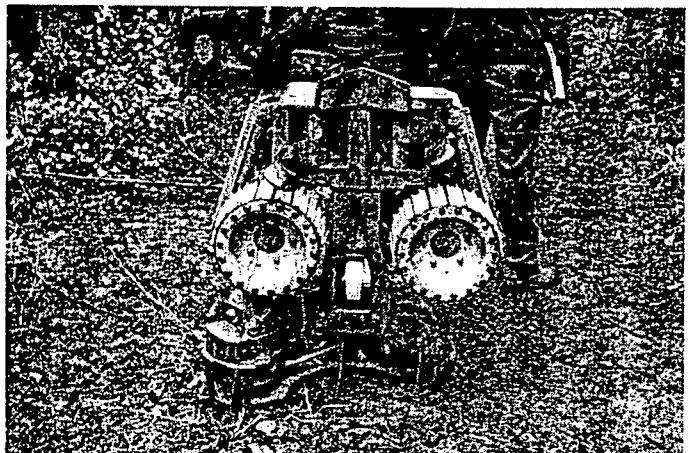


Figure 2. HTH 14 PAN single-grip harvesting head.

Table 1. Komatsu PC 128UU Harvester and Timberjack 230A Forwarder Specifications

	Komatsu PC 128UU Harvester	Timberjack 230A Forwarder
Engine power (kW)	63	75
Power transmission	hydrostatic	4-wheel drive hydrostatic
Head capacity (cm)	36-cm diameter	n.a.
Carrying capacity (t)	n.a.	8 - t
Approx. weight (kg)	11,800	11,431
Width (m)	2.44	3.00
Crane reach (m)	7.2	5.3
Ground clearance (m)	0.40	0.60

Production

The estimated production for the harvester and forwarder is approximately 200 m³/day, not including slashing trees < 6 cm at dbh and noncommercial vegetation. (Source: Pacific North Equipment Co.)

Equipment suppliers

The Komatsu and Timberjack equipment are available through Pacific North Equipment Co., 22431 - 83rd Avenue South, Kent, Washington 98032. P.O. Box 88000, Seattle, Washington 98138 Tel.: 206-872-3500.

In Canada, Timberjack equipment is available through local Timberjack distributors or FMG Timberjack Inc., Box 160, 925 Devonshire Ave., Woodstock, Ontario N4S 7X1 Tel.: 519-537-6271.

The HTH 14 PAN harvesting head is available through Pierce Pacific Manufacturing Inc., 930 Laval Crescent, Kamloops, B.C. V2C 5P5 Tel.: 604-372-9986 Toll Free: 1-800-666-4474 Fax: 604-372-9975.

Approximate price of the Komatsu harvester and the Timberjack 230A forwarder is C\$297,000 and C\$179,000 respectively.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street S.E., P.O. Box 47016, Olympia, Washington 98504-7016 Tel.: 360-902-1736 Fax: 360-902-1783.

Pacific North Equipment Co., 22431 - 83rd Avenue

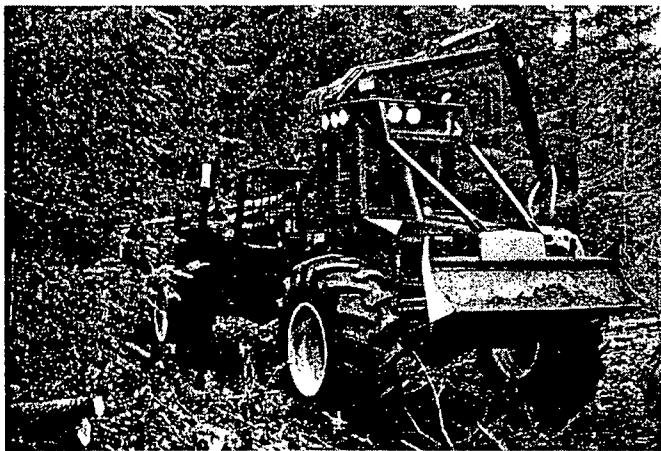


Figure 3. Timberjack 230A forwarder.

South, Kent, Washington 98032. P.O. Box 88000, Seattle, Washington 98138 Tel.: 206-872-3500 Fax: 206-872-3519.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #9

Region
Washington, U.S.A.

Author
Janet Mitchell, RPF

Date
April 1996

Source
FERIC visit to field demonstration

Contractor
Northwest Log Marketing, Chehalis, Washington,
U.S.A.

Equipment

- Valmet 500T harvester with a 955 single-grip harvesting head (Figure 1)
- Valmet 546 forwarder

Location
Washington State Department of Natural Resources,
South Puget Sound Region, near Enumclaw,
Washington.

Site and stand

- 16-ha study site
- 18-22 year-old Douglas-fir plantation
- preharvest - 839 trees/ha, average dbh of 22 cm,
average height of 18 m
- stand was precommercially thinned approximately
5 years ago
- flat to gentle slopes
- well drained soils

Prescription

- leave 495 well-spaced trees/ha
- final harvest will be in 10 to 15 years

Operating procedure

- tree selection was made by harvester operator
- stems were processed on the trail in front of the
machine to provide a debris mat for machine travel
- logs were piled at the side of the trail



Figure 1. Valmet 500T tracked harvester. (Source: Valmet 500T brochure)

- forwarder followed the harvester trails
- forwarder made one pass for sawlogs and a second pass for the pulplogs

Equipment description and specifications

See Table 1. Additionally,

- the cab, engine and boom are all mounted on same leveling base plate for a stable safe work platform
- the Valmet 500T has 4-way, 2-cylinder cab leveling system for working on slopes up to 55%
- Cranab two-stage telescopic boom with reach of 8.9 m
- log specifications provided by the on-board computer however, the operator can override the computer

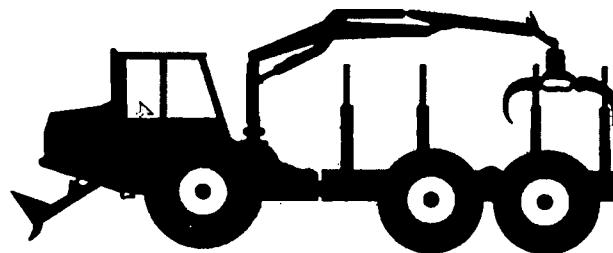


Figure 2. Valmet 546H forwarder. (Source: Valmet brochure)

Table 1. Valmet 500T Harvester and 546 Forwarder Specifications

	Valmet 500T harvester	Valmet 546 forwarder
Engine power (kW)	126	76
Power transmission	hydrostatic	6-wheel drive power-shift
Head capacity (cm)	56-cm diameter	n.a.
Carrying capacity (t)	n.a.	9 - t
Approx. weight (kg)	21,490	15,155
Width (m)	2.90	2.59
Maximum speed (km/h)	4.5	24
Crane reach (m)	8.9	5.4
Ground clearance (m)	0.66	0.48

The Valmet 500T has only recently been used for commercial thinning and no production figures are available at this time.

Equipment suppliers

In Canada, Valmet equipment is available through Finning Ltd., for example, Finning Ltd., 555 Great Northern Way, Vancouver, B.C. Tel.: 604-872-4444.

In Washington, Valmet equipment is available through Totem Equipment Co., 5000 E. Marginal Way South, Seattle, Washington 98134

Approximate price of the Valmet 500T harvester and the 546 forwarder is C\$552,000 and C\$262,200 respectively.

References

Hunt, J.A. 1992. *Initial Thinning Trials with the Valmet Woodstar 546 Harvester and Forwarder*. FERIC, Vancouver. Field Note. Silviculture-47. 2p.

Mitchell, Janet L. 1995. *Valmet Woodstar 546 Harvester and Forwarder: Short-Term Evaluation*. FERIC, Vancouver. Field Note Processing-42. 2p.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street S.E., P.O. Box 47016, Olympia, Washington 98504-7016 Tel.: 360-902-1736 Fax: 360-902-1783.

Bill Bethune, Northwest Log Marketing, 1300 N. W. Maryland Ave, Chehalis, Washington 98532 Tel.: 360-748-0243 Fax: 360-748-4766.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cable
Item: #5**

Region

Washington, U.S.A.

Author

Brian Boswell, RPF & Marv Clark, RPF

Date

May 1996

Source

FERIC field visit

Contractor

Pacific Logging, Marysville, Washington

Equipment

- hand falling
- Diamond D210 swing yarder (Figure 1)

Location

Private land (Longview Fiber) at Proctor Creek, about 45 km SE of Everett, Washington

Site and stand

- 50-year-old unmanaged third growth stand
- western hemlock (80%), western redcedar (10%), and Douglas-fir (10%)
- preharvest - 800 trees/ha, 720 m³/ha, average dbh of 40 cm
- gentle side slope to an adjacent lake (10 - 25%)

Prescription

- clearcut a 500 m by 60 m strip
- extract some stems from a 30 m buffer strip along an adjacent lake using lateral yarding techniques

Operating procedure

- yarder was rigged as a single span standing skyline with a tail spar for lift
- maximum yarding distance observed was about 185 m with an average yarding distance of 170 m
- observed lateral yarding distance was 20 m
- a Maki Mini-Mak II motorized carriage was used and logs were partially suspended during yarding

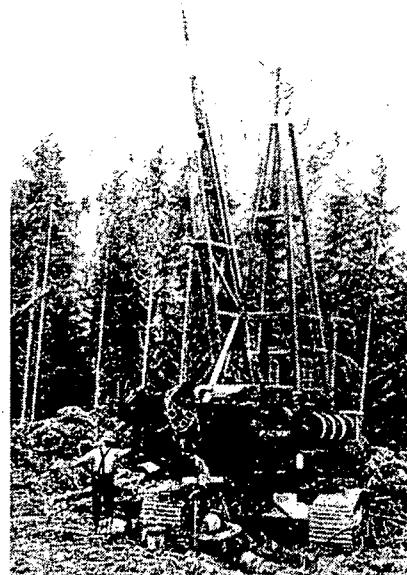


Figure 1. Diamond D210 swing yarder.

Equipment description and specifications

The specifications described in Table 1. The Diamond D210 is a light weight swing yarder, developed specifically for harvesting smaller timber. A side-mounted motor combined with a six speed power-shift transmission drives directly into the winch gear train. Power is transmitted from the winch's straight cut gearing into three in-line winch drums (main, haulback and skyline) through individual air activated plate clutches. Eaton water cooled brake units (46 cm diameter (18")) are installed on the outboard side of the winch frame on all three drum shafts for retardation (two Eaton units are used for the skyline drum). In addition, each drum is equipped with an auxiliary band brake assembly.

The Diamond D210's winch, cab, and boom assemblies are mounted on a swing platform that attaches to the yarder's car body through a large (117 cm diameter) sluing bearing. Two hydraulically-driven gear boxes provide the swing torque and braking for the rotating deck.

Table 1. Yarder Specifications

	Diamond D210 swing yarder
Engine (Cummins 6CT8.3C)	157 kW
Transmission (Funk 2000)	6 speeds forward 3 speeds reverse
Mainline/haulback	550 m - 16 mm
Skyline	610 m - 21 mm
Maximum line speed (m/min)	1150
Maximum line pull (kg)	20,500
Approx. weight (kg)	30,000
Max. track width (m)	3.3
Operating tower height (m)	12.5
Max. swing radius (m)	2.9
Max. travel speed (km/h)	4.8
Ground clearance (m)	0.44

The boom assembly consists of an A-frame tower pinned to the base of the gantry frame. The vertical angle of the tower is fixed by a two part pendant line bridle. The boom assembly is pinned directly over the winch frame. Three hydraulically powered guyline winches, located on the back of the winch frame, are used to anchor the machine against yarding forces. A stacked cluster of swivel fairleads at the top of the gantry assembly distributes the guyline reactions evenly into the boom system. The yarding tower is also equipped with three swivel fairleads. When the yarder is demobilized for highway transportation, the yarding tower is pulled back into the gantry frame and pinned there. Two of the gantry anchor pins are removed from the cab side of the winch frame and the whole assembly is tilted in the

direction of the motor by retracting a large multistage hydraulic cylinder. With the boom assembly cradled over the motor, the machine is then stabilized for transport by pinning a brace between the swing platform and the car body.

Because the main and haulback winch drums are not interlocked, the machine is most commonly rigged in a standing skyline configuration, however it can be rigged for straight highlead or shotgun applications. The yarder can also function in the running skyline mode using the skyline drum as the haulback, and the haulback drum as the a second main drum to pull slack or control a grapple.

The Diamond D210 swing yarder is assembled in Sedro Woolley, Washington, by a team of veteran winch builders (Figure 2). The yarder observed by FERIC was the first of 10 machines built, however only minor changes have occurred since this machine was assembled. The two most significant changes were a wider cab and a different undercarriage assembly.

Observed production

During FERIC's 2 hours of observation, turns averaged 4.1 min and 5.4 logs (2.2 m^3) each. Extrapolating this data suggests a shift level productivity of 215 m^3 . This estimate corresponds with the crews estimate of 8 to 9 truck loads per day for the site.

Equipment suppliers

Diamond D210 yarders are available through Coastal Pacific Inc., 3603-136th St. N.E., Marysville, Washington 98271 Tel.: 360-653-4993 Fax: 360-653-7650

The suggested base price for the yarder is US\$345,000 not including lines and carriage.

For further information, contact:

John Griffin, Coastal Pacific Inc. (above Tel & Fax)
Pacific Logging, Marysville, Washington; Bob Hild
Tele.: 360-691-5099; Babe Giebel Tele.: 360-435-3255

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Figure 2. Yarder Assembly — Sedro Woolley, Washington



Harvesting System: Cut-to-Length
Item: #10

Region

Northern Interior British Columbia

Author

Janet Mitchell, RPF

Date

July 1996

Source

FERIC visit to field demonstration

Contractor

E. A. Strimbold Ltd., Burns Lake, BC

Equipment

- Valmet 546H harvester with a Valmet 948 single-grip harvesting head (Figure 1)

Location

Crown land near Vanderhoof, BC, managed by the BC Ministry of Forests, Vanderhoof Forest District under the Small Business Forest Enterprise Program.

Site and stand

- Sub Boreal Spruce (SBSdw3) ecosystem
- fire-origin lodgepole pine (99%), spruce (1%)
- preharvest density - 4500 trees/ha
- flat to gentle slopes with occasional pitches to 10%
- coarse-textured well-drained loamy sand

Prescription

- reduce density to 600 trees/ha
- leave dominant and codominant trees
- minimise soil disturbance and damage to residual trees
- concentrate growth on remaining vigorous trees to improve individual piece sizes and stem volumes and salvage volume that may be lost to natural mortality

Operating procedure

- Valmet 546H harvester was demonstrated as part of the Northern Silviculture Committee field tour

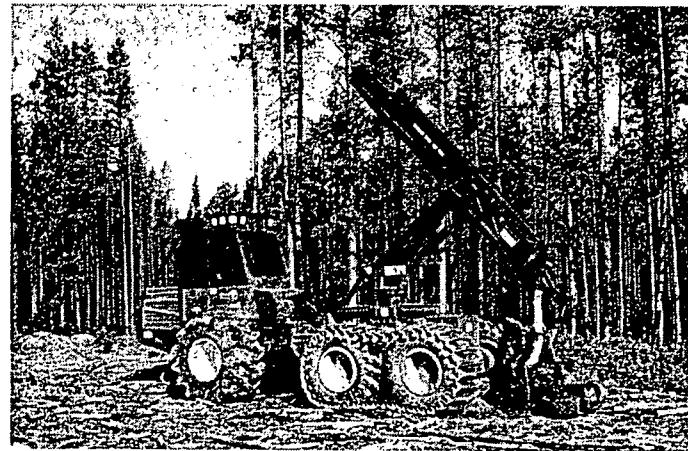


Figure 1. Valmet 546H harvester.

- tree selection was made by the harvester operator
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail

Equipment description and specifications

See Table 1. Additionally,

- although not on this harvester, an on-board computer can be used to record number of stems cut, average diameters, lengths and volumes by species
- harvester usually works in conjunction with a Valmet 546 forwarder

Table 1. Valmet 546H Harvester Specifications

Valmet 546H harvester with 948 head	
Engine power (kW)	93
Power transmission	6 WD drive 3x3 power shift
Head capacity (cm)	48-cm diameter
Approx. weight (kg)	13 635
Width (m)	2.6
Length (m)	6.7
Height (m)	3.9
Crane reach (m)	9.8
Ground clearance (m)	0.48

Observations

FERIC observed the Valmet 546H harvester during the one-day demonstration. Productivity was not measured, but in a similar stand, the contractor estimated that he would get approximately 6-8 m³/h.

Equipment suppliers

Valmet equipment is manufactured by SISU Logging USA Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 USA Tel.: 906-428-4800 Fax: 906-428-3922.

This equipment is available through local Fanning dealers, for example, Fanning Ltd., 4621 Keith Road, Terrace, BC V8G 1K3 Tel.: 250-638-4600 Fax: 250-638-4623.

The approximate (1996) price of the Valmet 546H harvester and forwarder are \$485 000 and \$350 000 respectively (f.o.b. Terrace).

References

Hunt, J.A. 1992. *Initial Thinning Trials with the Valmet Woodstar 546 Harvester and Forwarder*. FERIC, Vancouver. Field Note. Silviculture-47. 2p.

Mitchell, Janet L. 1995. *Valmet Woodstar 546 Harvester and Forwarder: Short-Term Evaluation*. FERIC, Vancouver. Field Note Processing-42. 2p.

Compendium article Operations Cut-to-Length #12

For further information, contact:

Marvin Strimbold, of E. A. Strimbold Ltd., Box 569, Burns Lake, BC V0J 1E0 Tel./Fax: 250-696-3607.

Dave Sommerville, Zone Officer, Silviculture, BC Ministry of Forests, Vanderhoof Forest District, Box 190, Vanderhoof, BC V0J 3A0 Tel.: 250-567-6363 Fax: 250-567-6370.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #11

Region

Northern Interior British Columbia

Author

Janet Mitchell, RPF

Date

July 1996

Source

FERIC visit to field demonstration

Contractor

Anrick Logging Ltd., Vanderhoof, BC

Equipment

- John Deere 290D excavator with an HTH 14 PAN single-grip harvesting head
- Kubota M8580 tractor with an Enviroquip B-Line 9000 forwarding trailer with a Farmi HK 4166 loader

Location

Crown land near Vanderhoof, BC managed by the BC Ministry of Forests, Vanderhoof Forest District under the Small Business Forest Enterprise Program.

Site and stand

- Sub Boreal Spruce (SBSdw3) ecosystem
- fire-origin lodgepole pine (99%), spruce (1%)
- preharvest density - 4 500 trees/ha
- flat to gentle slopes with occasional pitches to 20%
- coarse-textured well-drained loamy sand

Prescription

- reduce density to 600 trees/ha
- leave dominant and codominant trees
- concentrate growth on remaining vigorous trees to improve individual piece sizes and stem volumes and salvage volume that may be lost to natural mortality
- minimise soil disturbance and damage to residual trees

Operating procedure

- tree selection was made by the harvester operator
- trails were marked by a contractor for the BC Ministry of Forests
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were piled at the side of the trail
- forwarder followed the harvester's trails
- logs were sorted and decked at the landing before being transported to the mill

Table 1. John Deere 290D Excavator with an HTH 14 PAN Single-Grip Harvesting Head Specifications

	John Deere excavator	HTH 14 PAN single-grip harvesting head
Engine power (kW)	48.5	n.a.
Approx. weight (kg)	9 409	365
Width (m)	2.5	0.7 - 1.0
Length (m)	3.2	n.a.
Height (m)	2.6	n.a.
Head capacity (cm)	n.a.	36-cm diameter
Crane reach (m)	7.0	n.a.
Ground clearance (m)	0.60	n.a.

Table 2. Kubota M8580 Tractor Specifications

	Kubota M8580 tractor
Engine power (kW)	63.4
Power take off (kW)	59.7
Power transmission	4 wheel drive, fully synchro main speed and hydraulic-shift
Approx. weight (kg)	3 400
Width (m)	2.0
Length (m)	3.9
Height (m)	2.6
Ground clearance (m)	0.43

Equipment description and specifications

See Tables 1 and 2. Additionally,

- HTH 14 PAN single-grip harvesting head is mounted on the boom of a John Deere 290D excavator
- harvesting head can cut trees up to 36-cm in diameter
- forwarder is an Enviroquip B-Line 9000 forwarding trailer with a Farmi HK 4166 loader pulled by a Kubota M8589 tractor
- power for the loader is supplied by the tractor
- loader has a continuous rotating grapple and a boom reach of 6.6 m
- forwarder has four sets of stakes and carries 9 000 kg

Observations

FERIC observed the John Deere excavator with harvesting head during the one-day demonstration as part of the Northern Silviculture Committee field tour. Production was not measured, but the contractor estimates his production as 40 - 60 m³/day.

Equipment suppliers

The John Deere 290D excavator is approximately \$135 000 and is available through local John Deere distributors, for example, Coast Tractor and Equipment Ltd., 1090 Eastern St., BCR Industrial Park, Prince George, BC V2N 2K8 Tel.: 250-562-1151 Fax: 250-562-7266.

The HTH 14 PAN single-grip harvesting head is approximately \$103 000 and is manufactured and distributed by Pierce Pacific Manufacturing Inc., 930 Laval Crescent, Kamloops, BC V2C 5P5 Tel.: 250-372-9986 Toll Free: 1-800-666-4474 Fax: 250-372-9975.

The Kubota tractor is approximately \$94 000 and is available from North Country Farm Machinery, Chief Lake Rd, Chief Lake, BC Tel: 250-967-4412 or Cougar Pacific Equipment, Duncan, BC Tel.: 250-748-2809 Fax: 250-748-9696.

The Enviroquip B-Line 9000 forwarder and Farmi HK 4166 loader are approximately \$13 500 and \$21 500 respectively and available from Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9 Tel.: 1-800-496-6656 Fax: 250-334-9338.

For further information, contact:

Richard Wiens, Anrick Logging Ltd., Box 1637, Vanderhoof, BC V0J 3A0 Tel.: 250-567-4371 Fax: 250-567-9656.

Richard DeLuca, Sales Manager, Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9 Tel.: 1-800-496-6656 Fax: 250-334-9338.

Dave Sommerville, Zone Officer, Silviculture, BC Ministry of Forests, Vanderhoof Forest District, Box 190, Vanderhoof, BC V0J 3A0 Tel.: 250-567-6363 Fax: 250-567-6370.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #12

Region

Northern Coastal British Columbia

Authors

Stephanie Sambo & Janet Mitchell, RPF

Date

September 1996

Source

FERIC field visit

Contractor

E. A. Strimbold Ltd., Burns Lake, BC

Equipment

- Valmet 546H harvester with a Valmet 948 single-grip harvesting head (Figure 1)
- Valmet 546H forwarder (Figure 2)

Location

Crown land near Terrace, BC, managed by Repap British Columbia Inc.

Site and stand

- Coastal Western Hemlock (CWHws1) ecosystem
- naturally regenerated western hemlock and amabilis fir (advanced regeneration)
- average age 40 years
- juvenile spaced in 1987
- preharvest - 1280 trees/ha, 315 m³/ha, average dbh of 18 cm and piece size of 0.19 m³/piece
- slopes ranged from 0-40%

Prescription

- low thinning removing suppressed and intermediate crown classes and damaged or diseased trees
- densities reduced to 500-600 trees/ha
- approximately 4.4-m spacing
- leave mainly codominant and dominant hemlock and amabilis fir
- leave large deciduous trees and wildlife trees to promote species diversity

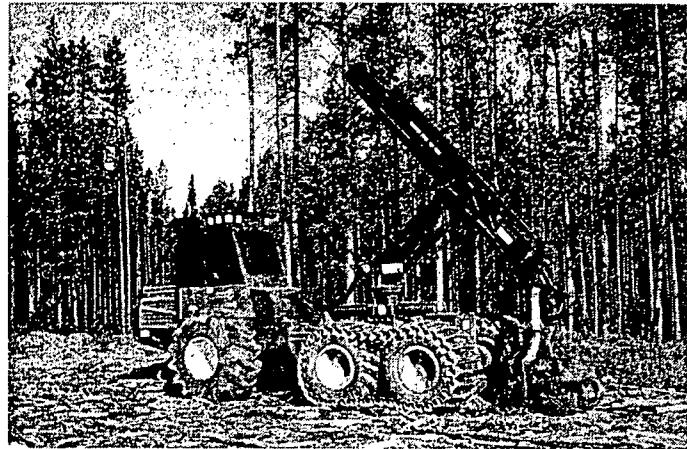


Figure 1. Valmet 546H harvester.

- minimise damage to residual stems and site (especially important in the spring during sap flow when bark is very susceptible to damage)

Operating procedure

- leave trees were preselected and marked by a contractor for Repap
- trails were selected by the harvester operator
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- logs were sorted and piled at the side of the trail
- the forwarder followed the harvester trails

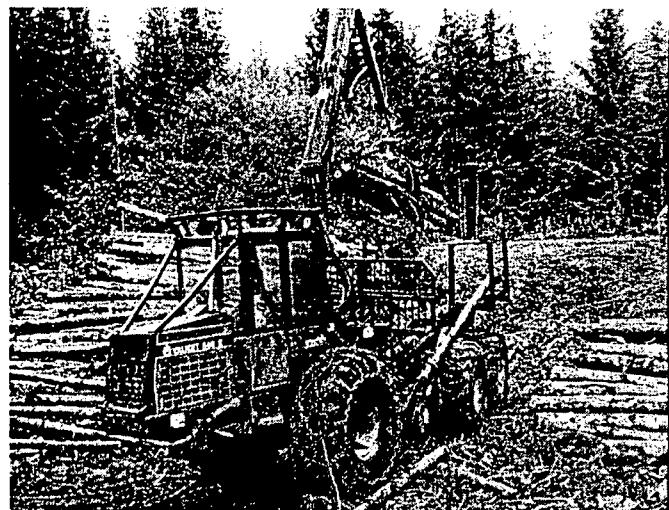


Figure 2. Valmet 546 forwarder.

Equipment description and specifications

See Table 1. Additionally,

- although not on this harvester, an on-board computer can be used to record stems cut, average diameters and lengths and volumes by species
- forwarder worked in conjunction with a self-loading logging truck

Observations

During FERIC's visit, FERIC observed the Valmet 546 forwarder but not the harvester. Productivity was not measured by FERIC, but Repap estimates the production to be 4 and 10 m³/h for a dense stand (+5000 trees/ha) and a precommercially thinned stand respectively (Source: Repap British Columbia Inc.).

On this block and blocks previously completed by the same contractor, damage to residual trees was minimal (<5%) (Source: Repap British Columbia Inc.). The low incidence of damage was attributed to the operating procedure of the contractor, who located his own forwarding trails and was therefore able to select the best location to maximise production and minimise damage to residuals.

Equipment suppliers

Valmet equipment is manufactured by SISU Logging USA Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 USA Tel.: 906-428-4800 Fax: 906-428-3922.

Table 1. Valmet 546H Harvester Specifications

	Valmet 546 harvester with 948 head	Valmet 546 forwarder
Engine power (kW)	93	77
Power transmission	6 WD drive 3x3 power shift	6 WD drive 3x3 power shift
Head capacity (cm)	48-cm diameter	n.a.
Carrying capacity (t)	n.a.	8-t
Approx. weight (kg)	13 635	11 794
Width (m)	2.6	2.6
Length (m)	6.7	8.8
Height (m)	3.9	3.8
Crane reach (m)	9.8	5.4
Ground clearance (m)	0.48	0.48

Valmet equipment is available through local Fanning dealers, for example, Fanning Ltd., 4621 Keith Road, Terrace, BC V8G 1K3 Tel.: 250-638-4600 Fax: 250-638-4623.

The approximate price of the Valmet 546 harvester and 546 forwarder are \$485 000 and \$350 000 respectively (f.o.b. Terrace).

References

Hunt, J.A. 1992. *Initial Thinning Trials with the Valmet Woodstar 546 Harvester and Forwarder*. FERIC, Vancouver. Field Note Silviculture-47. 2p.

Mitchell, Janet L. 1995. *Valmet Woodstar 546 Harvester and Forwarder: Short-Term Evaluation*. FERIC, Vancouver. Field Note Processing-42. 2p.

Compendium article Operations Cut-to-Length #10

For further information, contact:

Marvin Strimbold, of E. A. Strimbold Ltd., Box 569, Burns Lake, BC V0J 1E0 Tel./Fax: 250-696-3619.

Kevin Derow, Stand Management Forester, Repap British Columbia Inc., Woodlands, Terrace Lumber Operations, 4900 Keith Avenue, Terrace, BC V8G 5L8 Tel.: 250-638-5714 Fax: 250-638-5720.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #6

Region

Lower Mainland of British Columbia

Author

Janet Mitchell, RPF & Marv Clark, RPF

Date

August 1996

Source

FERIC field visit

Company

Canadian Forest Products Ltd., Mainland Logging
Division

Equipment

- hand falling
- 1980 Washington 78SL swing yarder (Figure 1)
- Maki Mini-Mak II motorized carriage (Figure 2)
- Kobelco 220LC loader

Location

FLA 19208 CP 311 on Chehalis Forest Service Road
near Harrison Mills, BC

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- 65-year-old unmanaged second growth stand
- western hemlock (78%), western red cedar (16%), amabilis fir (3%), Douglas-fir (2%), and maple (1%)
- preharvest - 928 trees/ha, 671 m³/ha, average dbh of 29.5 cm
- old-growth stumps were obstacles for yarding
- benched slope to a level backline (15 - 65%)

Prescription

- thin from below to a residual density of approximately 350 trees/ha (430 m³/ha)

Operating procedure

- yarder was rigged as a multi-span standing skyline with an intermediate and a tail spar for lift
- observed distance to backspar was about 220 m with an average observed yarding distance of 160 m
- maximum observed lateral yarding distance of 20 m



Figure 1. Washington 78SL swing yarder.



Figure 2. Maki Mini-Mak II motorized carriage.

Table 1. Yarding Specifications

	Washington 78SL swing yarder
Engine (GM 6V71)	176 kW
Transmission (Twin Disc)	4 speeds forward 4 speeds reverse
Line capacity	
Mainline/haulback	550 m - 16 mm
Skyline	670 m - 23 mm
Maximum line speed (m/min)	850
Maximum line pull (kg)	16 800
Approx. weight (kg)	41 700
Max. track width (m)	3.4
Operating tower height (m)	14.4
Max. swing radius (m)	3.53
Max. travel speed (km/h)	9.6
Ground clearance (m)	0.47

- a Mini-Mak II carriage was used in a shotgun mode (gravity return - no haulback)
- logs were usually fully suspended during yarding
- the seven person crew consisted of a hooktender and an assistant (needed because 2 trees were rigged on every corridor and occasionally 3), 2 choker setters, a chaser, loader operator and yarder operator
- commonly 3 chokers were preset and turns were taken from alternating sides of the skyline

Equipment description and specifications (Table 1) The Washington 78SL swing yarder was developed as a slackline machine that could be quickly field converted to a running skyline yarder. Only six versions of this model were manufactured. The more common predecessor Model 78A's and subsequent Model 88's were both intended more for running skyline and grapple yarding operations. It is the slackline capability that makes the 78SL particularly well suited for commercial thinning and partial cutting applications. Converting the 78SL between the slackline and running skyline modes involves either installing or removing lagging from the rear main drum and installing the appropriate size of cable.

The motor, combined with a four speed power-shift transmission, is mounted beside the winch frame rather than behind giving the machine a narrower profile for working along forested roadways in partial cut applications. All three winch drums (main, haulback and skyline) are powered through individual air activated clutches and have band type brakes. Because the haulback drum is mechanically

interlocked to the main shaft through two pinion gears of different diameters and an Eaton water cooled clutch, no drum braking is required to maintain line tensions for most rigging applications. However, when the yarder is rigged in a shotgun configuration (i.e. no haulback) the main drum brakes are used to retard the returning rigging. When the yarder is configured as a running skyline the two main drums are geared identically for equal line speed.

Even though Washington yarders have not been manufactured for 11 years, they are still well supported with parts and service through Trican Machinery Ltd. in New Westminster, BC. Because Model 78SL's are relatively rare it is difficult to obtain typical used prices for these machines, however used Model 78A's can be found ranging between \$75 000 and \$125 000 and used Model 88's between \$200 000 and \$220 000. Trican can upgrade 78A's to incorporate the features of the 78SL which include an additional guyline, a taller gantry, a mechanical interlock, and removable rear main drum lagging. Repowering the yarder with an additional 30 kW would also be recommended.

Observed production

During FERIC's visit, Canfor staff estimated that yarder productivity was about 90 m³/shift. FERIC observed six turns in detail while on site from an average yarding distance of 160 m. Turn times averaged 5.72 minutes, and consisted of 3.3 pieces (approximately 1.4 m³/turn). Assuming an 85% utilization level, these observations extrapolate to approximately 71 turns/shift, 234 pieces/shift and 82 m³/shift, substantiating Canfor's production estimates.

Equipment suppliers

Canfor's Washington 78SL yarder was purchased used through Trican Machinery Ltd., 455 Brunette Street, New Westminster, BC V3L 3G1 Tel.: 604-540-0826 Fax: 604-540-0855.

For further information, contact:

Mike Manson, General Superintendent, Harrison Operations of the Mainland Logging Division for Canadian Forest Products Ltd. Tel.: 604-462-0172 Fax: 604-796-3625.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable Item: #7

Region

Washington, USA

Author

Brian Boswell, RPF

Date

June 1996

Source

FERIC field visit

Contractor

Elma Forestry, Hoquiam, WA, USA

Equipment

- Dahlvester harvester (Figure 1)
- ThinLine monocable system (Figures 2 and 3)
- John Deere 70D hydraulic loader

Location

Weyerhaeuser's private land near Elma, in western Washington

Site and stand

- 21-year-old third growth Douglas-fir stand, precommercially thinned at 8 years of age
- prior to commercial thinning, average dbh of 18-20 cm, height of 15-18 m, density of 700-800 trees/ha, and an average piece size of 0.15 m^3
- 450 m maximum yarding distance

Prescription

- leave 400 residual trees/ha

Operating procedure

The harvester cut meandering trails, 3.5 - 4 m wide, through the stand, reaching into the stand to cut trees between trails. Trails were spaced up to 20 m apart and were not premarked, allowing the operator to avoid steeper ground and obstacles. The cut trees were delimbed and topped by the harvester and placed on the trails to facilitate yarding.



Figure 1. Dahlvester harvester (Photo courtesy of R.G. Burrows).

The monocable system was set up with the line following the harvester trails. Unlike a conventional monocable system where the line runs continuously, the ThinLine system is stopped when logs are hooked up, and then restarted. Also the line can be slackened in order to hook logs off the path of the line, rather than having the choker setter drag the log to the line. This allows the system to handle tree length logs up to 40 cm in butt diameter.

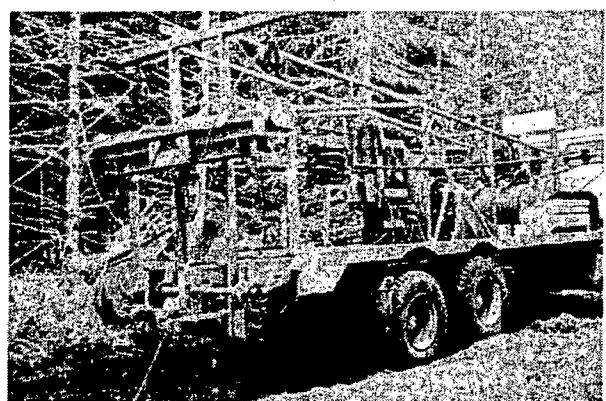


Figure 2. ThinLine monocable drive unit (Photo courtesy of R.G. Burrows).



Figure 3. Block mounted on tree to effect the turn at the corner on the trail (Photo courtesy of R.G. Burrows).

The logs were sorted at the landing and loaded into portable bunks. In this operation, half of the harvested volume was pulp grade with the remainder being chip'n'saw.

Within the harvesting area, open-face blocks are mounted on trees at a height of about 1.3 m; these blocks route the cable along the path prepared by the harvester. The wire rope chokers are attached to the line with hooks which are prevented from sliding by ferrules clamped to the line at 9 m intervals.

Crew size was 5 persons: harvester operator, block hanger, yarder operator/chaser, choker setter, and loader operator.

Equipment description and specifications

The harvester is a custom built unit, developed by the contractor specifically for thinning. A John Deere 650G tractor carries a 46 cm Pika 455 directional felling head mounted on a 8.2 m knuckle boom. The base of the boom has a 4-way tilt as well as a swing movement, providing a wide range of motion. A rear mounted roller can be raised and lowered to assist the machine over obstacles.

The ThinLine system is a patent-pending monocable, also developed by the contractor. The drive unit is mounted on a flat-deck truck, and is hydraulically driven from a pump attached to the truck's power take-off. The cable is continuous and driven by a capstan, similar to a conventional monocable system. A system of movable blocks mounted on the truck is used to tension the monocable and to provide slack when needed.

Study results

FERIC did not conduct a time study of the operation, but the contractor estimated that the system produced 2.5 loads or about 75 m³ per shift.

For further information, contact:

Gale Dahlstrom, Elma Forestry, 2630 Bay Avenue, Hoquiam WA 98550 USA Tel.: 360-533-0190 Fax.: 360-533-5563.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #8

Region
Washington, USA

Author
Brian Boswell, RPF

Date
June 1996

Source
FERIC field visit

Contractor
Mayr Bros. Company, Hoquiam, WA, USA

Equipment

- hand falling
- two trailer-mounted Koller K-300 yarders with Koller SKA-1 carriages (Figures 1 and 2)
- Caterpillar 235 and Linkbelt LS2800 hydraulic loaders

Location
Federal land managed by the US Forest Service near Shelton, in western Washington

Site and stand

- 50-year-old Douglas-fir stand
- estimated $600 \text{ m}^3/\text{ha}$ prior to thinning, with a piece size average of 0.2 m^3
- 40 - 60% slope
- 275 m maximum yarding distance

Prescription

- 5.5 m spacing between trees, leaving 330 trees/ha
- leave all trees $>51 \text{ cm dbh}$ or $>56 \text{ cm}$ at the stump
- corridors 2.1 m wide (up to 3.1 m wide after rub trees are removed)
- 46 m distance between corridors

Operating procedure

- hand falling and bucking at the stump
- three-person yarding crew: yarder operator/chaser and two choker setters, working an 8-h shift

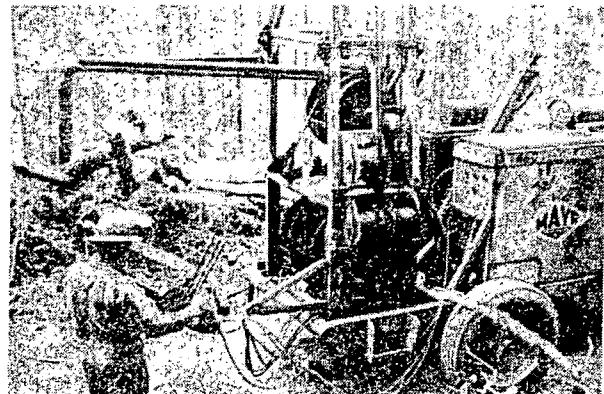


Figure 1. Modified Koller K-300 (Photo courtesy of R.G. Burrows).

- standing skyline with intermediate supports, uphill yarding, shotgun system
- skyline corridors were spaced about 40 m apart
- plastic culvert pipe was used to protect corridor trees



Figure 2. Koller K-300 with truck axle and Koller SKA-1 carriage.

Equipment description and specifications (Table 1) Two yarders were observed. The first was purchased from Koller as a tower and two drum winch set. The contractor built the trailer, installed the engine and hydrostatic drive, added the haulback drum and a third guyline, and increased the tower height with a 2.4 m custom-made extension. The second was purchased complete from Koller and is very similar to the K-300s that are available today. The contractor modified the trailer for the second yarder by installing a heavy duty truck axle and wheels. Both towers are open lattice construction.

The yarder has a 3 point hitch and can be driven through a power take off. Many K300s are mounted on farm tractors.

Study results

One yarder was timed for a short period during the field visit, and averaged 4.5 min/turn and 3.3 pieces/turn ($0.7 \text{ m}^3/\text{turn}$), at a yarding distance of 200 m. The crew estimated its productivity was 2.5 to 3 loads per shift in the summer and 4 loads/shift in the winter when trees are less susceptible to bark damage. Average load size was 22 m^3 .

Equipment suppliers

Koller is available through Koller USA Corporation, 8828 NE Killingsworth Street, Portland, OR 97220 USA Tel.: 503-257-9778 Toll free: 1-800-821-1475 Fax.: 503-257-9780.

A new trailer-mounted K-300 three drum yarder has a list price of US\$89 500, including three guylines, a 1.2 m tower extension, all lines, a Koller SKA-1 carriage with two intermediate supports, Talkie Tooters, tool box and service kit. Alone, the SKA-1 carriage lists for US\$10 500.

For further information, contact:

Tom Mayr, Mayr Bros. Company, PO Box 180, Hoquiam, WA 98550 USA Tel.: 360-532-7490 Fax.: 360-532-2381.

Joe Mahon, Koller USA Corporation, 8828 NE Killingsworth Street, Portland, OR 97220 USA Tel.: 503-257-9778 Toll free: 1-800-821-1475 Fax.: 503-257-9780.

Table 1. Yarding Specifications

Koller K-300	
Engine	MWM-Deutz 3 cylinder diesel
Engine power (kW)	64
Power transmission	hydrostatic
Brakes	band brakes
Line capacity	
Skyline	366 m - 16 mm
Mainline	366 m - 10 mm
Haulback	640 m - 8 mm
Guylines	3 with 30 m - 16 mm
Maximum line speed (m/min)	300
Maximum line pulls (kg)	
Mainline	1 800 @ mid-drum diameter
Skyline	4 400 in tensioning compartment
Approx. weight (kg)	4 100
Tower height (m)	7.0 (a 1.2 m extension is available)
Trailer width (m)	2.0
length (m)	4.7

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: **Cable**
Item: **#9**

Region

Lower Mainland of British Columbia

Author

Janet Mitchell, RPF & Marv Clark, RPF

Date

August 1996

Source

FERIC field visit

Contractor

R.K. Silviculture Co. Ltd., Mission, BC

Equipment

- hand falling
- Timbermaster 4-drum yarder (Figure 1)
- Ford 5600 tractor (power source)

Location

Red Mountain, District of Mission, TFL #26

Site and stand

- Coastal Western Hemlock (CWHdm) ecosystem
- 55-year-old stand, partially juvenile spaced by girdling, in approximately 1983
- western hemlock (74%), Douglas-fir (12%), western red cedar (11%), deciduous (3%)
- preharvest - 7 000 trees/ha, 448 m³/ha, average stem size of 0.2 m³, average dbh of 23 cm, and average height of 27 m

Prescription

- remove 45% of volume
- leave 300 dominant stems/ha (6.5 m spacing), favour Douglas-fir, then cedar and hemlock
- retain hardwoods for biodiversity
- final harvest in 20-30 years
- minimize road and landing improvements
- maintain access for recreation

Operating procedures

- District of Mission forester marked leave trees
- corridors were established



Figure 1. Timbermaster yarder.

- hand falling and bucking were done by two fallers (lengths of 3 m - 12 m (min/max), and 10-cm top)
- yarder was rigged as a multispan standing skyline with an intermediate and a tail spar for lift
- observed distance to backspar was about 200 m

Equipment description and specifications (Table 1)

The trailer-mounted Timbermaster yarder observed by FERIC was powered from the PTO of an agricultural tractor. The winch set includes a skyline, mainline, haulback and strawline drum which are powered mechanically through a combination of chain and gear drives. The skyline drum is fitted with a divider flange to partition it into both a cable storage and tensioning drum. An over-centering band brake secures the tensioned skyline during yarding. The mainline and haulback drums are installed on a common shaft, but differ in that the haulback clutch has less torque capacity than the mainline clutch and the haulback drum core diameter is larger for higher line speeds on the out-haul. The tower, which pivots hydraulically about a mounting bracket at the cab height, can be lowered for road transport, however it is left in the raised position for moving along the

Table 1. Timbermaster Yarding Specifications

Timbermaster	
Recom. engine power (kW)	45 - 60
Fuel consumption (L/shift)	14
Power transmission	PTO
Line capacity	
Skyline	450 m - 16 mm
Mainline	400 m - 10 mm
Haulback	900 m - 10 mm
Maximum line speed (m/min)	
Mainline	300
Haulback	600
Maximum load capacity	3 tonne partially suspended and 1.5 tonne fully suspended
Approx. weight (kg)	3 500
Tower height (m)	9.0
Width (m)	2.2
Length (m)	3.5

block road between rig-ups. The tower is secured by a system of two single and one double part guylines which are manually tensioned.

A Timbermaster load-locking carriage was used on the operation observed. The carriage did not lock to the skyline, but an ingenious technique was used to position the carriage for lateral yarding. A large shackle with a tethering rope slid on the skyline on the down hill side of the carriage. The chokersetter moved the tether rope from tree to tree between turns to locate the next stop point for the carriage. The operator allowed the carriage to drift lightly against tether rope and then fed mainline slack to the chokersetter for connection of the preset chain-type chokers. Chain chokers have an advantage in that their length can be minimized when attached to the mainline hook which maximizes the available lift of the skyline. The carriage clamps to the mainline on the in-haul and remains locked until it passes over a special trip shoe that is attached to the skyline in the landing.

Once rigged, the machine operates with a crew of two. The operator also releases the chokers in the landing and the chokersetter picks the turns, spots the carriage, pulls mainline slack, sets chokers and signals the operator for line movement. A third crew member works as a faller, pre-rigs the back and intermediate spars, and assists with machine moves.

At the backspar the skyline terminates in a clamp shackled directly to a fabric strap that chokes the tree. This skyline anchor strap also passes through a steel "D" which is positioned on the back side of the spar as an attachment point for four guylines. This method of skyline anchoring maximizes backspar lift because the skyline does not hang below the anchoring point as it does when a support jack is used.

Observed production

Productivity was difficult to estimate during FERIC's brief visit because the machine had just changed yarding corridors and the chokersetter was covering ground that had been highgraded during right-of-way loading and previous corridor yarding. Based on eight turns observed by FERIC over an average yarding distance of 50 m, turns averaged 0.3 m³ and took 7.3 min. Assuming 85% utilization, these observations extrapolate to approximately 66 turns/8-h shift, 1.1 pieces/turn and 20 m³/shift. The contractor reported that productivity was typically one highway log truck load/shift (30 m³/shift) on this block and was influenced more by site constraints, such as decking room at the yarder and bucking specifications, than by machine capacity.

Equipment suppliers

The Timbermaster is manufactured in the UK by Trewella Bros. (UK) Ltd. and is available through R.K. Silviculture Co. Ltd. of Mission, BC.

Approximate costs (dependent on exchange and tariff rates) for the machine, tower, carriage and trip is C\$85 000 (f.o.b. Mission). The cost of a power source (i.e., tractor or skidder), and the lines and rigging would be additional.

For further information, contact:

Bob O'Neal, Forestry Manager, District of Mission, 8645 Stave Lake Street, Box 20, Mission, BC V2V 4L9 Tel.: 604-820-3763 Fax: 604-826-8633.

Roy Kittles, R.K. Silviculture Co. Ltd., 8660 Cedar Street, Mission, BC V4S 1A1 Tel./Fax: 604-826-0629.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #10

Region
Washington, USA

Author
Dennis Araki, RPF

Date
September 1996

Source
FERIC field visit

Contractor
Anderson Resources Inc., Shelton, WA, USA

Equipment
• hand falling
• Howe-Line yarder (Figure 1)
• Maki II carriage
• Hitachi EX200 hydraulic loader

Location
Private land, managed by Weyerhaeuser near Centralia, Washington.

Site and stand
• Coastal Douglas-fir
• average age was less than 50-year-old
• stand was established (naturally and planted) after large forest fire in 1943
• average butt diameter of 38 cm and average height of 30 m
• 200 m average yarding distance (maximum 400 m)

Prescription
• commercial thinning to remove the damage, diseased, suppressed, and intermediate trees
• approximate 5-m spacing, leaving the largest, thirstiest trees
• minimize damage to residual trees

Operating procedure
• utilize trees to a 12.5-cm top, because pulp market is poor

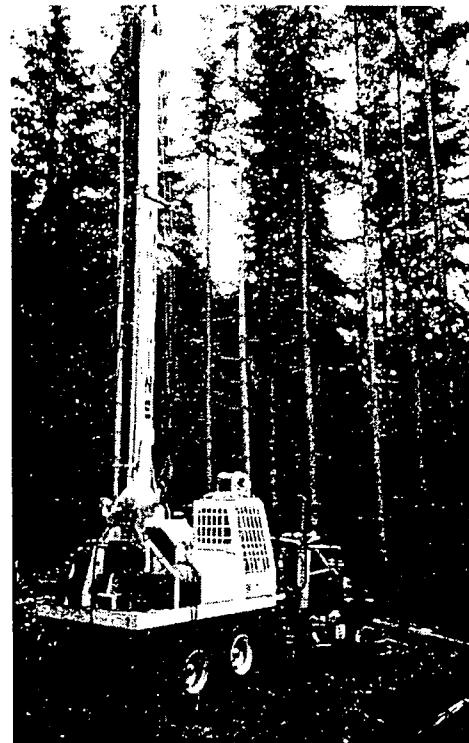


Figure 1. Howe-Line yarder.

- logs to be manufactured to export specifications with small logs sent to a local sawmill
- yarding corridors were marked prior to felling
- corridors were felled first so fallers could fall remaining trees into the openings
- falling was mostly uphill towards the yarding road and landing, requiring the fallers to wedge

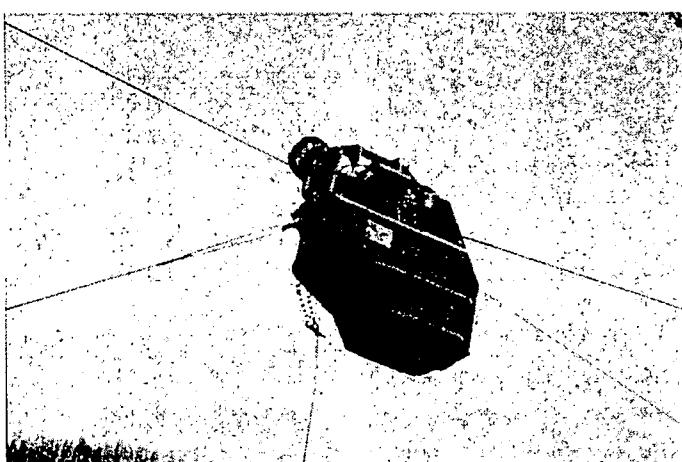


Figure 2. Maki II carriage

Table 1. Howe-Line Yarder Specifications

Howe-Line yarder	
Engine	Cummins diesel
Engine power (kW)	135
Power transmission	hydrostatic drive
Line capacity	
Skyline	600 m - 20 mm (swedge)
Mainline	600 m - 14 mm (swedge)
Haulback	1200 m - 12 mm
Guylines	60 m - 20 mm
Maximum line speed (m/min)	360
Maximum line pulls (kg)	
Mainline	5 400
Skyline	9 000
Tower height (m)	12.0

- many of the trees to get them to fall uphill
- felling started at the landing and proceeded down the hill (opposite to the normal falling procedures in BC)
- stems were cut into 12.1 m lengths and delimbed

Equipment description and specifications (Table 1) The Howe-Line yarder is manufactured in South Africa and has just recently been introduced to the North American market. It has an extendible 12-m solid tower with 5 guyline, strawline, main and haulback lines and corresponding drums. The yarder can be mounted on a trailer or on a truck. The one observed by FERIC was mounted on an old Mack logging truck. Once the truck is moved into place, the yarder is hydraulically leveled.

The logging operation consisted of the yarder, and a Hitachi EX200 hydraulic loader. Apart from the operators for the two machines, there was a hooktender and two chokersetters. Falling was accomplished with a subcontracted 3-person crew. The operation produced between 75 and 125 m³/day depending on the size of material and yarding distances. (Source: Anderson Resources, Inc.)

A Maki II carriage was used in this operation but the computer chip had been slightly modified to allow the carriage to lower the load in a controlled manner as it approached the landing. Three to five sliding ring chokers were used on the thinning operation and

intermediate supports were used to suspend the skyline and lift the logs off the ground during yarding.

Anderson Resources, Inc. is also in the process of developing an ultra-light motorized slack pulling carriage for small yarders.

Observations

FERIC observed the yarder working in the immature Douglas-fir stand where two intermediate support jacks were used to reach out approximately 350 m down a very steep slope to a small creek. The residual trees showed little rubbing damage as the chokersetters were very careful to pull the logs to the yarding road and with the intermediate jacks placed high in the trees the logs did not drag on the ground.

Equipment suppliers

The Howe-Line yarder is distributed by Anderson Resources, Inc., PO Box 1226, Shelton, WA 98584 USA Tel.: 360-426-5913 Fax: 360-426-0523.

The suggested base price for the Howe-Line yarder is approximately US\$170 000, not including the truck, lines and carriage.

The Maki II carriage is approximately US\$32 500 and is available through Maki Mfg. Inc., HC.64 Box 60, Pierce, ID 83546 USA Tel./Fax: 208-464-2120.

For further information, contact:

Lloyd Anderson, Anderson Resources, Inc., PO Box 1226, Shelton, WA 98584 USA Tel.: 360-426-5913 Fax: 360-426-0523.

Bill Maki, Maki Mfg. Inc., HC.64 Box 60, Pierce, ID 83546 USA Tel./Fax: 208-464-2120.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #11

Region

Southern Coastal British Columbia

Author

Janet Mitchell, RPF & Marv Clark, RPF

Date

September 1996

Source

FERIC field visit

Equipment

- hand falling
- Urus I Uni 300 yarder (Figure 1)
- Stuefer HSK 2000 carriage (Figure 2)

Location

Crown land near Cook Creek (north of Qualicum Beach, BC), managed by the BC Ministry of Forests, Port Alberni Forest District, under the Small Business Forest Enterprise Program.

Site and stand

- Coastal Western Hemlock (CWHxm) ecosystem
- 55-year-old stand, 30 m in height, previously spaced
- Douglas-fir (54%), western hemlock (37%), western red cedar (9%)
- preharvest - 600 trees/ha, 500 m³/ha, average stem size of 0.8 m³
- slope mainly 15 - 20%, rising to 45% toward south boundary
- silt-loam soils with 60% coarse fragment content

Prescription

- leave 300 dominant stems/ha, basal area of 33 m²/ha, and volume of 312 m³/ha
- leave species mix Douglas-fir (73%), western red cedar (17), western hemlock (11%)
- use partial suspension with lateral yarding, use rub trees to protect residual trees

Operating procedures

- trees were marked to leave
- corridors were spaced approximately 50 m apart

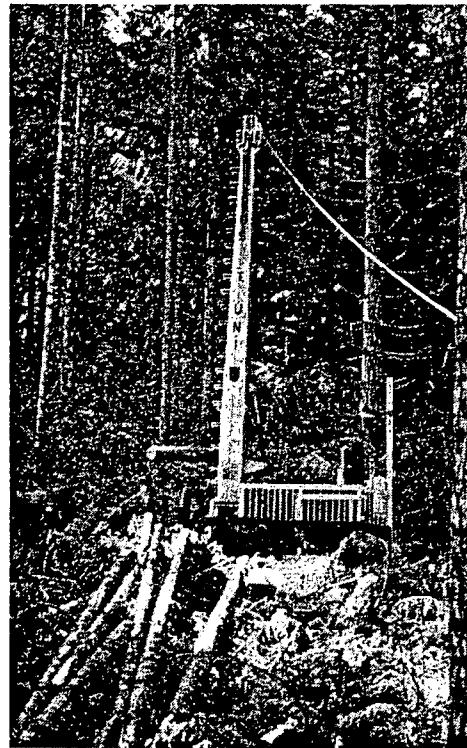


Figure 1. Urus I Uni 300 yarder.

- the yarding corridor FERIC observed had an average width of 4.5 m and length of 210 m
- a previous corridor was longer and an intermediate support was used to reach the back
- logs were yarded log-length (preferred length of 12 m) and decked at the side of the road



Figure 2. Stuefer HSK 2000 carriage.

Table 1. Urus I Uni 300 Yarder Specifications

Urus I Uni 300 yarder	
Engine	Cummins diesel, 4 cylinder 75
Engine power (kW)	
Transmission (Allison, automatic)	4 speeds forward 1 speed reverse mechanical
Winch drive	
Line capacity	
Skyline	310 m - 16 mm
Mainline	310 m - 10 mm
Haulback	650 m - 8 mm
Guyline	40 m - 16 mm
Maximum line speed (m/min)	
Mainline	360
Haulback	360
Maximum line pulls (kg)	
Skyline	1 400
Mainline	4 600
Overall tower height (m)	9.9

- when FERIC observed the Urus it was rigged in a shot gun configuration (gravity haulback)
- three 8-mm diameter preset chokers were normally attached for each turn; to attach, the mainline toggle hook was threaded through slider rings on the choker cables

Equipment description and specifications

See Table 1. Additionally,

- Urus I Uni is a mobile 9.9-m tower mounted on a trailer
- tower is raised and lowered hydraulically and secured by 4 guylines which were tensioned with manual winches
- a hydraulic sequencing device activates the skyline clamps on the Stuefer HSK 2000 carriage
- skyline clamp released when the mainline pulled the chokers into the carriage
- carriage (and load) traveled to the landing upon clamp release
- operator guarding was added to the yarder to comply with Workers' Compensation Board of BC requirements

Observed production

During the demonstration, the regular crew was unavailable, so two employees of the distributor ran

the machine to demonstrate its capability. However, as productivity could not be considered typical, it was not monitored by FERIC. During the previous week, production was estimated at 100 pieces per 8 h-shift, at approximately $0.5 \text{ m}^3/\text{piece}$, production would be $50 \text{ m}^3/\text{shift}$.

Residual tree damage appeared low which was due in part to good falling alignment, wide corridors, the use of rub guards and snatch blocks for lateral yarding, and rub trees left along the corridors.

Equipment suppliers

The Urus is manufactured in South Africa by Hinteregger S.A. (Pty) Ltd., Newton St. Labore, Brakpan, PO Box 1557, Kempton Park 1620, South Africa Tel.: 27-738-3505 Fax: 27-738-3508.

The Urus I Uni is available through Enviroquip Sales Ltd. for C\$110 000 (f.o.b. Vancouver) complete with a non-locking carriage. A larger yarder (Urus II Uni) with a 12-m tower is available for C\$130 000

The Stuefer HSK 2000 carriage is manufactured in Austria and is available through Enviroquip Sales Ltd. for C\$30 500 (f.o.b. Vancouver).

References

Compendium article Operations Cable #4.

For further information, contact:

Richard DeLuca, General Manager, Enviroquip Sales Ltd., 1109 Comox Road., Courtenay, BC V9N 3P7
Tel.: 250-897-9050 Toll free: 1-800-496-6656
Fax: 250-334-9338.

Dave Cruikshank, Small Business Forester, BC Ministry of Forests, Port Alberni Forest District, 4227 6th Ave, Port Alberni, BC V9Y 4N1 Tel.: 250-724-9205 Fax: 250-724-9261.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable Item: #12

Region

Southern Coastal British Columbia

Author

Janet Mitchell, RPF

Date

November 1996

Source

FERIC field visit

Contractor

Enviro Techniques Timber Harvesting, Courtenay, BC
R. Caouette Trucking, Courtenay, BC

Equipment

- hand fall
- Kubota excavator with custom collapsible extension on the boom for cable yarding (Figure 1)
- Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader and Kubota M9580 tractor (Figure 2)
- free-standing roll-on bunks (Figure 3)

Location

Private land north of Courtenay, BC

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- average age 65 years
- Douglas-fir, western hemlock, western red cedar
- stand had been thinned several times over the last 40 years
- preharvest - 266 trees/ha, 410 m³/ha, average dbh of 30 cm, average piece size 0.65 m³/ha
- flat to gentle slope, sandy loam soils

Prescription

- remove approximately 10% of the volume
- select the largest Douglas-fir to create openings for the crop trees and to meet market demands
- minimise damage to residual stems and site

Operating procedure

- leave trees were preselected and marked by the contractor



Figure 1. Kubota excavator with custom collapsible extension for yarding.

- trails were already located and constructed during past thinning entries
- very few new trails were necessary
- hand fallers cut trees, and topped and bucked stems into short logs (4.8, 5.4 and 6.0 m) at the stump
- yarding crew consisted of 1 - 2 chokersetters and the yarder operator
- excavator/yarder was not tied down with guylines: the bucket could be used to manoeuvre the logs at the trail side and the excavator could move along the trail as necessary
- loader loaded logs from the side of the trail and the forwarder carried them to the landing where they were unloaded directly into free-standing bunks
- once full, the bunks were transported 30 km to Richmond Plywood, Rosewall Log Sort, by a roll-on truck



Figure 2. Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader and Kubota M9580 tractor.

Equipment description and specifications (Table 1)

- Kubota excavator was purchased by the contractor recently after it had been used for over a year in thinning operations by the contractor that designed the tower modifications (Compendium article Operations Cable #1)
- Farmi trailer was pulled behind a Kubota M9580 4-wheel drive tractor
- trailer has a hydraulic drive sprocket between each set of rear wheels, 3 pairs of stakes and Nokia forestry tires
- Farmi HK 4166 loader requires a pump capacity of 30-55 L/min and a working pressure of 195 bar
- loader has a 6.6 m reach, telescopic boom and continuous rotator

Observations

The trees removed represent the largest, healthiest trees that suit the current market and have the greatest financial return to the owner. The contractor estimates the productivity of the system as 55-60 m³/day.

Equipment suppliers

The Farmi equipment is manufactured by Orion Corporation Normet, Peltosalmi, Finland and distributed in western Canada by Enviroquip Sales Ltd., Courtenay, BC. The approximate (1996) prices of the Farmi forwarding trailer and loader are \$30 500 and \$21 500 respectively.

Kubota excavators and tractors are distributed by Worrall Supply, Courtenay, BC. The approximate price of the Kubota KH191 excavator complete with winches, highlead kit and guarding is \$140 000. The Kubota tractor is approximately \$62 000.

Table 1. Equipment Specifications

	Kubota excavator	Farmi forwarding trailer with HK 4166 crane
Engine power (kW)	44	52*
Carrying capacity (kg)	n.a.	9 000
Approx. weight (kg)	6 000	2 690
Width (m)	2.15	2.32
Length (m)	n.a.	6.03
Height (m)	n.a.	2.17
Max. yarding distance (m)	150	n.a.
Crane reach (m)	n.a.	6.6
Ground clearance (m)	0.35	0.59

* minimum size of tractor required

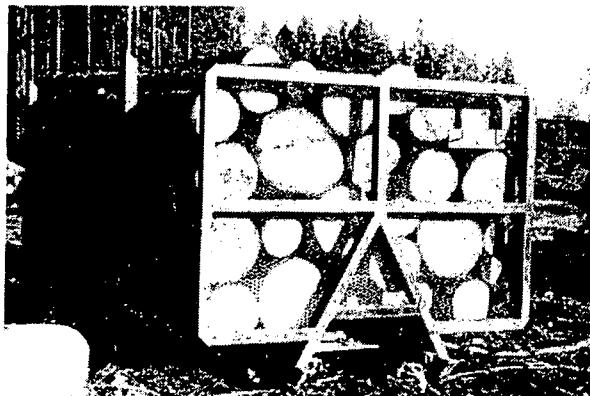


Figure 3. Free standing roll-on bunk.

The free standing bunks are manufactured and distributed by Versatile Industries Ltd., Courtenay, BC. The approximate price of the bunks are \$5 000.

References

Compendium articles Operations Cable #1 and #13.

For further information, contact:

Neil Blackburn, Enviro Techniques Timber Harvesting, RR 4, Site 465, C-10, Courtenay, BC V9N 7J3 Tel.: 250-338-9428.

Richard DeLuca, Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9 Tel.: 250-897-9050 or Toll free: 1-800-496-6656 Fax: 250-334-9338.

R. Caouette Trucking, c/o Roy Hagg, 306-1355 Cumberland Rd., Courtenay, BC V9N 2G1 Tel.: 250-338-1236.

Versatile Industries Ltd., 1109 Comox Road, Courtenay, BC V9N 3P7 Tel.: 250-334-2201 Fax: 250-334-9338.

Worrall Supply, 300 Old Island Highway, Courtenay, BC V9N 3P2 Tel: 250-338-6741 Fax: 250-338-0112.

Farmi Equipment: Orion Corporation Normet, FIN-74510, Peltosalmi, Finland Tel.: +358-77-152-41 Fax: +358-77-236-06.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable Item: #13

Region

Southern Coastal British Columbia

Author

Janet Mitchell, RPF

Date

November 1996

Source

FERIC field visit

Contractor

Enviroquip Sales Ltd., Courtenay, BC

R. Caouette Trucking, Courtenay, BC

Equipment

- hand fall
- modified Farmi JL2/601 double-drum winch (Figures 1 and 2)
- Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader (Figure 3)
- free-standing roll-on bunks (Figure 4)
- Kubota M9580 4-wheel drive tractor (Figure 3)

Location

Private land north of Courtenay, BC

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- average age 65 years
- Douglas-fir, western hemlock, western red cedar
- preharvest - 266 trees/ha, 410 m³/ha, average dbh of 30 cm, average piece size of 0.65 m³
- flat to gentle slope
- sandy loam soils

Prescription

- area consisted of a small patch clearcut to demonstrate the equipment to FERIC
- Farmi winch was used for commercial thinning the previous week

Operating procedure

- hand felled, bucked and cut to length (5.4 and 6.0 m)



Figure 1. Modified Farmi JL2/601 double drum winch for yarding.

- normally the crew would consist of one faller, one chokersetter and a winch operator who would also unhook the turns
- three 8-mm diameter preset chokers were normally attached for each turn

Equipment description and specifications

See Table 1. Additionally,

- frame of winch had been modified by Enviroquip Sales Ltd. to raise the pulley off the ground by approximately 5 m
- two pins allow quick release and return the winch

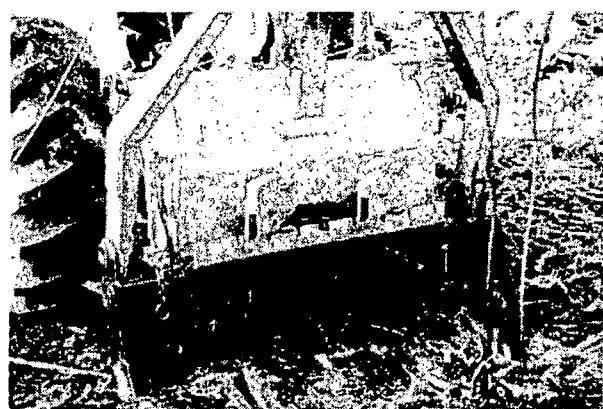


Figure 2 Modified Farmi JL2/601 double drum winch.



Figure 3. Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader.

- to the original set up
- two guylines tie back the tower
 - tower can be lowered for road transport, however it is left upright for moving along the block road
 - Farmi winch can mount on the back of any farm tractor that provides 34 kW

Observations

Farmi winch was demonstrated for FERIC in the clearcut portion of the stand, but is suitable for yarding in a thinning operation. The modifications to the winch allow more lift during the yarding phase. The pulleys are located 4.5 m above the ground, improving yarding conditions and allowing larger and higher log decks at the roadside.

Yarding production was estimated by the contractor as 50 m³/shift for a two person crew.

Equipment suppliers

The Farmi winch is manufactured by Orion Corporation Normet, Peltosalmi, Finland and is distributed in Western Canada by Enviroquip Sales Ltd., Courtenay, BC.

Table 1. Farmi Winch Specifications

	Farmi winch (original)	Farmi winch (modified)
Max. tractive power (t)	5.5	5.5
Cable capacity (mm/m)	10/130	10/130
Power needed (kW)	44.8	44.8
Pulley height (m)	1.7	4.5
Total height (m)	1.7	5.0

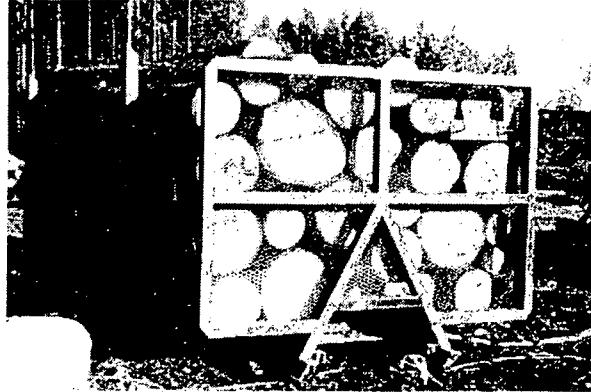


Figure 4. Free standing roll on bunks.

The approximate price of the Farmi JL2/601 winch with and without modifications are \$13 500 and \$10 150 respectively.

References

Compendium articles Operations Cut-to-Length #11 and Cable #12.

For further information, contact:

Richard DeLuca, Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9 Tel.: 250-897-9050 Toll free: 1-800-496-6656 Fax: 250-334-9338.

R. Caouette Trucking, c/o Roy Hagg, 306-1355 Cumberland Rd., Courtenay, BC V9N 2G1 Tel.: 250-338-1236.

Farmi Equipment: Orion Corporation Normet, FIN-74510, Peltosalmi, Finland Tel.: +358-77-152-41 Fax: +358-77-236-06.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller Buncher #1 Model: Morbark Wolverine

References

- Compendium article Operations Mechanical #1
- FERIC Special Report SR-94
- FERIC Field Note Felling-17

Illustration

- Morbark Wolverine 6300 (Figure 1)

Location

Galloway Lumber Co. Ltd. operating area on Crown land near Cranbrook, BC

Contractor

Bren Kar Logging Ltd., Galloway, BC

Equipment specifications

See Table 1.

- the Wolverine is a three-wheel feller-buncher, available with a shear or a chainsaw felling head; in this case, the machine was equipped with a chainsaw head
- two hydrostatically-driven wheels are located at the front of the machine, powered independently of each other, and a freewheeling small tire is positioned at the rear
- very manoeuverable within the stand because the machine is skid-steered and can turn in its own length
- 3 wheels and light frame make it unstable on steep or rough ground

Table 1. Morbark Wolverine Feller-Buncher Specifications



Figure 1. Morbark Wolverine feller-buncher.

Manufacturer

Morbark Wolverine equipment is manufactured by Wolverine Equipment Corp., 8507 S. Winn Road, PO Box 1000, Winn, MI 48896 USA Tel.: 517-866-2381 Fax: 517-866-2280.

Equipment Distributors

The Morbark Wolverine is available through local Finning distributors, for example, Finning Ltd, 555 Great Northern Way, Vancouver, BC V5T 1E2 Tel.: 604-872-4444 Fax: 604-872-2994.

Approximate (1995) price of the Wolverine chainsaw feller-buncher is \$172 000.

For further information, contact:

Dave Mader, Bren Kar Logging Ltd., Box 95, Galloway, BC V0B 1P0.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #1 Model: Timberjack 1270

References

- Compendium articles Operations Cut-to-Length #1, #2, and #6
- FERIC Technical Note TN-235
- FERIC Field Note Processing-40

Illustrations

- Timberjack 1270 harvester with a 762B single-grip harvesting head (Figures 1 and 2)

Location

The harvester has worked in pre-logging, commercial thinning and partial cutting on Vancouver Island and in the Okanagan region of BC. In these instances, the harvester worked in conjunction with a Timberjack 910 or 1010 forwarder.

Contractors

Shortlog Thinning Inc., Victoria, BC
Brookside Logging, Kelowna, BC
Pacific North Equipment Co., Kent, WA

Equipment specifications

See Table 1. Additionally,

- articulated with a tandem-axle bogie on the front section
- front bogie can be fitted with a flexible steel track

Table 1. Timberjack 1270/1270B Harvester Specifications



Figure 1. Timberjack 1270 harvester.

- to aid traction and reduce ground pressure
- high visibility cab
- parallel motion knuckleboom crane has 236° operating radius
- log specifications can be programmed into the on-board computer
- minimum log lengths and top diameters for pulp and sawlogs can be identified, however, the operator can override the computer

Manufacturer

Timberjack equipment is manufactured by the Timberjack Group, Headquarters, PO Box 203, SF-00171 Helsinki, Finland Tel.: +358-0-182-851 Fax: +358-0-608-617.

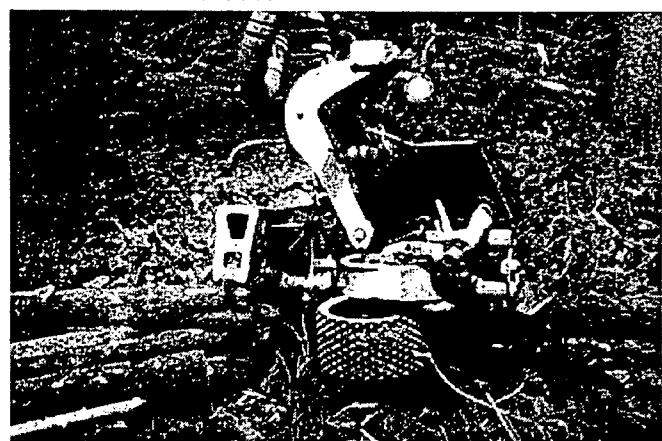


Figure 2. Timberjack 762B single-grip harvesting head

Equipment distributors

Canadian distributor: Timberjack Inc., Box 160, 925 Devonshire Ave, Woodstock, ON N4S 7X1 Tel.: 519-537-6271 Fax: 519-539-5282.

Timberjack equipment is available through local Timberjack distributors, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC Tel: 604-532-8324 Fax: 604-532-8354.

Approximate (1996) price of the 1270 harvester is \$600 000 (f.o.b. Victoria).

For further information, contact:

Mike Steeves (250-370-2667) or Jim Lambrick (250-746-9443), Shortlog Thinning Inc., 1480 Fort Street, Victoria, BC V8S 1Z5 Fax: 250-370-2611.

Pacific North Equipment Co., 22431 83rd Avenue South, Kent, WA 98032 USA Tel.: 206-872-3500.

Tim White, Timberjack Inc., Box 160, 925 Devonshire Ave, Woodstock, ON N4S 7X1 Tel.: 519-537-6271 Fax: 519-539-5282.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #2 Model: Timberjack 608

References

- Compendium article Cut-to-Length #5

Illustration

- Timberjack 608 feller-buncher with a 762B single-grip harvesting head (Figure 1)

Location

The harvester worked in commercial thinning near Whitecourt, Alberta. In this instance, the harvester worked in conjunction with a Rottne 6 wheel drive forwarder.

Contractor

Kenmatt Logging, Whitecourt, AB

Equipment specifications

See Table 1. Additionally,

- L90 measuring and control system allows up to 88 programmable pre-set log lengths for up to four species
- volume measuring and recording available from the on-board computer with printer
- Timberjack 608 Tele-boom track harvester is now available with telescopic boom with 9.4 m reach
- cab has 360° continuous rotation
- 1.8-m tail swing

Table 1. Timberjack 608 Specifications

	Timberjack 608 Tele-boom harvester	Timberjack 608 feller-buncher
Engine power (kW)	125	125
Head capacity (cm)	60-cm diameter	60-cm diameter
Approx. weight (kg)	18 275	19 958
Width (m)	2.9	2.9
Length (m)	4.06	4.06
Height (m)	2.97	3.0
Crane reach (m)	9.4	7.0
Ground clearance (m)	0.58	0.50



Figure 1. Timberjack 608 feller-buncher with a 762B single-grip harvesting head.

Manufacturer

Timberjack equipment is manufactured by the Timberjack Group, Headquarters, PO Box 203, SF-00171 Helsinki, Finland, Tel.: +358-0-182-851, Fax: +358-0-608-617.

Equipment Distributors

Canadian distributor: Timberjack Inc., Box 160, 925 Devonshire Ave, Woodstock, ON, N4S 7X1, Tel.: 519-537-6271 Fax: 519-539-5282.

Timberjack equipment is available through local Timberjack distributors, for example, Coneco Equipment Inc., 16116 - 111 Avenue, Edmonton, AB T5M 2S1 Tel.: 403-451-2630 Fax: 403-451-2646.

Approximate (1996) price of the Timberjack 608 feller buncher with a 762B head is \$495 000 (f.o.b. Edmonton).

For further information, contact:

Ken van Gundy and Matt Curtis, Kenmatt Logging, Box 2134, Whitecourt, AB T7S 1M8 Tel.: 403-778-0278.

Les Hadden, Coneco Equipment Inc., 16116 - 111 Avenue, Edmonton, AB T5M 2S1 Tel.: 403-451-2630 Fax: 403-451-2646.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #3 Model: Valmet 546H

References

- FERIC Field Note. Silviculture-47
- FERIC Field Note. Processing-42
- Compendium article Operations Cut-to-Length #10

Illustration

- Valmet 546H harvester with a Valmet 948 single grip harvesting head (Figure 1)

Location

The harvester was demonstrated during a field tour near Vanderhoof, BC. FERIC also observed the harvester in a commercial thinning operation near Terrace, BC.

Contractor

E. A. Strimbold Ltd., Burns Lake, BC

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive, articulated harvester
- front bogies can be fitted with high flotation tracks to aid traction and reduce ground pressure
- high visibility cab
- joystick for forward and rearward driving
- Cranab 2-stage telescoping boom

Table 1. Valmet 546H Harvester Specifications

Valmet 546H harvester with 948 head	
Engine power (kW)	93
Power transmission	6 wheel drive
Head capacity (cm)	3x3 power shift 48-cm diameter
Approx. weight (kg)	13 635
Width (m)	2.6
Length (m)	6.7
Height (m)	3.9
Crane reach (m)	8.5
Ground clearance (m)	0.48

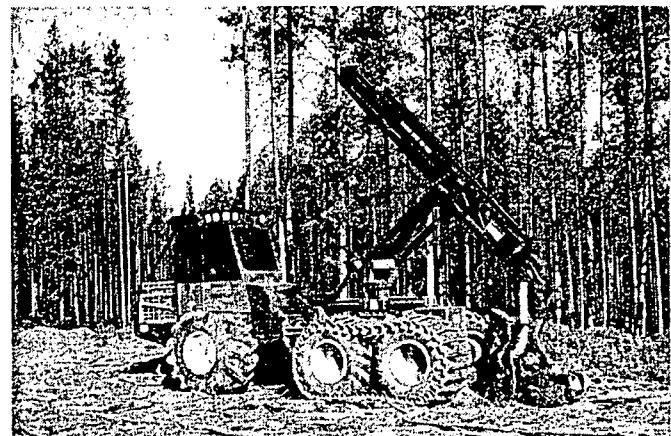


Figure 1. Valmet 546H harvester.

- on-board computer records stems cut, average diameters and lengths and volumes by species (was not installed on harvester observed by FERIC)
- harvester usually works in conjunction with a Valmet 546 forwarder

Manufacturer

Valmet equipment is manufactured by SISU Logging USA, Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 USA Tel.: 906-428-4800 Fax: 906-428-3922.

Equipment Distributors

Valmet equipment is available through Fanning Ltd., for example, Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

Approximate (1996) price of the Valmet 546H harvester is \$485 000 (f.o.b. Terrace).

For further information, contact:

Marvin Strimbold, E.A. Strimbold Ltd., Box 569, Burns Lake, BC V0J 1E0 Tel./Fax: 250-696-3607.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #4 Model: Valmet 500T

References

- Compendium article Operations Cut-to-Length #9

Illustration

- Valmet 500T harvester (Figure 1)

Location

The harvester was demonstrated during a field tour by the Washington State Department of Natural Resources, South Puget Sound Region, near Enumclaw, WA, USA. The Valmet 500T harvester was working in conjunction with a Valmet 546 forwarder.

Contractors

Northwest Log Marketing, Chehalis, WA, USA

Equipment specifications

See Table 1. Additionally,

- the cab, engine and boom are all mounted on same leveling base plate for a stable safe work platform
- 4-way, 2-cylinder cab leveling system for working on slopes up to 55%
- high visibility cab
- Cranab two-stage telescopic boom with maximum reach of 8.9 m
- Valmet 960 single-grip harvesting head
- log specifications can be programmed into the on-

Table 1. Valmet 500T Harvester Specifications



Figure 1. Valmet 500T harvester (Source: Valmet 500T brochure).

board computer however, the operator can override the computer

- volume measuring and recording available from the on-board computer and printer on some models (was not available on harvester observed by FERIC)

Manufacturer

Valmet equipment is manufactured by SISU Logging USA, Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 USA Tel.: 906-428-4800 Fax: 906-428-3922.

Equipment Distributors

Valmet equipment is available through Fanning Ltd., for example, Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

In Washington, Valmet equipment is available through PBI Machinery, 954 Jackson Highway South, Toledo, WA 98591 Tel.: 360-864-6004.

Approximate (1996) price of the Valmet 500T harvester is C\$552 000.

	Valmet 500T harvester
Engine power (kW)	126
Power transmission	hydrostatic
Head capacity (cm)	56 cm diameter
Approx. weight (kg)	21 490
Width (m)	2.9
Length (m)	4.36
Height (m)	3.8
Crane reach (m)	8.9
Ground clearance (m)	0.66

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street SE, PO Box 47016, Olympia, WA 98504-7016 USA Tel.: 360-902-1736 Fax: 360-902-1783.

Bill Bethune, Northwest Log Marketing, 1300 NW Maryland Ave., Chehalis, WA 98532 USA Tel.: 360-748-0243 Fax: 360-748-4766.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC, V6T 1Z4, Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #5 Model: Timbco T445

References

- Compendium article Operations Cut-to-Length #3

Illustration

- Timbco T445 excavator with Keto 500 feller-processor head (Figure 1)

Location

The harvester worked in commercial thinning on Vancouver Island. In this instance, the harvester worked in conjunction with a Caterpillar D4H tracked grapple skidder.

Company

TimberWest Forest Limited, Campbell River, BC

Equipment specifications

See Table 1. Additionally,

- Timbco T445 excavator has 4-way, 2-cylinder cab leveling system for working on slopes up to 55%
- high visibility cab
- Keto 500 feller-processor head can cut trees up to 55 cm in diameter
- log specifications can be programmed into the on-board computer

Table 1. Timbco T425 and T445 Excavator Specifications

	Timbco T425	Timbco T445
Engine power (kW)	128	157
Power transmission	2-speed drive motors	2-speed drive motors
Undercarriage	Caterpillar 325 (D6)	Caterpillar 330 (D7)
Approx. weight (kg)	23 000	25 000
Width (m)	2.9	3.15
Length (m)	4.3	4.6
Height (m)	3.6	3.6
Crane reach (m)	5.1	5.1
Ground clearance (m)	0.71	0.76

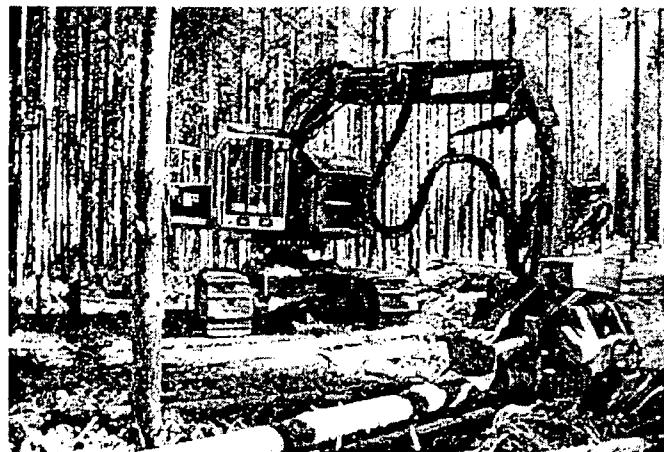


Figure 1. Timbco T445 excavator with Keto 500 head.

- minimum log lengths and top diameters for pulp and sawlogs can be programmed, however, the operator can override the computer

Manufacturer

Timbco equipment is manufactured by Timbco Hydraulics Inc., PO Box 516, 1075 Airport Drive, Shawano, WI 54166 USA Tel.: 715-524-2820 Fax: 715-526-2347.

Keto feller-processing heads are manufactured in Finland by Koneketonen Lt.

Equipment Distributors

The Timbco T445 excavator is available through Parker Pacific, 20329 Logan Ave., Langley, BC V3A 4L8 Tel.: 604-534-8511 Fax: 604-534-3515.

Keto feller-processing heads are available from Hakmet Ltd., PO Box 248, 881 Harwood Blvd., Dorion, PQ J7V 7J5 Tel.: 514-455-6101 Toll Free: 1-800-361-2288 Fax: 514-455-1890.

Approximate (1995) price of the Timbco T445 excavator and the Keto head are \$378 000 and \$159 000 respectively (f.o.b. Campbell River).

For further information, contact:

Barry Gibson, TimberWest Forest Limited, Oyster

River Operation, North Island Region, PO Box 2500,
5705 North Island Hwy., Campbell River, BC V9W
5C5 Tel.: 250-287-8118.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #6 Model: Norcar 490

References

- Compendium article Operations Cut-to-Length #4

Illustration

- Norcar 490 harvester (Figure 1)

Location

The Norcar 490 harvester has worked in commercial thinning near Qualicum Beach on south-central Vancouver Island, BC and near Terrace, BC. In these instances, the harvester was used in conjunction with the Norcar 600H forwarder.

Contractor

Shortlog Thinning Inc., Victoria, BC

Equipment specifications

See Table 1. Additionally,

- articulated tandem bogies on front and back equipped with wheel motors
- wheels can be fitted with chains, tracks or superwide tracks to aid in traction and reduce ground pressure
- up to 9 log specifications can be preselected and programmed into the on-board computer
- minimum log lengths and top diameters can be identified, however, the operator can override the computer

Table 1. Norcar 490 Harvester Specifications

Norcar 490 harvester	
Engine power (kW)	81
Power transmission	8-wheel drive hydrostatic
Head capacity (cm)	52-cm diameter
Approx. weight (kg)	10 800
Width (m)	2.5
Length (m)	8.45
Height (m)	3.70
Crane reach (m)	10.0
Ground clearance (m)	0.70

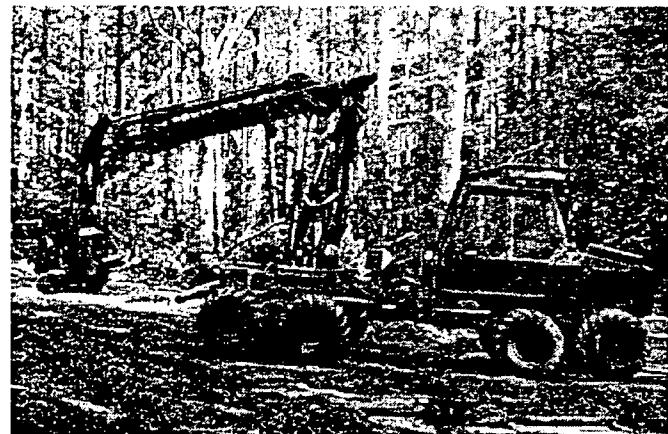


Figure 1. Norcar 490 Harvester.

- harvester was built in 1990 and purchased used by the contractor
- the original harvester boom was replaced by a larger and heavier boom with longer reach

Equipment Manufacturer and Distributor

Norcar equipment is manufactured and distributed by OY Logset AB, Hännisentie 2, 66530 Koivulahti, Finland, Tel.: 961-3463-234 Fax: 961-3460-603

The approximate (1995) price of new equipment model comparable to the Norcar 490 harvester is \$420 000

For further information, contact:

Mike Steeves (250-370-2667) or Jim Lambrick (250-746-9443), Shortlog Thinning Inc., 1480 Fort Street, Victoria, BC V8S 1Z5 Fax: 604-370-2611.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #7 Model: Bell TH 120

References

Compendium article Operations Cut-to-Length #7

Illustration

- Bell TH 120 tracked harvester (Figure 1)

Location

The harvester was demonstrated by the Washington State Department of Natural Resources, South Puget Sound Region, near Enumclaw, WA. The harvester was also demonstrated near Whitecourt, AB.

Contractors

Fiber Tech Inc., Stanwood, WA, USA

Hammer Equipment Sales Limited, Edmonton, AB

Equipment specifications

See Table 1. Additionally,

- the harvester has 40-cm wide tracks with an elevated drive sprocket with hydraulic track adjusters and coil spring tensioners
- Bell harvester crane with knuckle boom
- SP 550 single-grip harvesting head with rubber or spiked feed rollers
- programmable on-board DASA computer accepts up to 33 log lengths and 66 diameter limits, has a

Table 1. Bell TH 120 Tracked Harvester Specifications



Figure 1. Bell TH 120 tracked harvester.

keyboard, display and printer and can record volume, number of logs by species and product (i.e. pulp log or sawlog)

Manufacturer

Bell equipment is manufactured by Bell Equipment North America, Inc., 2843 Highway 80, Garden City, GA 31408 USA Tel.: 912-966-2615 Fax: 912-964-1594.

The SP 550 single-grip harvesting head and the DASA computer are manufactured by SP-Maskiner AB, Box 322, S-341 26 Ljungby, Sweden Tel.: +46-372-811-85 Fax: +46-372-822-13

Equipment Distributors

In Alberta, Bell equipment is available through Hammer Equipment Sales Limited, 17720 - 105 Avenue, Edmonton, AB T5S 1G4 Toll free: 1-800-784-0483 Fax: 403-483-0386.

In Washington, Bell equipment is available through Pacific North Equipment Co., 22431 83rd Avenue South, Kent, WA 98032. PO Box 88000, Seattle, WA 98138 USA Tel.: 206-872-3500.

Approximate (1996) price of the Bell harvester is \$315 000.

	Bell TH 120 tracked harvester
Engine power (kW)	86
Power transmission	hydrostatic
Head capacity	55-cm diameter
Feed speed	5 m/s (16 ft/s)
Approx. weight (kg)	9 700
Width (m)	2.5 - 2.7
Length (m)	4.6
Height (m)	3.23
Maximum speed (km/h)	6.6
Crane reach (m)	5.3
Ground clearance (m)	0.65

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street SE, PO Box 47016, Olympia, WA 98504-7016 USA Tel.: 360-902-1736 Fax: 360-902-1783.

Robert Hitchcock, Hammer Equipment Sales Limited, 17720 - 105 Avenue, Edmonton, AB T5S 1G4 Toll free: 1-800-784-0483 Fax: 403-483-0386.

Pacific North Equipment Co., 22431 83rd Avenue South, Kent, WA 98032. PO Box 88000, Seattle, WA 98138 USA Tel.: 206-872-3500 Fax: 206-872-3519.

Bell Equipment North America, Inc., 2843 Highway 80, Garden City, GA 31408 USA Tel.: 912-966-2615 Fax: 912-964-1594.

Tom Foster, Fiber Tech Inc., 3325 256th Street NW, Stanwood, WA 98292 USA Tel.: 360-629-9725 Fax: 206-745-0131.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #1 Model: Iron Horse

References

- Compendium article Operations Cut-and-Skid #1
- FERIC Field Note Silviculture -9

Illustration

- Iron Horse mini-skidder (Figure 1)

Location

The equipment was viewed by FERIC at two demonstrations near Sechelt and Vanderhoof, BC.

Contractors

West Coast Logging Shows, Squamish, BC

Equipment specifications

See Table 1. Additionally,

- Iron Horse mini-skidder is equipped with two reinforced rubber drive-tracks, a winch and a motor
- winch and tracks are driven by two belts and can run simultaneously
- speed is controlled by a throttle on the steering arm
- the Iron Horse has a load guard, a protective frame around the engine, a chain saw holder, a storage box, folding bunks, and hook to hold gas and oil
- the Iron Horse mini-skidder can be transported in



Figure 1. Iron Horse mini-skidder.

the box of a full-size pickup truck

- accessories include a hoist, one of several trailer designs, a tipper platform or a combi-platform with a folding tail board
- the Iron Horse is available in smaller models and a wheeled model (The Wheel Horse) similar to a forwarder with a winch, a hoist and a trailer
- modifications have been made to recent models to improve the drive train and increase durability.
- the Iron Horse can be used to transport seedlings, fire suppression equipment or other heavy equipment.

Manufacturer

The Iron Horse is manufactured by J-TRAC AB in Sweden.

Equipment distributors

The Iron Horse is distributed by Husqvarna and Jonsred throughout Finoscandinavia and Europe. In Canada, the Iron Horse and Wheel Horse are available through West Coast Logging Shows, Box 1035, Squamish, BC V0N 3G0 Tel.: 604-898-9493 Fax: 604-898-9495.

The approximate (1996) price of the Iron Horse is \$15 000 (f.o.b. Squamish). The timber trailer with roller would be approximately \$2 500.

Iron Horse mini-skidder

Engine power (kW)	6.7
Power transmission	2 speed, belt driven
Approx. weight (kg)	350
Width (m)	1.08
Length (m)	2.8
Height (m)	0.98
Maximum speed (km/hr)	4.5
Mainline	15 m - 10 mm
Ground pressure loaded (kPa)	10.0
Track width (cm)	38

For further information, contact:

Bryan Couture, West Coast Logging Shows, Box 1035, Squamish, BC V0N 3G0 Tel: 604-898-9493 Fax: 604-898-9495.

Paul Harper, BC Ministry of Forests, Sunshine Coast Forest District, Sechelt Field Office, 1975 Field Rd., Sechelt, BC V0N 3A0 Tel.: 604-885-5174 Fax: 604-885-3803.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #2 Model: ASV Posi-Track

References

- Compendium article Operations Cut-and-Skid #2

Illustration

- ASV Posi-track mini-skidder (Figures 1 and 2)
- Farmi JL 501 skidding winch (Figure 3)

Location

The equipment was viewed by FERIC at two demonstrations near Sechelt and Vanderhoof, BC.

Contractors

Hyster Sales, Seattle, WA

R and T Lead Products Ltd., Smithers, BC

Equipment specifications

See Table 1. Additionally,

- 45-cm molded rubber tracks made of KevlarTM¹, nylon, polyester, fiberglass rods (Figure 2)
- The ASV Posi-track mini-skidder used in the demonstration included a Farmi JL 501 skidding

Table 1. ASV Posi-Track Specifications

	ASV Posi-track mini-skidder	Farmi JL 510 skidding winch
Engine power (kW)*	52	30 - 45**
Power transmission	hydrostatic	PTO
Approx. weight (kg)	2 545	286
Width (m)	1.63	1.40
Length (m)	2.87	n.a.
Height (m)	1.98	1.65
Pulling capacity (kg)	1 800	5 011
Maximum speed (km/hr)	12.8	n.a.
Maximum line speed (m/min)	n.a.	90
Track width (cm)	45	n.a.
Ground pressure (kPa)	10.0	n.a.

* 69 kW turbo charge optional

** minimum size of carrier required



Figure 1. Posi-Track mini-skidder.

winch and forks

- other attachments include 6-way blade, brush cutter, arched grapple, loader, snow blower, and bucket
- the ASV Posi-track mini-skidder can work on maximum slopes of 38 % unloaded, and 33 % loaded, if traction allows
- three point hitch for other agricultural and forestry equipment
- operator's seat is reversible
- transported on a trailer pulled by a pickup truck
- quick attachment system conforms to Bobcat mounting system



Figure 2. KevlarTM track.

¹ KevlarTM is a registered trademark of E.I. Dupont Co.

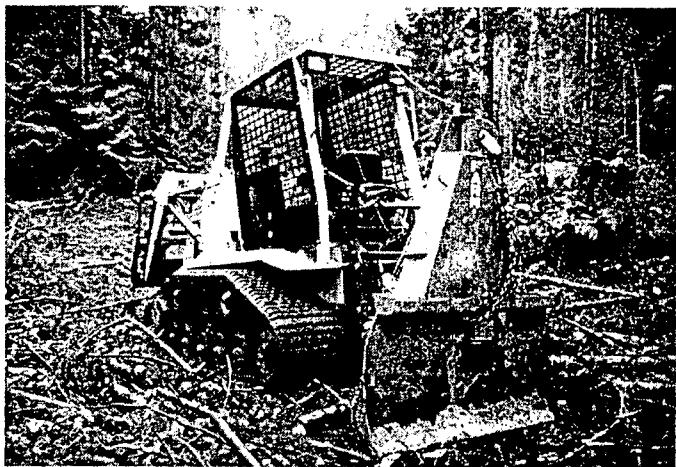


Figure 3. ASV Posi-track with Farmi JL 501 skidding winch.

Manufacturer

The ASV Posi-track mini-skidder is manufactured by ASV Incorporated, Grand Rapids, MI, USA

The Farmi winch is manufactured by Orion Corporation Normet, Fin-74510 Peltosalmi, Finland Tel.: +358-77-15241 Fax: +358-77-23606.

Equipment distributors

The ASV Posi-track mini-skidder is available from Hyster Sales Company, 9892-40th Avenue South, Seattle, WA 98118 USA Tel.: 206-722-5800 Fax: 206-722-3657.

In Canada, the ASV Posi-Track mini-skidder is available through Ted Ramsey, Smithers, BC Cell phone: 638-2887.

Approximate (1996) price of the ASV Posi-track mini-skidder equipped with the Farmi winch is US\$40 000 (C\$56 000) f.o.b. Vancouver.

Farmi equipment is distributed in Western Canada by Enviroquip Sales Ltd., Courtenay, BC.

For further information, contact:

John Parisi, Hyster Sales Company, 9892-40th Avenue South, Seattle, WA 98118 USA Tel.: 206-722-5800 Fax: 206-722-3657.

Ted Ramsey, R and T Lead Products Ltd., Smithers, BC Cell phone: 638-2887.

Richard DeLuca, Enviroquip Sales Ltd., 2356 Rosewall Cres, Courtenay, BC V9N 8R9 Tel.: 1-800-496-6656 Fax: 250-334-9338.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #1 Model: Timberjack 910/1010/1210B

References

- Compendium articles Operations Cut-to-Length #1, #2, and #6
- FERIC Technical Note TN-235
- FERIC Field Note Processing -40

Illustrations

- Timberjack 910 forwarder (Figure 1)
- Timberjack 1010 forwarder (Figure 2)
- Timberjack 1210B forwarder (Figure 3)

Locations

The Timberjack 910 and 1010 forwarders have worked in pre-logging, commercial thinning and partial cutting on Vancouver Island and in the Okanagan region of British Columbia. In these instances, the forwarder worked in conjunction with a Timberjack 1270 harvester. The Timberjack 1210B forwarder, in conjunction with the Timberjack 1270 harvester, was demonstrated in Washington by the Department of Natural Resources.

Contractors

SLT Shortlog Thinning Inc., Victoria, BC
Brookside Select Logging, Kelowna, BC
4 M Fiber, Sweethome, OR, USA

Table 1. Timberjack Forwarder Specifications

	Timberjack forwarder		
	910	1010	1210B
Engine power (kW)	82	82	128
Power transmission	6-wheel drive power-shift	6-wheel drive power-shift	8-wheel* hydrostatic
Approx. weight (kg)	13 330	13 330	15 155
Width (m)	2.68	2.85	2.85
Length (m)	8.63	8.63	9.93
Height (m)	3.30	3.55	3.58
Crane reach (m)	6.8	6.8	7.2
Carrying capacity (t)	9 - t	10 - t	12 - t
Ground clearance (m)	0.71	0.60	0.60

* 6-wheel drive is also available

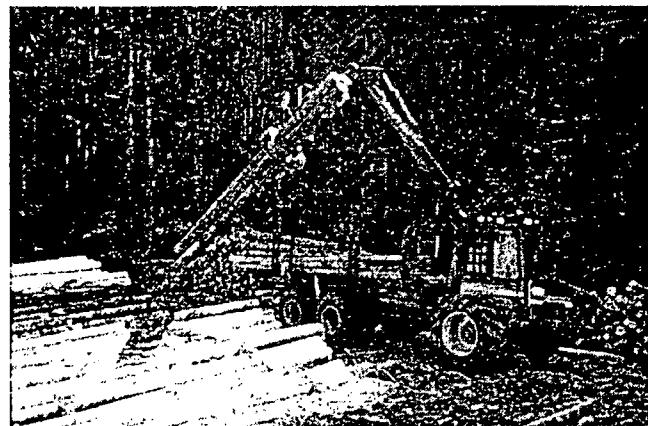


Figure 1. Timberjack 910 forwarder.

Equipment specifications

See Table 1. Additionally,

- articulated
- double bogies (front and rear) on 1210B model
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- loader has telescoping extension
- grapple has continuous rotation
- four pairs of stakes with extensions
- seat swivels 180° for forward and rearward steering

Manufacturer

Timberjack equipment is manufactured by the Timberjack Group, Headquarters, PO Box 203, SF-00171 Helsinki, Finland, Tel.: +358-0-182-851, Fax: +358-0-608-617.



Figure 2. Timberjack 1010 forwarder.

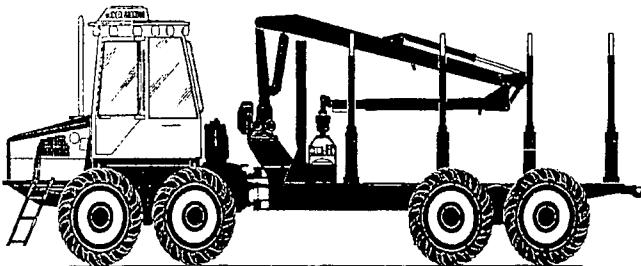


Figure 3. Timberjack 1210B forwarder (Source: Timberjack 1210B brochure).

Equipment distributors

The Canadian distributor of Timberjack equipment is Timberjack Inc., Box 160, 925 Devonshire Ave, Woodstock, ON N4S 7X1 Tel.: 519-537-6271 Fax: 519-539-5282.

Timberjack equipment is available through local Timberjack distributors, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel: 604-532-8324 Fax: 604-532-8354.

The 910 forwarder is no longer available and the approximate (1996) price for the 1010 and 1210B forwarders are \$345 000 and \$480 000 respectively.

For further information, contact:

Larry Layden (250-763-7481) or Randy Spencer (250-765-5265), Brookside Select Logging, 815 Kitch Road, Kelowna, BC V1X 5V8 Fax: 250-765-5272.

Mike Steeves (250-370-2667) or Jim Lambrick (250-746-9443), STL Shortlog Thinning Inc., 3 - 2994 Boys Rd., Duncan, BC V9L 4T8 Fax: 250-370-2611.

Mike Melcher, 4 M Fiber, PO .Box 600, Sweethome, OR 97386 USA Tel.: 541-367-3232 Fax: 541-367-7299.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #2 Model: Valmet 546

References

- Compendium articles Operations Cut-to-Length #9, #10, and #12
- FERIC Field Note. Felling-23
- FERIC Field Note. Silviculture-47
- FERIC Field Note Processing-42

Illustration

- Valmet 546 forwarder (Figure 1)

Location

The forwarder was demonstrated in a precommercial thinning on Department of Natural Resources land, near Enumclaw, WA. The forwarder was also demonstrated near Terrace, BC.

Contractors

E. A. Strimbold Ltd., Burns Lake, BC
Northwest Log Marketing, Chehalis, WA

Equipment specifications

See Table 1. Additionally,

- articulated with a tandem axle bogie on the back section
- 6 wheel drive
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- high visibility cab

Table 1. Valmet Forwarders Specifications

Valmet 546 forwarder	
Engine power (kW)	76
Power transmission	6 wheel drive power shift
Approx. weight (kg)	15 155
Width (m)	2.59
Length (m)	9.14
Height (m)	3.76
Carrying capacity (t)	9 - t
Crane reach (m)	5.4
Ground clearance (m)	0.48

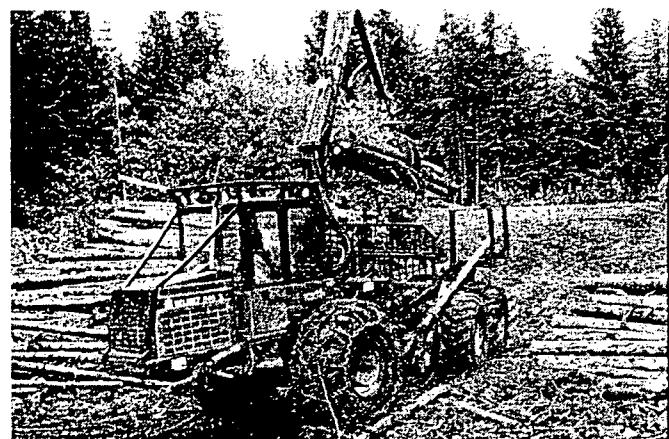


Figure 1. Valmet 546 forwarder.

- seat swivels 180° for forward and rearward steering
- 4 pairs of stakes
- grapple has continuous rotation

Manufacturer

Valmet equipment is manufactured by Sisu Logging USA, Inc., 103 North 12th Street, PO Box 401, Galdstone, MI 49837-0401 USA Tel.: 906-428-4800 Fax: 906-428-3922.

Equipment distributors

In Canada, Valmet equipment is available through Fanning Ltd., for example, Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

The approximate price for the Valmet 546 forwarder is \$350 000 (f.o.b. Terrace).

For further information, contact:

Marvin Strimbold, of E. A. Strimbold Ltd., Box 569, Burns Lake, BC V0J 1E0 Tel./Fax: 250-696-3607.

Bill Bethune, Northwest Log Marketing, 1300 NW Maryland Ave, Chehalis, WA 98532 Tel.: 360-748-0243 Fax: 360-748-4766.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC, V6T 1Z4, Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #3 Model: Norcar 600H

References

- Compendium article Operations Cut-to-Length #4

Illustration

- Norcar 600H forwarder (Figure 1)

Location

The forwarder has worked in pre-logging, commercial thinning and partial cutting on Vancouver Island and Terrace, BC. In these instances the forwarder worked in conjunction with a Norcar 490 harvester.

Contractor

SLT Shortlog Thinning Inc., Victoria, BC

Equipment specifications

See Table 1. Additionally,

- 8 wheel drive
- high visibility cab
- seat swivels 180° for forward and rearward steering
- 4 pairs of stakes; back set can be extended 54 cm

Equipment manufacturer and distributor

Norcar equipment is manufactured and distributed by OY Logset AB, Hännisentie 2, 66530 Koivulahti, Finland Tel.: 961-3463-234 Fax: 961-3460-603.

Table 1. Norcar 600H Forwarder Specifications

Norcar 600H	
Engine power (kW)	81
Power transmission	8-wheel drive hydrostatic
Approx. weight (kg)	10 500
Width (m)	2.5
Length (m)	7.5*
Height (m)	3.67
Crane reach (m)	8.7
Carrying capacity (t)	9.5 - t
Ground clearance (m)	0.70

*8.04 m with back stakes extended 54 cm

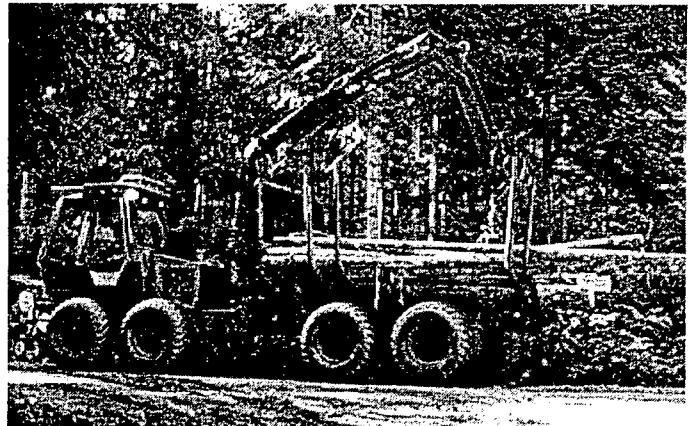


Figure 1. Norcar 600H forwarder.

The approximate (1995) price of a new equipment model comparable to the Norcar 600H forwarder is \$280 000.

For further information, contact:

Jim Lambrick (250-746-9443) or Mike Steeves (250-370-2667), SLT Shortlog Thinning Inc., 3-2994 Boys Rd, Duncan, BC V9L 4T8 Fax: 250-370-2611.

Dave Robinson, Texada Logging Ltd., Horne Lake Division, 470 Warder Crescent, Qualicum Beach, BC V9K 2A4 Tel.: 250-752-5020.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #4 Model: Rottne 6 Wheel Drive

References

- Compendium article Operations Cut-to-Length #5

Illustration

- Rottne 6 wheel drive forwarder (Figure 1)

Location

The forwarder has worked in commercial thinning near Whitecourt, AB. In this instance the forwarder worked in conjunction with a Timberjack 608 feller buncher and a Rottne harvester.

Contractor

Kenmatt Logging, Whitecourt, AB

Equipment specifications

See Table 1. Additionally,

- six wheel drive
- articulated with a tandem axle bogie on the back section
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- high visibility cab
- seat swivels 180° for forward and rearward steering
- 4 pairs of stakes
- Hultdins Supergrip 260 grapple
- 8 wheel drive model available with double set of bogies

Table 1. Rottne Forwarder Specifications

Rottne forwarder	
Engine power (kW)	125
Power transmission	6 wheel drive, hydrostatic
Carrying capacity (t)	10 - t
Approx. weight (kg)	13 700
Width (m)	2.4
Length (m)	8.5
Height (m)	3.5
Crane reach (m)	6.0
Ground clearance (m)	0.56

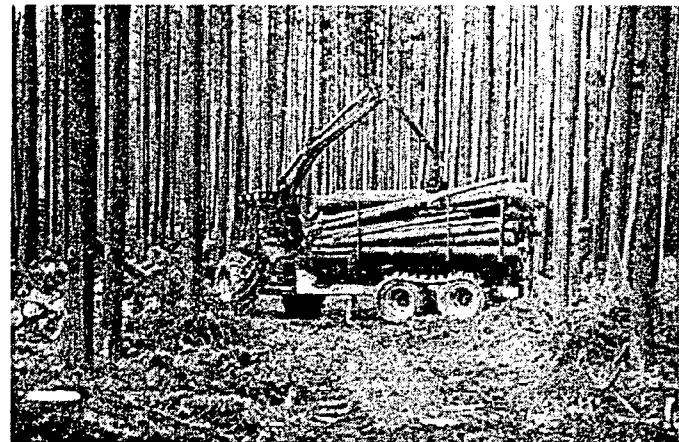


Figure 2. Rottne 6 wheel drive forwarder.

Manufacturer

Rottne forwarders are manufactured by Rottne Industri AB, S-360 40 Tottne, Sweden, Tel.: 0450-911-70 Fax: 0470-922-68.

Hultdins grapples are manufactured by Hultdins Inc., PO Box 1205, 24 Morton Ave. E, Brantford, ON N3T 5T3 Tel.: 519-754-0044 Fax: 519-754-1569.

Equipment distributors

Rottne equipment is available from ROCAN Forestry BC Ltd., Box 2940 - 5339A Hartway Drive, Prince George, BC Tel.: 250-962-8244 Fax: 250-962-8892.

The newer versions of the Rottne forwarder are larger and more powerful and cost approximately \$425 000 (1995).

Hultdins equipment is available through Hultdins Inc., PO Box 1205, 24 Morton Ave. E, Brantford, ON N3T 5T3 Tel.: 519-754-0044 Fax: 519-754-1569.

The Hultdins Supergrip 260 grapple is approximately \$3 450 (f.o.b. Brantford).

For further information, contact:

Ken van Gundy and Matt Curtis, Kenmatt Logging, Box 2134, Whitecourt, AB T7S 1M8 Tel.: 403-778-0278.

Brent MacLeod, ROCAN Forestry BC Limited, Box
2940 - 5339A Hartway Drive, Prince George, BC
V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #5 Model: Bell T12B

References

- Compendium article Operations Cut-to-Length #7

Illustration

- Bell T12B forwarder (Figure 1)

Location

The forwarder was demonstrated in a precommercial thinning on Department of Natural Resources land, near Enumclaw, WA. The forwarder was also demonstrated near Whitecourt, AB. In both of these instances the forwarder worked in conjunction with a Bell TH 120H harvester.

Contractors

Fiber Tech Inc., Stanwood, WA, USA

Hammer Equipment Sales Limited, Edmonton, AB

Equipment specifications

See Table 1. Additionally,

- 6 wheel drive
- articulated with tandem bogie on back section
- the forwarder is rubber-tired but the rear bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure
- forwarder can work on maximum slopes of 35% (40% on dry ground)
- seat swivels 180° for forward and rearward steering

Table 1. Bell T12B Forwarder Specifications

Bell T12B forwarder	
Engine power (kW)	86
Power transmission	6 speed powershift
Carrying capacity (t)	12 - t
Width (m)	2.6
Length (m)	9.23
Height (m)	3.81
Crane reach (m)	7.15
Ground clearance (m)	0.51



Figure 2. Bell T12B forwarder.

- Cranab 660 crane
- 4 pairs of stakes

Manufacturer

Bell equipment is manufactured by Bell Equipment North America, Inc., 2843 Highway 80, Garden City, GA 31408 USA Tel.: 912-966-2615 Fax: 912-964-1594.

Equipment distributors

In Alberta, Bell equipment is available through Hammer Equipment Sales Limited, 17720 - 105 Avenue, Edmonton, AB T5S 1G4 Toll free: 1-800-784-0483 Fax: 403-483-0386.

In Washington, Bell equipment is available through Pacific North Equipment Co., 22431 83rd Avenue South, Kent, WA 98032. PO Box 88000, Seattle, WA 98138 Tel.: 206-872-3500.

The approximate (1996) price of the Bell T12B forwarder is C\$276 000.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street SE, PO Box 47016, Olympia, WA 98504-7016 Tel.: 360-902-1736 Fax: 360-902-1783

Robert Hitchcock, Hammer Equipment Sales Limited,
17720 - 105 Avenue, Edmonton, AB T5S 1G4 Toll
free: 1-800-784-0483 Fax: 403-483-0386.

Pacific North Equipment Co., 22431 83rd Avenue
South, Kent, WA 98032 PO Box 88000, Seattle, WA
98138 Tel.: 206-872-3500 Fax: 206-872-3519.

Bell Equipment North America, Inc., 2843 Highway
80, Garden City, GA 31408 USA Tel.: 912-966-
2615 Fax: 912-964-1594.

Tom Foster, Fiber Tech Inc., 3325 256th Street NW,
Stanwood, WA 98292 Tel.: 360-629-9725 Fax: 206-
745-0131.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #1 Model: Kubota with tower

References

- Compendium article Operations Cable #1

Illustration

- Kubota KH191 excavator with home-made collapsible extension on the boom for light cable yarding (Figure 1)

Location

The Kubota excavator was used for commercial thinning near Campbell River and Courtenay, BC. The Kubota worked in conjunction with a Nokka forwarder and a Farmi forwarder.

Contractors

Enviro-Harvesting Inc., Courtenay, BC
Neil Blackburn, Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- a collapsible tower was designed and mounted on the boom of the excavator to give more lift during yarding
- yarder has 2 drum winch
- operator used snatch blocks for lateral yarding

Table 1. Kubota KH191 Excavator with Tower Specifications

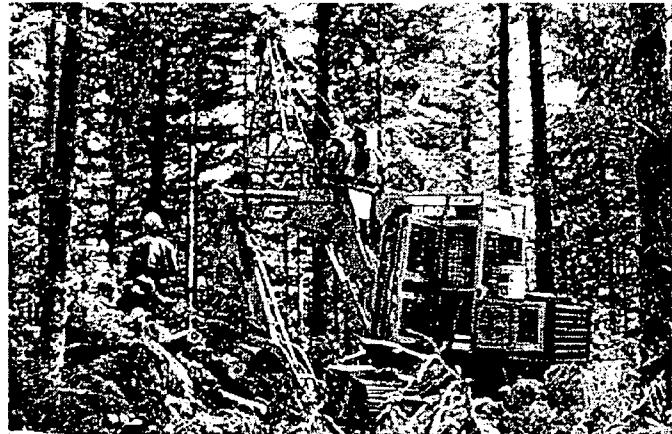


Figure 1. Kubota KH191 excavator.

- tower is not guylined, and is able to move along the road as needed and can use the bucket to manoeuvre logs at the trail edge
- forwarder loads the logs from the trail edge and carries them to the landing

Equipment distributors

The Kubota KH191 excavator is available through Cougar Pacific Equipment Ltd., 4485 Trans Canada Hwy, RR 7, Duncan, BC V9L 4W4 Tel: 250-748-2809 Fax: 250-748-9696.

The approximate price of the Kubota KH191 is \$105 000, including the modifications for the tower and the winches.

For further information, contact:

Bob Woods, Enviro-Harvesting Inc., 4262 Cotton Road, Courtenay, BC V9N 5X9 Tel./Fax: 250-334-3554.

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9344.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

Kubota KH 191 excavator with tower	
Engine power (kW)	44
Approx. weight (kg)	6 000
Width (m)	2.15
Line capacity	
Mainline	135 m - 10 mm
Haulback	255 m - 8 mm
Maximum line speed (m/min)	72 - 126
Maximum line pull (kg)	4 500
Overall Tower height (m)	6.1
Maximum yarding distance (m)	150
Ground clearance (m)	0.35

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #2
Model: Koller K300

References

- Compendium article Operations Cable #8

Illustration

Koller K300 yarder with Koller SKA-1 carriage
(Figure 1)

Location

Hoquiam, WA, USA

Contractor

Mayr Bros. Company, Hoquiam, WA, USA

Equipment specifications

See Table 1. Additionally,

Two yarders were observed. The first was purchased from Koller as a tower and two drum winch set. The contractor built the trailer, installed the engine and hydrostatic drive, added the haulback drum and a third guyline, and increased the tower height with a

Table 1. Yarder Specifications

Koller K-300 yarder	
Engine	MWM-Deutz 3 cylinder diesel
Engine power (kW)	64
Power transmission	hydrostatic
Line capacity	
Skyline	366 m - 16 mm
Mainline	366 m - 10 mm
Haulback	640 m - 8 mm
Guylines	3 with 30 m - 16 mm
Maximum line speed (m/min)	300
Maximum line pulls (kg)	
Mainline	1 800 @ mid-drum diameter
Skyline	4 400 in tensioning compartment
Approx. weight (kg)	4 100
Tower height (m)	7.0*
Trailer width (m)	2.0
length (m)	4.7

* 1.2 m extension is available



Figure 1. Koller K-300 with truck axle and Koller SKA-1 carriage.

2.4 m custom-made extension. The second was purchased complete from Koller and is very similar to the K-300s that are available today. The contractor modified the trailer for the second yarder by installing a heavy duty truck axle and wheels. Both towers are open lattice construction.

The yarder has a 3 point hitch and can be driven through a power take off. Many K300s are mounted on farm tractors.

Equipment manufacturer and distributors

Koller is manufactured and distributed by Koller USA Corporation, 8828 NE Killingsworth Street, Portland, OR 97220 USA Tel.: 503-257-9778 Toll free: 1-800-821-1475 Fax.: 503-257-9780.

A new trailer-mounted K-300 three drum yarder has a list price of US\$89 500, including three guylines, a 1.2 m tower extension, all lines, a Koller SKA-1 carriage with two intermediate supports, Talkie Tooters, tool box and service kit. Alone, the SKA-1 carriage lists for US\$10 500.

For further information, contact:

Tom Mayr, Mayr Bros. Company, PO Box 180,
Hoquiam, WA 98550 USA Tel.: 360-532-7490
Fax.: 360-532-2381.

Joe Mahon, Koller USA Corporation, 8828 NE
Killingsworth Street, Portland, OR 97220 USA Tel.:
503-257-9778 Toll free: 1-800-821-1475 Fax.: 503-
257-9780.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #3 Model: Timbermaster

References

- Compendium articles Operations Cable #9

Illustration

- Timbermaster 4-drum yarder (Figure 1)

Location

The Timbermaster yarder has worked in commercial thinning for the District of Mission's TFL near Mission, BC. The Timbermaster worked in conjunction with a Ford 5600 tractor as a power source

Contractor

R.K. Silviculture Co. Ltd., Mission, BC

Equipment specifications

See Table 1. Additionally,

- trailer-mounted
- powered from the PTO of an agricultural tractor
- winch set includes a skyline, mainline, haulback

Table 1. Washington Swing Yarder Specifications

	Timbermaster
Recom. engine power (kW)	45 - 60
Fuel consumption (L/shift)	14
Power transmission	PTO
Line capacity	
Skyline	450 m - 16 mm
Mainline	400 m - 10 mm
Haulback	900 m - 10 mm
Maximum line speed (m/min)	
Mainline	300
Haulback	600
Maximum load capacity (kg)	3 tonne partially suspended and 1.5 tonne fully suspended
Approx. weight (kg)	3 500
Tower height (m)	9.0
Width (m)	2.2
Length (m)	3.5

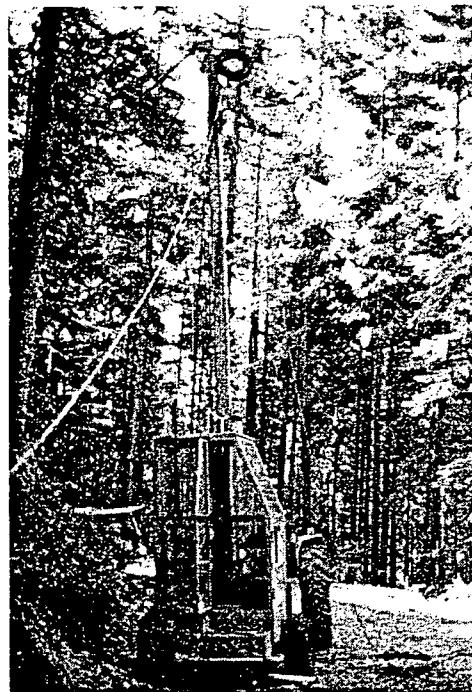


Figure 1. Timbermaster yarder.

and strawline drum which are powered mechanically through a combination of chain and gear drives

- skyline drum is fitted with a divider flange to partition it into both a cable storage and tensioning drum
- An over-centering band brake secures the tensioned skyline during yarding
- tower is raised and lowered hydraulically
- Once rigged, the machine operates with a crew of two. The operator also releases the chokers in the landing and the chokersetter picks the turns, spots the carriage, pulls mainline slack, sets chokers and signals the operator for line movement. A third crew member works as a faller, pre-rigs the back and intermediate spars, and assists with machine moves.

Manufacturer

The Timbermaster is manufactured in the UK by Trewella Bros. (UK) Ltd..

Equipment distributors

The Timbermaster is available through R.K. Silviculture Co. Ltd. of Mission, BC.

Approximate costs (dependent on exchange and tariff rates) for the machine, tower, carriage and trip is C\$85 000 (f.o.b. Mission). The cost of a power source (i.e., tractor or skidder), and the lines and rigging would be additional

For further information, contact:

Roy Kittles, R.K. Silviculture Co. Ltd., 8660 Cedar Street, Mission, BC V4S 1A1 Tel./Fax: 604-826-0629.

Bob O'Neal, Forestry Manager, District of Mission, 8645 Stave Lake Street, Box 20, Mission, BC V2V 4L9 Tel.: 604-820-3763 Fax: 604-826-8633.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #4
Model: Urus I-Uni

References

- Compendium articles Operations Cable #4 and #11

Illustration

- Urus I-Uni (Figure 1)
- Stuefer HSK 2000 carriage (Figure 2)

Location

Vancouver Island and Bosques Arauco S.A., private land near Arauco, in south-central Chile. In both instances, the yarder worked in conjunction with a hand faller and an Austrian-manufactured Stuefer HSK 2000 carriage.

Contractors

Enviroquip Sales Ltd., Courtenay, BC
Bosques Arauco S.A. employees, Chile

Equipment specifications

See Table 1. Additionally,

Table 1. Urus I-Uni Yarder Specifications

Urus I-Uni 300 yarder	
Engine	Cummins diesel, 4 cylinder
Engine power (kW)	54
Transmission (Allison, automatic)	4 speeds forward 1 speed reverse
Line capacity	
Skyline	310 m - 16 mm
Mainline	310 m - 10 mm
Haulback	660 m - 8 mm
Guyline	40 m - 16 mm
Maximum line speed (m/min)	
Mainline	360
Haulback	360
Maximum line pulls (kg)	
Skyline	1400
Mainline	4600
Overall tower height (m)	9.9

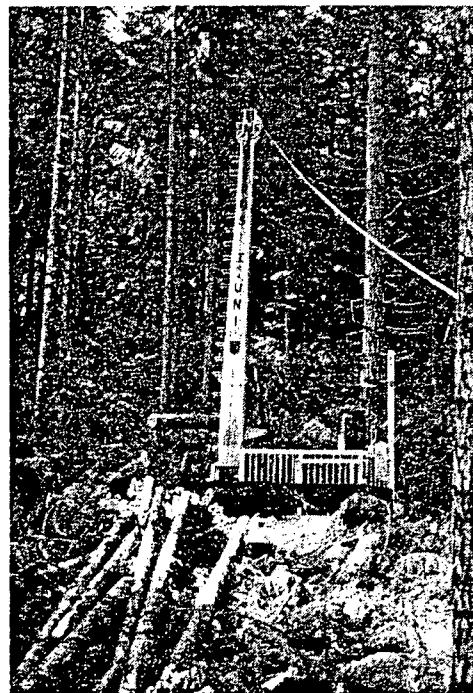


Figure 1. South African manufactured Urus I-Uni yarder.

- Urus I Uni is a mobile 9.9-m tower mounted on a trailer
- tower is raised and lowered hydraulically and secured by 4 guylines which were tensioned with manual winches
- a hydraulic sequencing device activates the skyline clamps on the Stuefer HSK 2000 carriage.



Figure 2. Stuefer HSK 2000 carriage.

- skyline clamp released when the mainline pulled the chokers into the carriage
- carriage (and load) traveled to the landing upon clamp release
- operator guarding was added to the yarder to comply with Workers' Compensation Board of BC requirements
- commonly used for uphill yarding, but it is equipped with 3 drums and can yard downhill

Manufacturer

The Urus is manufactured in South Africa by Hinteregger S.A. (Pty) Ltd., Newton St. Labore, Brakpan, PO Box 1557, Kempton Park 1620 South Africa Tel.: 27-738-3505 Fax: 27-738-3508.

The Stuefer HSK 2000 carriage is manufactured in Austria and is available through Enviroquip Sales Ltd. for C\$30 500 (f.o.b. Vancouver).

Equipment distributors

The Urus I-Uni is available through Enviroquip Sales Ltd. for C\$110 000 (f.o.b. Vancouver) complete with a non-locking carriage. A larger yarder (Urus II Uni) with a 12-m tower is available for C\$130 000.

For further information, contact:

Richard DeLuca, General Manager, Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9
Tel.: 250-897-9050 Toll free: 1-800-496-6656 Fax: 250-334-9338.

Humberto Aicón Perez, Thinning Manager, Bosques Arauco S.A., Casilla 147, Arauco, Chile Tel.: 56-41-571-941 Fax: 56-41-571-944.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #5 Model: Howe-Line

References

- Compendium article Operations Cable #10

Illustration

- Howe-Line yarder (Figure 1)

Location

Shelton, WA, USA

Contractor

Anderson Resources Inc., Shelton, WA, USA

Equipment specifications

See Table 1. Additionally,

- yarder has an extendible 12-m solid tower with 5 guyline, strawline, main and haulback lines and corresponding drums
- can be mounted on a trailer or on a truck (one observed was mounted on an old Mack logging truck)
- tower is leveled hydraulically
- crew consists of yarder operator, hooktender and two chokersetters
- Maki II carriage was used in this operation
- 3-5 sliding ring chokers
- 2 intermediate supports

Table 1. Howe-Line Yarder Specifications

Howe-Line yarder	
Engine power (kW)	135
Power transmission	hydrostatic drive
Line capacity	
Skyline	600 m - 20 mm (swedge)
Mainline	600 m - 14 mm (swedge)
Haulback	1200 m - 12 mm
Guylines	60 m - 20 mm
Maximum line speed (m/min)	360
Maximum line pulls (kg)	
Mainline	5 400
Skyline	9 000
Tower height (m)	12.0

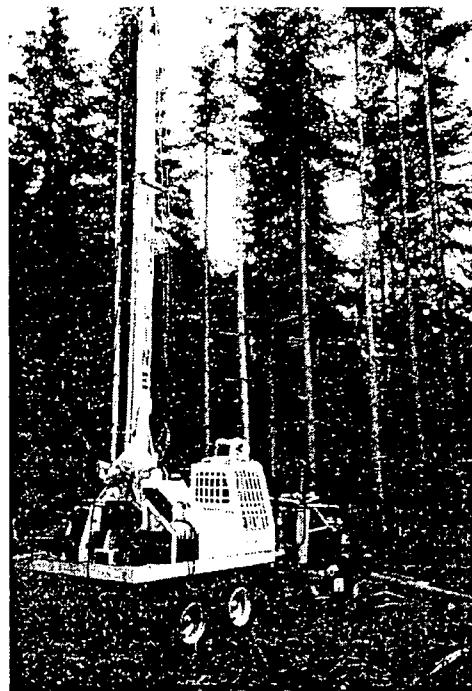


Figure 1. Howe-Line yarder.

Manufacturer

The Howe-Line yarder is manufactured in South Africa by Derek Howe, PO Box 2831, Pietermaritzburg 3200, South Africa Tel.: +27-331-947-260 Fax: +27-331-945-150, and has just recently been introduced to the North American market.

Equipment distributors

The Howe-Line yarder is distributed by Anderson Resources, Inc., PO Box 1226, Shelton, WA 98584 USA Tel.: 360-426-5913 Fax: 360-426-0523

The suggested base price for the Howe-Line yarder is approximately US\$170 000, not including the truck, lines and carriage.

The Maki II carriage is approximately US\$32 500 and is available through Maki Mfg. Inc., HC.64 Box 60, Pierce, ID 83546 Tel./Fax: 208-464-2120.

For further information, contact:

Lloyd Anderson, Anderson Resources, Inc., PO Box 1226, Shelton, WA 98584 USA Tel.: 360-426-5913 Fax: 360-426-0523.

Bill Maki, Maki Mfg. Inc., HC 64 Box 60, Pierce, ID 83546 USA Tel./Fax: 208-464-2120.

Derek Howe, Howe-Line, PO Box 2831, Pietermaritzburg 3200, South Africa Tel.: +27-331-947260 Fax: +27-331-945-150.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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SR108-4

FOREST ENGINEERING
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Western Division



INSTITUT CANADIEN
DE RECHERCHES
EN GENIE FORESTIER
Division de l'ouest

November, 1997

FERIC Members and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108)

The enclosed material comprises the fourth issue of twelve, 1-page descriptions of commercial thinning operations. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you did not receive the first three issues, please complete the form below and send it to the address given.

If you have comments on the content of the attached items or suggestions for future material in the compendium, please contact me, or Ingrid Hedin.

Please note that the area code in BC, outside the lower Mainland, has been changed from 604 to 250.⁰ You will have to make the necessary changes in the first and second issues.

The Compendium is funded in 1997/98 by Forest Renewal BC.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — (SR-108)

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #13

Region

Alberta

Author

Janet Mitchell, RPF

Date

October 1997

Source

FERIC field visit in December 1996

Contractor

Hammer Equipment Sales Limited, Edmonton, AB

Equipment

- Bell TH 120 tracked harvester with a SP 550 harvesting head (Figures 1 and 2)
- Bell T12B forwarder (Figures 3 and 4)

Location

Millar Western Industries Ltd., near Whitecourt, AB

Site and stand

- 50-year-old lodgepole pine/white spruce stand
- preharvest: density - 3400 trees/ha, average dbh of 14 cm, average 13 trees/m³
- average volume 237 m³/ha
- flat to gentle slopes (5 to 15%)
- loam to sandy loam
- few obstacles to machine travel

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- leave 1700 trees/ha, average spacing of 2.4 m, and leave all spruce advanced regeneration
- Millar Western will monitor the block and schedule either a second thinning, or final harvest depending on the growth response of the stand

Operating procedure

- initially, crop trees were pre-marked to train the harvester operator, and later, they were selected by the operator with checking by Millar Western



Figure 1. Bell TH 120 harvester.

- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- harvester operator made a "ghost trail" between two main trails
- logs were piled at the side of the main trail
- forwarder followed the harvester's main trails

Equipment description and specifications

See Table 1. Additionally,

- the harvester has 40 cm-wide tracks with an elevated drive sprocket with hydraulic track adjusters and coil spring tensioners (Figure 1)
- the forwarder is rubber-tired but the front bogies can be equipped with a flexible steel track to improve traction and reduce ground pressure (Figure 2)

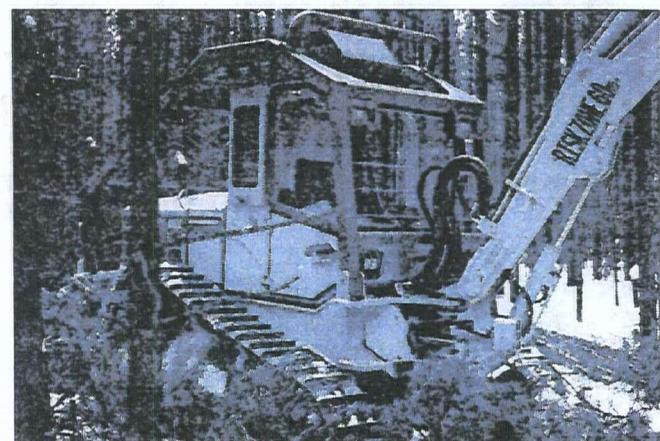


Figure 2. Bell TH 120 harvester.

Table 1. Bell TH 120 Tracked Harvester and T12B Forwarder Specifications

	Bell TH 120 harvester	Bell T12B forwarder
Engine power (kW)	86	86
Engine	Cummins 4BTA - 3.9	Cummins 4BTA - 3.9
Power transmission	hydrostatic	hydrostatic
Head capacity (cm)	55-cm diameter	n.a.
Carrying capacity (t)	n.a.	12 - t
Width (m)	2.7	2.9
Crane reach (m)	5.3	7.1
Ground clearance (m)	0.65	0.65

- the harvester and forwarder are equipped with high intensity halogen lights for night operation
- harvester and forwarder can work on maximum slopes of 35% (40% on dry ground)
- forwarder has a Cranab 660 loader and Bell grapple
- SP 550 harvesting head can cut trees up to 55 cm in diameter and requires an engine power rating of at least 85 kW, working pressure of 25 Mpa, and pump capacity or 180-200 L/min.
- Dasa 280 measuring system

Production

The thinning operation was a one-month operational trial. The estimated production of the harvester for this trial, was 8.1 m³/hour for thinning, and 11.1 m³/hour for cutting trail. The harvester operator was not a full time operator and had not thinned in this



Figure 3. Bell T12B forwarder.



Figure 4. Bell T12B forwarder.

timber type before. The forwarder production was based on previous work at 10-14 m³ /hour, because during the trial there was not an experienced operator to operate the machine. (Source: Millar Western Industries Ltd.).

Equipment suppliers

Bell equipment is available through Hammer Equipment Sales Limited, 17720 - 105 Avenue, Edmonton, AB T5S 1G4 Tel.: 403-486-2273 Toll free: 1-800-784-0483 Fax: 403-483-0386.

Approximate price of the Bell TH 120 tracked harvester and the T12B forwarder are \$385 000 and \$317 000 respectively.

For further information, contact:

Steven MacPhail, Millar Western Industries Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 403-778-2221 Fax: 403-778-4631.

Robert C. Hitchcock, Hammer Equipment Sales Limited, 17720 - 105 Avenue, Edmonton, AB T5S 1G4 Tel.: 403-486-2273 Toll free: 1-800-784-0483 Fax: 403-483-0386.

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #8 Model: Komatsu PC 128UU

References

- Compendium article Operations Cut-to-Length #8

Illustrations

- Komatsu PC 128UU (ultra urban) tracked thinning harvester with a HTH 14 PAN single-grip harvesting head (Figures 1 and 2)

Location

The harvester was demonstrated during a field tour by the Washington State Department of Natural Resources, South Puget Sound Region, near Enumclaw, WA, USA. The Komatsu harvester was working in conjunction with a Timberjack 230A forwarder.

Contractor

Pacific North Equipment Co., Kent, WA, USA

Equipment specifications

See Table 1. Additionally,

- harvester is a Japanese excavator with a boom and harvesting head
- harvester carrier is 2.4 m wide and can turn within its width - no tail swing
- harvesting head has an auto measuring system to measure length and diameter
- uses commonly available components
- boom has reach of 8.9 m

Table 1. Komatsu PC 128 UU Harvester Specifications

Komatsu PC 128 UU Harvester	
Engine power (kW)	63
Power transmission	hydrostatic
Head capacity (cm)	36-cm diameter
Approx. weight (kg)	11 800
Width (m)	2.44
Crane reach (m)	7.2
Ground clearance (m)	0.40



Figure 1. Komatsu PC 128UU (ultra urban) tracked thinning harvester with a HTH 14 PAN single-grip harvesting head.

Manufacturer

Komatsu equipment is manufactured by Komatsu America International Company, 440 N Fairway Drive, Vernon Hills, IL 60061-8112 Tel.: 847-970-5815.

PAN equipment is manufactured by Pierce Pacific, 930 Laval Crescent, Kamloops, BC, V2C 5P5 Tel.: 250-372-9986 Toll free: 1-800-666-4474 Fax: 250-372-9975.

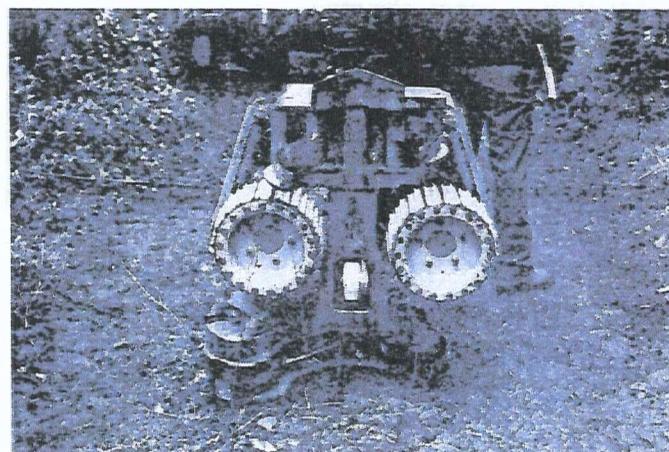


Figure 2. HTH 14 PAN single-grip harvesting head.

Equipment Distributors

In British Columbia, Komatsu equipment is available through Komatsu Canada Ltd., Richmond, BC Tel.: 604-278-3811 Fax: 604-278-1176 or Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.: 604-532-8324 Fax: 604-532-8354.

In Washington, Komatsu equipment is available through Pacific North Equipment Co., 22431 - 83rd Avenue S, Kent, WA 98032. Mailing address: PO Box 88000, Seattle, WA 98138 Tel.: 206-872-3500 Fax: 206-872-3519.

The HTH 14 PAN harvesting head is available through Pierce Pacific Manufacturing Inc., 930 Laval Crescent, Kamloops, BC V2C 5P5 Tel.: 250-372-9986 Toll Free: 1-800-666-4474 Fax: 250-372-9975.

Approximate (1996) price of the Komatsu PC 128UU (ultra urban) tracked thinning harvester is C\$297 000.

For further information, contact:

Dave Doan, Thinning Program Manager, Washington State Department of Natural Resources, Forest Resources, 1111 Washington Street SE, PO Box 47016, Olympia, WA 98504-7016 USA Tel.: 360-902-1736 Fax: 360-902-1783.

Pacific North Equipment Co., 22431 - 83rd Avenue S, Kent, WA 98032. PO Box 88000, Seattle, WA 98138 Tel.: 206-872-3500 Fax: 206-872-3519.

Janét Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

**Equipment: Feller-Processor #9
Model: ROCAN Thinning Harvester**

Illustration

- ROCAN T thinning harvester (Figure 1)

Location

Millar Western Industries Ltd., near Whitecourt, AB.
Demonstrated as part of the Commercial Thinning
Workshop sponsored by FERIC and Millar Western.

Contractor

Rocan Forestry BC Ltd., Prince George, BC

Equipment specifications

See Table 1. Additionally,

- ROCAN T thinning harvester is a Ford Versatile 9030 tractor chassis with a Pan 828 harvesting head
- parallel boom configuration
- because of its narrow width, can be used with "ghost trails"
- Mowi 465 loader

Manufacturer

ROCAN equipment is manufactured by Rocan Forestry Services Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5R8, Tel.: 506-859-9906 Fax: 506-857-8018.

Table 1. ROCAN T Thinning Harvester Specifications

	ROCAN T thinning harvester
Engine power (kW)	84
Power transmission	4 WD hydrostatic 3 speed forward/reverse
Head capacity (cm)	41-cm diameter
Approx. weight (kg)	6 400
Length (m)	5.1
Height (m)	3.2
Width (m)	2.1
Weight (kg)	6 000
Crane reach (m)	6.6
Ground clearance (m)	0.60

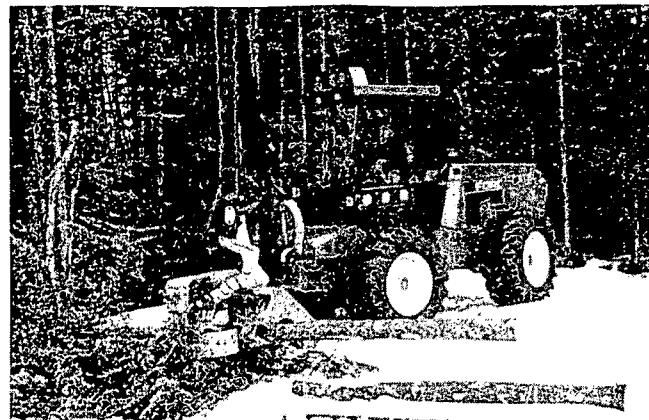


Figure 1. ROCAN T harvester with Pan 828 harvesting head. (Photo courtesy of Rocan Forestry BC Limited)

Equipment Distributors

ROCAN equipment is available through Rocan Forestry BC Limited, Prince George, BC Tel.: 250-962-8244 Fax: 250-962-8892 and Rocan Forestry Services Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5R8, Tel.: 506-859-9906 Fax: 506-857-8018.

The approximate (1997) price of the ROCAN T thinning harvester is \$330 000.

For further information, contact:

Brent MacLeod, Rocan Forestry BC Limited, Box 2940 - 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #6
Model: Farmi 9000 kg

References

- Compendium article Operation Cable #12 and 13

Illustration

- Farmi 9000 kg powered-forwarding trailer with Farmi HK 4166 loader and Kubota M9580 tractor (Figure 1)

Location

Courtenay, BC

Contractors

R. Caouette Trucking, Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- Farmi trailer was pulled behind a Kubota M9580 4-wheel drive tractor
- trailer has a hydraulic drive sprocket between each set of rear wheels, 3 pairs of stakes and Nokia forestry tires
- Farmi HK 4166 loader requires a pump capacity of 30-55 L/min and a working pressure of 195 bar
- loader has a 6.6 m reach, telescopic boom and continuous rotator
- forwarding trailer is also available in 12 000 kg capacity

Manufacturer

The Farmi 9000 kg forwarding trailer is manufactured by Orion Corporation Normet, FIN-74510, Peltosalmi, Finland Tel.: +358-77-152-41 Fax: +358-77-236-06.

Table 1. Farmi Forwarding Trailer Specifications.

Farmi Forwarding trailer	
Engine power required (kW)	52
Approx. weight (kg)	2 690
Width (m)	2.32
Length (m)	6.03
Height (m)	2.17
Crane reach (m)	6.6
Carrying capacity (kg)	9 000
Ground clearance (m)	0.59

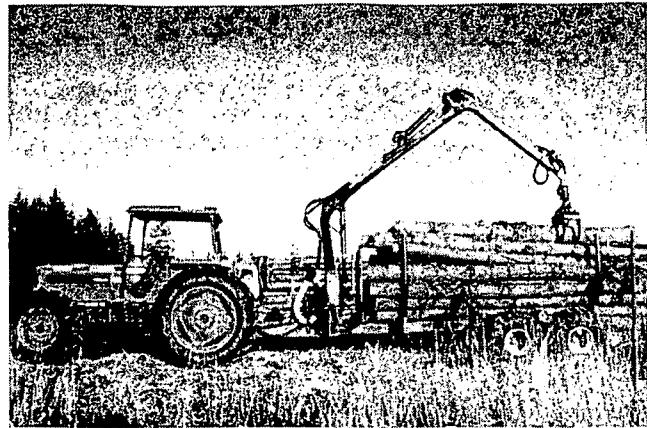


Figure 1. Farmi 9000 kg powered-forwarding trailer.

Equipment distributors

In Canada, the Farmi forwarding trailers are available through Enviroquip Sales Ltd., 2356 Rosewall Cres., Courtenay, BC V9N 8R9 Tel.: 1-800-496-6656 Fax: 250-334-9338.

The approximate (1997) prices for the Farmi forwarding trailer and loader are \$32 500 and \$21 500 respectively.

For further information, contact:

Richard DeLuca, Enviroquip Sales Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-897-9050 Toll free: 1-800-496-6656 Fax: 250-334-9338.

Roy Hagg, R. Caouette Trucking, 306-1355 Cumberland Rd., Courtenay, BC V9N 2G1 Tel.: 250-338-1236.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #7
Model: Enviroquip B-Line 9000

Reference

- Compendium article Operation Cut-to-Length #11

Illustration

- Enviroquip B-Line 9000 forwarding trailer (Figure 1)

Locations

Courtenay, BC

Contractors

Enviroquip Sales Ltd., Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- 9000 kg capacity
- pulled by agricultural tractor
- Farmi HK 4166 loader, grapple and continuous rotator
- walking beam assembly for travel over uneven terrain, stumps and brush
- trailer has 3 pairs of stakes

Manufacturer and distributor

The B-Line 9000 forwarding trailer was designed and manufactured by Enviroquip Sales Ltd., Courtenay, BC. The approximate (1997) price for the B-Line 9000 forwarding trailer complete with Farmi HK 4166 loader, grapple and continuous rotator is \$34 000.

Table 1. B-Line 9000 Forwarding Trailer Specifications

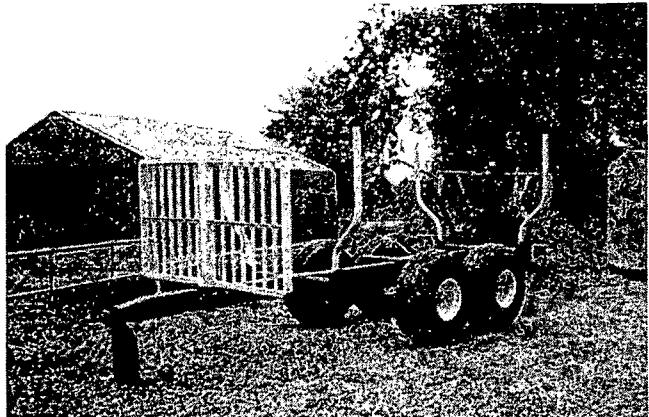


Figure 1. Enviroquip B-Line 9000 forwarding trailer (Photo courtesy of Enviroquip Sales Ltd.).

For further information, contact:

Richard DeLuca, Enviroquip Sales Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-897-9050 Toll free: 1-800-496-6656 Fax: 250-334-9338.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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B-Line Forwarding trailer and loader crane

Approx. total weight (including loader) (kg)	2 770
Width (m)	2.13
Length (m)	7.5
Crane reach (m)	6.6
Carrying capacity (kg)	9000



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #8 Model: Nokka 36

Reference

- Compendium article Operations Cable #1

Illustration

- Nokka 36 loader and forwarding trailer (Figure 1)

Location

The forwarder has worked in commercial thinning on Crown land in the Sayward Forest, near Campbell River on central Vancouver Island. In this instance the forwarder worked in conjunction with a Kubota KH191 excavator with a tower for light cable yarding.

Contractor

Enviro-Harvesting Inc., now Enviro Techniques Timber Harvesting, Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- loader and forwarding trailer require a 45 kW-tractor
- logs were yarded to the trails using a tower and cable system mounted on a Kubota KH191 excavator
- Nokka 36 loaded the logs from the trail-side decks into the trailer
- loader unloaded the trailer at roadside and sorted logs into free-standing bunks for transport to the mill on roll on trucks

Manufacturer

Nokka equipment is manufactured by Nokka-Tumes, Tume Oy, Marketing and Manufacturing, FIN-40950

Table 1. Nokka Forwarder Specifications

Nokka forwarder	
Carrying capacity (m ³)	12
Approx. weight (kg)	950
Width (m)	2.13
Crane reach (m)	7.1
Ground clearance (m)	0.35



Figure 1. Nokka 36 loader and trailer pulled by a farm tractor.

Muurame, Finland Tel.: 358-14-330-1500 Fax: 358-14-330-1555.

Equipment distributors

The Nokka loader and trailer are available through Cougar Pacific Equipment, Duncan, BC Tel: 250-748-2809, and Enviro Techniques Timber Harvesting, 4262 Cotton Road, Courtenay, BC V9N 5X9 Tel./Fax: 250-334-3554.

Approximate (1995) price of the Nokka 36 loader and trailer is \$23 000.

For further information, contact:

Bob Woods, Enviro Techniques Timber Harvesting, 4262 Cotton Road, Courtenay, BC V9N 5X9 Tel./Fax: 250-334-3554.

Cougar Pacific Equipment, 4485 Trans Canada Hwy., Duncan, BC V9L 4W4 Tel: 250-748-2809 Fax: 250-748-9696.

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9344 Fax: 250-286-9490.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #9 Model: Timbco TF 815

References

- Compendium article Operations Cut-to-Length #3

Illustrations

- Timbco TF 815 forwarder (Figure 1)

Location

DEMO '96, equipment show near Quebec City, QC
Pacific Logging Congress, equipment show near Snoqualamie, WA

Equipment specifications

See Table 1. Additionally,

- Timbco TF 815 forwarder has 2-way, 2-cylinder cab leveling system for working on slopes up to 55%
- Huldtins Supergrip 360 grapple with rotator
- Caterpillar 3116T engine
- 8 wheel drive
- tracks up to 48" wide
- 16 ton load capacity
- parts are compatible with Timbco feller-bunchers (i.e. Timbco T445 - Compendium article Operations Cut-to-Length #3)

Manufacturer

Timbco equipment is manufactured by Timbco Hydraulics, Inc., PO Box 516, 1075 Airport Drive, Shawano, WI 54166 Tel.: 715-524-2820 Fax: 715-526-2347.

Table 1. Timbco TF 815 Forwarder Specifications

Timbco TF 815 forwarder	
Engine power (kW)	186
Power transmission	hydrostatic drive
Carrying capacity (t)	16 t
Approx. weight (kg)	18 000
Length (m)	9.1
Height (m)	3.6
Width (m)	2.9
Crane reach (m)	7.5
Ground clearance (m)	0.61



Figure 1. Timbco TF 815 forwarder.

Equipment Distributors

The Timbco TF 815 forwarder is available through local Inland Kenworth/Parker Pacific dealers, for example, Parker Pacific Equipment Sales, 20329 Logan Ave., Langley, BC V3A 4L8 Tel.: 604-534-8511 Fax: 604-534-3515.

Approximate (1997) price of the Timbco TF 815 forwarder is \$375 000.

For further information, contact:

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #6 Model: Washington 78-40 & 78SL

References

- Compendium articles Operations Cable #2, #6

Illustrations

- Washington 78-40 swing yarder (Figure 1)
- Washington 78SL swing yarder (Figure 2)
- Maki II carriage (Figure 3)

Location

The Washington 78-40 yarder has worked in pre-logging, commercial thinning and partial cutting on Crown land in the Sayward Forest, near Campbell River, BC. The Washington 78SL yarder worked with a Maki carriage in commercial thinning on private land near Harrison Mills, BC. In both instances, the yarder worked in conjunction with a hand faller.

Companies and Contractors

Art Graham, Campbell River, BC

Canadian Forest Products Ltd. (Canfor), Mainland Logging Division, Harrison Mills, BC

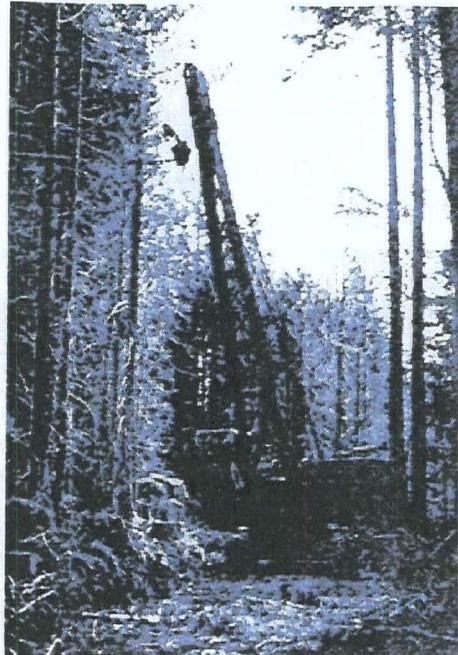


Figure 1. Washington 78-40 yarder.

Table 1. Washington Swing Yarder Specifications

	Washington 78SL	Washington 78- 40
Engine power (kW)	176	147
Power transmission	twin disc 4 speeds (forward and reverse)	power-shift
Line capacity		
Skyline	670 m - 23 mm	366 m - 16 mm
Mainline	550 m - 16 mm	366 m - 16 mm
Haulback	*	690 m - 16 mm
Maximum line speed (m/min)	850	380 - 460
Maximum line pull (kg)	16 800	22 136
Approx. weight (kg)	41 700	36 900
Width (m)	4.30	4.30
Tower height (m)	14.4	15.0
Swing radius (m)	3.53	2.32
Ground clearance (m)	0.47	0.47

* shotgun mode - no haulback



Figure 2. Washington 78SL yarder.

Equipment specifications

See Table 1. Additionally,

- Model 78SLs are relatively rare and it is difficult to obtain typical used prices for these machines, however used Model 78As can be found ranging between \$75 000 and \$125 000 and used Model 88s between \$200 000 and \$220 000
- 78As can be upgraded to incorporate the features of the 78SL which include an additional guyline, a taller gantry, a mechanical interlock, and removable rear main drum lagging
- repowering the yarder with an additional 30 kW would also be recommended
- Washington 78-40 swing yarder observed by FERIC was built in 1978 and is no longer available, but a comparable model would cost approximately \$650 000 - \$700 000

Manufacturer and distributor

Washington yarders have not been manufactured for 11 years, but they are still well supported with parts and service through Trican Machinery Ltd. in New Westminster, BC.

Canfor's Washington 78SL swing yarder was purchased used through Trican Machinery Ltd., 455 Brunette Street, New Westminster, BC V3L 3G1
Tel.: 604-540-0826 Fax: 604-540-0855.

For further information, contact:

Art Graham, 152 Lennea Place, Campbell River, BC V9W 5T7 Tel.: 250-923-5087.

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9344 Fax: 250-286-9490.

Mike Manson, General Superintendent, Harrison Operations of the Mainland Logging Division for Canadian Forest Products Ltd. Tel.: 604-462-0172 Fax: 604-796-3625.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

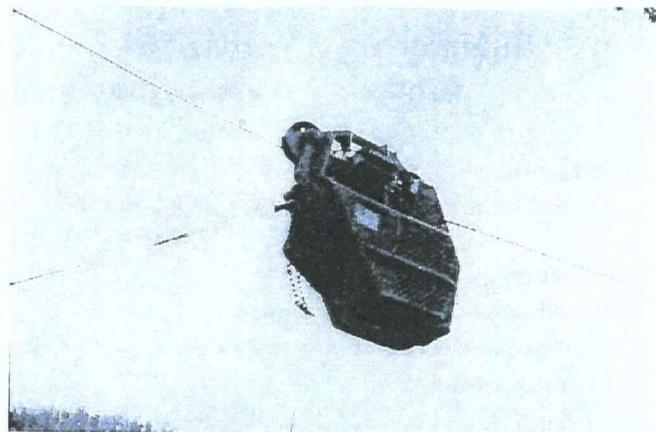


Figure 3. Maki II carriage.

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Yarder #7

Model: Farmi winch with high lead kit

References

- Compendium article Operations Cable #13

Illustrations

- modified Farmi JL2/601 double-drum winch (Figures 1 and 2)

Location

The Farmi winch with extension for yarding was working on private land north of Courtenay, BC.

Contractors

Enviroquip Sales Ltd., Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- frame of winch had been modified by Enviroquip Sales Ltd. to raise the pulley off the ground by approximately 5 m
- two pins allow quick release and return the winch to the original set up
- two guylines tie back the tower
- tower can be lowered for road transport, however it is left upright when moving along the block road
- Farmi winch can mount on the back of any farm tractor that provides 34 kW
- operation requires one faller, one chokersetter/winch operator who also unhooks the turns

Manufacturer

The Farmi winch is manufactured by Orion

Table 1. Farmi Winch Specifications

	Farmi winch (original)	Farmi winch (modified)
Max. tractive power (t)	5.5	5.5
Cable capacity (mm.m)	10/130	10/130
Power needed (kW)	44.8	44.8
Pulley height (m)	1.7	4.5
Total height (m)	1.7	5.0



Figure 1 Modified Farmi JL2/601 double drum winch for yarding.

Corporation Normet, FIN-74510, Peltosalmi, Finland Tel.: +358-77-152-41 Fax: +358-77-236-06 and was modified by Enviroquip Sales Ltd., Courtenay, BC.

Equipment distributors

Farmi equipment is distributed in Western Canada by Enviroquip Sales Ltd., Courtenay, BC.



Figure 2 Modified Farmi JL2/601 double drum winch.

The approximate (1997) price of the Farmi JL2/601 winch with and without modifications are \$14 500 and \$10 600 respectively.

For further information, contact:

Richard DeLuca, Enviroquip Sales Ltd., 1109 Comox Rd, Courtenay, BC V9N 3P7 Tel.: 250-897-9050
Toll free: 1-800-496-6656 Fax: 250-334-9338.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Yarder #8 Model: Igland Jones Trailer Alp

References

- Compendium article Operations Cable #3
- FERIC Technical Note TN-19
- Peters, P.A.; Kellogg, L.D. 1980. "Smallwood Harvesting Using a Trailer Alp Cable Yarding System" in Transactions of the ASAE. Vol. 23, No. 5, pp. 1080-1083. American Society of Agricultural Engineers, St. Joseph, MI.

Illustration

- Igland Jones Trailer Alp (Figure 1)

Location

The yarder has worked in pre-logging, commercial thinning and partial cutting on Crown land in the Sayward Forest, near Campbell River on Vancouver Island, BC. In these instances, the yarder was powered by a Belarus tractor and worked in conjunction with a hand faller.

Contractor

R. J. Timber Products Ltd., Merville, BC

Equipment specifications

See Table 1. Additionally,

- Igland Jones Trailer Alp yarder observed by FERIC was built in 1979
- yarder consists of winches and a tower mounted on a trailer, pulled by a farm tractor

Table 1. Igland Jones Trailer Alp Yarde
Specifications

Igland Jones Yarde	
Engine power (kW)	49
Power transmission	drive shaft, chain, and worm-gear drives
Line capacity	
skyline	800 m - 16 mm
mainline	550 m - 10 mm
haulback	550 m - 10 mm
Line speeds (m/min)	183 - 274
Tower height (m)	7.2
Trailer length (m)	4.4



Figure 1. Igland Jones Trailer Alp
yarder.

- originally a Norwegian design, but modified in Scotland for use in Scotland before being imported into Canada

Manufacturer

The Igland Jones yarder originally came from James Jones and Sons, Lambert, Stirlingshire, Scotland, United Kingdom.

Equipment distributors

The Igland Jones yarder is not currently available through local distributors.

For further information, contact:

Rick Shellink, R. J. Timber Products Ltd., PO Box 4, Merville, BC V0R 2M0

Bill Hughes, Campbell River Forest District, BC Ministry of Forests, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9344 Fax: 250-286-9490.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Yarder #9
Model: Komatsu excavator with tower

Illustrations

- Komatsu PC200LC-6 hydraulic excavator with custom collapsible extension on the boom for yarding (Figures 1 - 3)

Location

The Komatsu excavator was used for excavator forwarding in a small clearcut block for Texada Logging Limited near Qualicum Beach, BC.

Contractor and Company

Shortlog Thinning, Duncan, BC (This company has since been sold.)

Texada Logging Ltd., Qualicum Beach, BC

Equipment specifications and operating procedure

See Table 1. Additionally,

- trees were hand felled, and bucked to length
- Komatsu PC200LC-6 hydraulic excavator had been converted into a combination log-loader and yarder
- loader was used in the block for excavator forwarding but occasionally, due to the broken terrain and the steep slopes was unable to excavator forward
- a collapsible tower (mounted on the boom of the loader) was then raised and secured with a pin (Figure 1)
- rigging consisted of a mainline, skyline and a small Christy carriage

Table 1. Komatsu PC200LC-6 Excavator Specifications

	Komatsu excavator with tower
Engine power (kW)	99
Line capacity	
Skyline	450 m - 16 mm
Mainline	m - 16 mm
Haulback	300 m - 12 mm
Maximum line speed (m/min)	7.8 m/s
Overall Tower height (m)	7.6



Figure 1. Komatsu excavator with collapsible extension on boom for yarding.

- tower is not guylined, the heel of the boom is placed on the road surface or log deck in front of the loader, but is able to move as needed (Figure 2)
- grapple on loader can be used to manoeuvre logs onto the deck at the road/landing edge
- boom was modified to allow the loader to be transported in a compact position (Figure 3)
- loader had 3 drums and could be used with a haulback

Equipment manufacturers

Komatsu equipment is manufactured by Komatsu America International Company, 440 N Fairway Drive, Vernon Hills, IL 60061-8112 Tel.: 847-970-5815.

The modifications to the Komatsu loader were designed by Jim Lambrick and Bob Turnbull, Contract Equipment Co. Ltd.

Equipment distributors

The modified Komatsu loader is available through Wes Lade, Terratech Equipment Inc., 1531 Harold Rd. Site Z2, C-18, RR4, Nanaimo, BC V9R 5X9 Tel.: 250-753-7821 Fax: 250-753-6821.

The approximate price of the loader is \$400 000 including the modifications for the tower, the winches and the guarding. The cables and wire are extra.

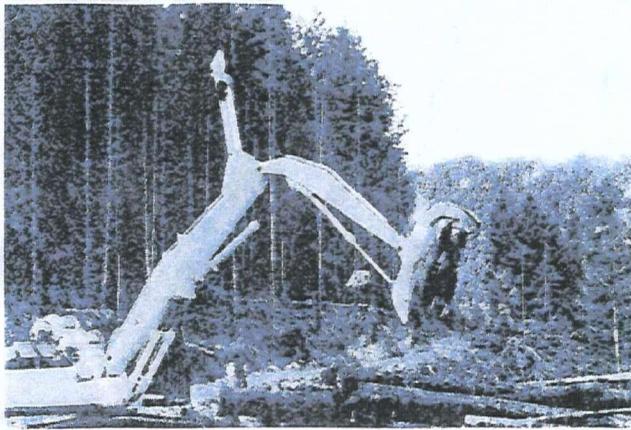


Figure 2. Komatsu loader with boom raised for moving logs at roadside.

Christy carriages are manufactured by Christy Manufacturing Inc., PO Box 2259, Orofino, ID 83544-2259 Tel.: 208-476-4870 Fax: 208-476-5339.

Christy carriages are available through Skylead Logging Equipment Corp., Enderby, BC and are available in various sizes.

For further information, contact:

Jim Lambrick, Tel.: 250-743-8226, Cell Phone: 246-5623.

Bob Turnbull, Contract Equipment Co. Ltd., 6433 Island Hwy., Box 3602, Courtenay, BC V9N 6Z8 Tel.: 250-338-0700 Fax: 250-338-0722.

Texada Logging Ltd., Horne Lake Division, 470 Warder Crescent, Qualicum Beach, BC V9K 2A4 Tel.: 250-752-5020.

Wes Lade, Terratech Equipment Inc., 1531 Harold Rd. Site Z2, C-18, RR4, Nanaimo, BC V9R 5X9 Tel.: 250-753-7821 Fax: 250-753-6821.

Bill Varner, Skylead Logging Equipment Corp., Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

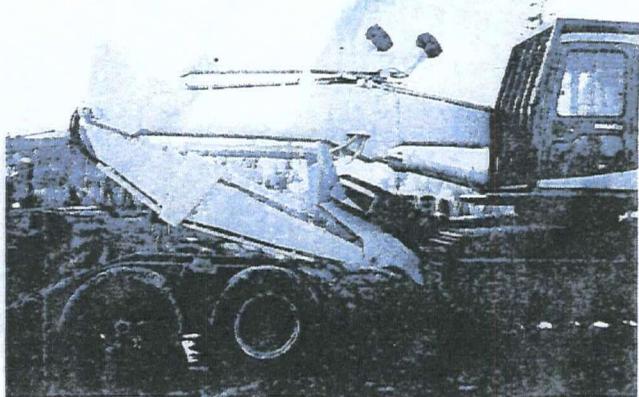


Figure 3. Modified loader in transport position (Photo courtesy of Contract Equipment Co.).

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DE RECHERCHES
EN GENIE FORESTIER
Division de l'ouest

March, 1998

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108)

The enclosed material comprises the fifth issue of ten, 1-page descriptions of commercial thinning operations. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you did not receive the first four issues, please complete the form below and send it to the address given. Please note that an index has been provided with this issue.

If you have comments on the content of the attached items or suggestions for future material in the compendium, please contact me, or Ingrid Hedin.

The Compendium is funded in 1997/98 by Forest Renewal BC.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink, appearing to read "Janet L. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — (SR-108)

Please return completed form to:

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Vancouver, BC V6T 1Z4
Fax: 604-228-0999

E-mail: janet-m@vcr.feric.ca

<input type="checkbox"/> issues 1-4	PLEASE SEND COMPENDIUM (SR-108) TO:	
NAME:		
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CITY:	PROVINCE:	
COUNTRY:	POSTAL CODE:	
TELEPHONE:	FAX:	



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Index

Commercial Thinning - Operations Index

Harvesting System	Item	Location	Equipment
I-A Cut-and-Skid	1	Coastal BC	Hand falling and Iron Horse mini-skidder
	2	Coastal BC	Hand falling and ASV Posi-Track mini-skidder with Farmi JL 501 winch
	3	Southern Interior BC	Hand falling, Tree Farmer C-7 line-skidder and John Deere 544 rubber-tired loader
	4	Southern Interior BC	Hand falling, John Deere 540 rubber-tired skidder, Nokka 400 processor and Hitachi EX 60 excavator
I-B Mechanical	1	Interior BC	Morbark Wolverine feller-buncher, Caterpillar 518 rubber-tired grapple-skidder and Steyr processor
	2	Interior BC	Timbco T445 excavator with Quadco harvesting head and Caterpillar D4H custom tracked skidder with Hydrawrap grapple
I-C Cut-to-Length	1	Coastal BC	Timberjack 1270 harvester and Timberjack 910 forwarder
	2	Interior BC	Timberjack 1270 harvester and Timberjack 1010 forwarder
	3	Coastal BC	Timbco T445 excavator with Keto 500 harvesting head and Caterpillar D4H tracked skidder with ESCO 210 grapple
	4	Coastal BC	Norcar 490 harvester and Norcar 600H forwarder
	5	Alberta	Timberjack 608 feller-buncher with 762B harvesting head, Rottne single-grip harvester and Rottne forwarder
	6	Washington, USA	Timberjack 1270 harvester and Timberjack 1210B forwarder
	7	Washington, USA	Bell TH 120 tracked harvester and Bell T12B forwarder
	8	Washington, USA	Komatsu PC 128UU tracked thinning harvester and Timberjack 230A forwarder
	9	Washington, USA	Valmet 500T harvester and Valmet 546 forwarder
	10	Northern Interior BC	Valmet 546H harvester
	11	Northern Interior BC	John Deere 290D excavator with HTH 14 Pan harvesting head and Kubota M8580 tractor with an Enviroquip B-Line 9000 forwarding trailer
	12	Northern Coastal BC	Valmet 546H harvester and Valmet 546H forwarder

Harvesting System	Item	Location	Equipment
I-C Cut-to-Length Cont.	13	Alberta	Bell TH 120 tracked harvester and Bell T12B forwarder
	14	Alberta	Valmet 901C Harvester
	15	Southern Interior BC	Komatsu PC 90 excavator with Hahn HSG 140 harvesting head and F4-Dion forwarder
I-D Cable	1	Coastal BC	Hand falling, Kubota KH191 excavator, Nokka forwarding trailer and loader and free-standing bunks
	2	Coastal BC	Hand falling and Washington 78-40 swing yarder
	3	Coastal BC	Hand falling and Igland Jones Trailer Alp yarder
	4	Chile	Hand falling and Urus I-Uni yarder with Stuefer HSK 2000 carriage
	5	Washington, USA	Hand falling and Diamond D210 swing yarder
	6	Lower Mainland of BC	Hand falling, 1980 Washington 78SL swing yarder, Maki Mini-Mak II carriage and Kobelco 200LC loader
	7	Washington, USA	Dahlvester harvester, ThinLine monocable system and John Deere 70D hydraulic loader
	8	Washington, USA	Hand falling, trailer mounted Koller K-300 yarder with Koller SKA-1 carriage, Caterpillar 235 and Linkbelt LS2800 hydraulic loader
	9	Lower Mainland of BC	Hand falling and Timbervmaster 4-drum yarder
	10	Washington, USA	Hand falling, Howe-Line yarder, Maki carriage and Hitachi EX200 hydraulic loader
	11	Southern Coastal BC	Hand falling and Urus I Uni 300 yarder with Stuefer HSK 2000 carriage
	12	Southern Coastal BC	Hand falling, Kubota excavator, Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks
	13	Southern Coastal BC	Hand falling, Farmi JL2/601 winch, Farmi forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks



Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Index

Commercial Thinning - Equipment Index

Equipment	Item	Model
II-A Feller-Bunchers	1	Morbark Wolverine 6300 feller-buncher
II-B Feller-Processors	1	Timberjack 1270 harvester with 762B harvesting head
	2	Timberjack 608 feller-buncher with 762B harvesting head
	3	Valmet 546H harvester with 948 harvesting head
	4	Valmet 500T harvester with 960 harvesting head
	5	Timbco T445 excavator with Keto 500 harvesting head
	6	Norcar 490 harvester
	7	Bell TH 120 tracked harvester with SP 550 harvesting head
	8	Komatsu PC 128UU tracked thinning harvester with HTH 14 Pan harvesting head
	9	Rocan T thinning harvester with Pan 828 harvesting head
	10	Valmet 901C with 942 harvesting head
	11	Komatsu PC 90 with Hahn HSG 140 harvesting head
	12	CombiCat 4.3s with Pan 828 harvesting head
II-C Skidders	1	Iron Horse mini-skidder
	2	ASV Posi Track mini-skidder with Farmi winch
II-D Forwarders	1	Timberjack 910/1010/1210B forwarders
	2	Valmet 546 forwarder
	3	Norcar 600H forwarder
	4	Rottne forwarder
	5	Bell T12B forwarder
	6	Farmi 9000 forwarding trailer
	7	Enviroquip B-Line 9000 forwarding trailer
	8	Nokka 36 forwarding trailer
	9	Timbco TF815 forwarder
	10	F4-Dion forwarder
II-E Yarders	1	Kubota KH 191 excavator with tower
	2	Koller K300
	3	Timbermaster
	4	Urus I-Uni
	5	Howe-Line
	6	Washington 78-40/78SL

Equipment	Item	Model
II-E Yarders Cont.	7	Farmi JL2/601 winch with extension
	8	Igland Jones Trailer Alp
	9	Komatsu excavator with tower
II-F Other	1	Free-standing bunks
	2	Wood-Mizer portable sawmill
	3	Micromill SLP 1500 small log processor
	4	Nokka 400 tractor-mounted processor



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #14

Region

Alberta

Author

Janet Mitchell, RPF

Date

March 1998

Source

FERIC field visit in September 1997

Contractor

SISU Logging USA, Gladstone, MI

Equipment

- Valmet 901C harvester (Figures 1 and 2)

Location

Millar Western Industries Ltd., near Whitecourt, AB

Site and stand

- 40-year-old lodgepole pine/white spruce stand
- preharvest 1280 trees/ha, average dbh of 14.1 cm, average 21.6 m²/ha, volume was 122.3 m³/ha
- flat to gentle slopes (0 to 5%)
- loam to sandy loam
- few obstacles to machine travel

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- trails were to be 20 - 25 m apart with 1 ghost trail between

Operating procedure

- operator was brought from Sweden to demonstrate the equipment which was brought from Maine
- operator had only been in Canada for 1 week and had spent much of his time remounting the hoses in the boom, which had been mounted wrong
- when FERIC was on site, it was the operator's second day and he was still cutting trails

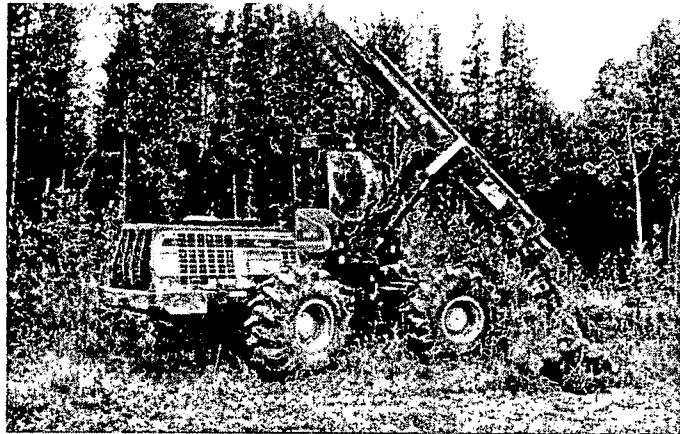


Figure 1. Valmet 901C harvester.

Equipment description and specifications

See Table 1. Additionally,

- 4-wheel drive, articulated harvester
- on-board computer records stems cut, average diameters and lengths and volumes by species
- self-leveling cab with 315° rotation
- Cranab 998 telescopic boom
- Valmet 942 harvesting head

Production

The harvester thinned for a one-month operational trial. The estimated production of the harvester for this trial period, is approximately 7.49 m³/hour or 75 merchantable trees/hour (Source: Millar Western Industries Ltd.). The residual stand had 725 trees/ha and had low damage levels.



Figure 2. Valmet 942 harvesting head.

Table 1. Valmet 901C Harvester Specifications

Valmet 901C harvester	
Engine power (kW)	110
Engine	Cummins Elite 6BT 5.9 L turbo diesel
Power transmission	hydrostatic
Head capacity (cm)	42.0
Width (m)	2.7
Weight (kg)	12 000
Length (m)	6.6
Height (m)	3.7
Crane reach (m)	9.5
Turning radius (m)	5.9
Ground clearance (m)	0.57

Equipment suppliers

Valmet equipment is manufactured by SISU Logging USA, Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 Tel.: 906-428-4800 Toll free: 1-888-CTL-SISU Fax: 906-428-3922.

In Canada, Valmet equipment is available through Fanning Ltd., for example, Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

Approximate (1997) price of the Valmet 901C harvester is \$500 000.

References

Makkonen, Ismo. 1990. *Valmet 901 Single-grip Harvester*. FERIC, Point Claire. Field Note No. Processing-13. 2p.

For further information, contact:

Steven MacPhail, Millar Western Industries Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 403-778-2221 Fax: 403-778-4631.

SISU Logging USA, Inc., Division of SISU North America, Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 Tel.: 906-428-4800 Toll free: 1-888-CTL-SISU Fax: 906-428-3922.

Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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Gladstone, MI 49837-0401 Tel.: 906-428-4800
Toll free: 1-888-CTL-SISU Fax: 906-428-3922.

Finning Ltd., 20150 10 Langley By-Pass, Langley,
BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-
0374.

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BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #10
Model: Valmet 901C

References

- Compendium article Cut-to-Length #14
- FERIC Field Note Processing-13

Illustrations

- Valmet 901C harvester (Figures 1 and 2)

Location

Whitecourt, AB

Company and Contractor

Millar Western Industries, Whitecourt, AB
SISU Logging USA, Gladstone, MI

Equipment specifications

See Table 1. Additionally,

- 4-wheel drive, articulated harvester
- available in 6-wheel drive
- on-board computer records stems cut, average diameters and lengths and volumes by species
- self-leveling cab with 315° rotation
- very good visibility
- cab moves with the harvesting head
- Cranab 998 telescopic boom
- Valmet 942 harvesting head

Table 1. Valmet 901C Harvester Specifications

Valmet 901C harvester	
Engine power (kW)	110
Engine	Cummins Elite 6BT 5.9 L turbo diesel hydrostatic
Power transmission	
Head capacity (cm)	42.0
Approx. weight (kg)	12 000
Length (m)	6.6
Width (m)	2.7
Height (m)	3.7
Crane reach (m)	9.5
Turning radius (m)	5.9
Ground clearance (m)	0.57

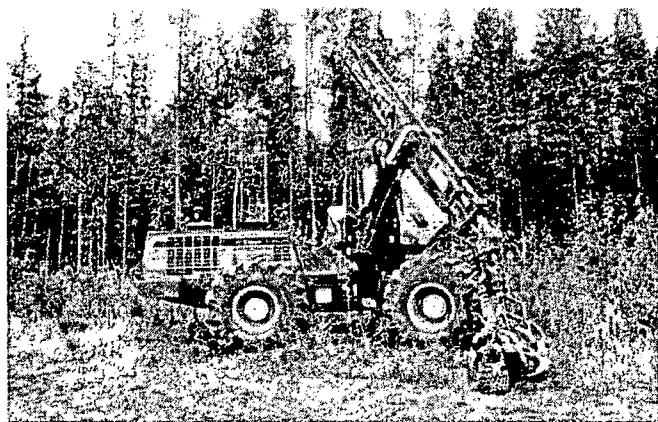


Figure 1. Valmet 901C harvester.

Manufacturer

Valmet equipment is manufactured by SISU Logging USA, Inc., 103 North 12th Street, PO Box 401, Gladstone, MI 49837-0401 Tel.: 906-428-4800 Toll free: 1-888-CTL-SISU Fax: 906-428-3922.

Equipment distributors

Valmet equipment is available through Fanning Ltd., for example, Fanning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

Approximate (1998) price of the Valmet 901C is \$500 000.



Figure 2. Valmet 942 harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cut-to-Length
Item: #15**

Region

Interior British Columbia

Author

Janet Mitchell, RPF

Date

March 1998

Source

FERIC visit to field demonstration

Contractor

G. Berube Enterprises Ltd., Jaffray, BC

Equipment

- Komatsu PC 90 excavator (Figure 1)
- Hahn HSG 140 single-grip harvesting head
- F4-Dion forwarder (Figures 2 and 3)

Location

Part Cuts '97 Equipment Demonstration near Cranbrook, BC.

Site and stand

- 90-year-old lodgepole pine stand
- preharvest 700 - 1400 trees/ha, 230 - 270 m³/ha, average dbh of 18 cm
- flat to gentle slopes (0 - 5%)
- coarse-textured well drained soil
- little understory vegetation or slash

Prescription

- for demonstration purposes
- remove stems to leave 5 m by 5 m spacing

Equipment description and specifications

See Tables 1 and 2. Additionally,

- excavator and forwarder are narrow
- excavator has economical fuel consumption 90 L/day (20 gallons/day)
- forwarder travels same speed forward and reverse
- forwarder can handle steep ground (65-80% slope)
- contractor designed a trailer for the F4-Dion forwarder to decrease ground pressure from 41 to

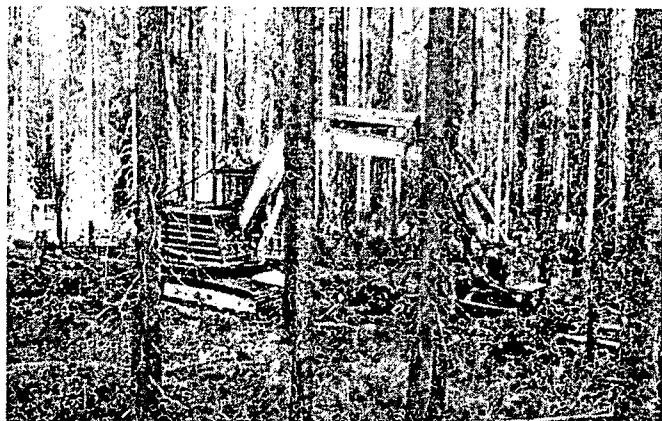


Figure 1. Komatsu PC 90 excavator with Hahn HSG 140 harvesting head.

31 kPa (6.0 to 4.5 psi)

- forwarder has clambunk for forwarding stems up to 9.0 m in length
- can switch between clambunk, trailer and forwarder configurations easily (5-10 min.)

Production

The estimated production of the harvester and forwarder in this operation, is 40 m³/day for a 2-person crew (Source: Jack Berube).

Equipment suppliers

Komatsu equipment is manufactured by Komatsu Canada, 1725 B Sismet Rd., Missisauga, ON L4W 1P9 Tel.: 905-625-6292 Fax: 905-625-3036.



Figure 2. F4-Dion forwarder.

Table 1. Komatsu PC 90 Excavator with Hahn 140 Harvesting Head Specifications

	Komatsu excavator	Hahn harvesting head
Engine power (kW)	48	n.a.
Power transmission	hydrostatic	n.a.
Head capacity (cm)	n.a.	33.0
Width (m)	2.30	0.98
Overall length (m)	6.45*	1.17
Height (m)	2.60	1.56
Weight (kg)	8 400	840
Boom reach (m)	5.40	n.a.
Ground clearance (m)	0.40	n.a.

*with boom and head

Komatsu equipment is available through Terratech Equipment Ltd., for example, Terratech Equipment Ltd., Site 16-17, SS 3, 1903 Theatre Rd., Cranbrook, BC V1C 6H3 Tel.: 250-489-1715 Fax: 250-489-1775.

Hahn harvesting heads are available through Hahn Machinery, Inc., PO Box 220, Two Harbors, MN 55616 Tel.: 218-834-2156 Fax: 218-834-5640.

Table 2. F4-Dion Forwarder Specifications

	F4-Dion forwarder
Engine power (kW)	60
Power transmission	4-speed 4-cylinder diesel Deutz
Carrying capacity (kg)	4 500
Width (m)	1.7
Length (m)	8.0
Height (m)	2.0
Weight (m)	4 227
Crane reach (m)	4.0
Ground clearance (m)	0.30
Ground pressure (psi)* with trailer	6.0 4.5

*calculated with a 10 000 lb. payload (Source: Jack Berube)



Figure 3. F4-Dion forwarder, note trailer.

F4-Dion forwarders are manufactured by A. Vohl and Sons Ltd., St. Mard des Carrières, PO Box 28, Portneuf County, Quebec G0A 4B0 Tel.: 418-268-3527.

F4-Dion forwarders are available through Entreprises F4-Dion Inc. 195 Highway #2, St. Augustin, Portneuf County, Quebec G3A 1W3 Tel.: 418-878-2115.

Approximate (1995) price of the Komatsu PC 90 excavator with the Hahn HSG 140 single-grip harvesting head and all the guarding is \$205 000. F4-Dion forwarders are approximately \$107 000.

For further information, contact:

Jack Berube, G. Berube Enterprises Ltd., Box 179, Jaffray, BC V0B 1T0 Tel.: 250-429-3293 Fax: 250-429-3937.

Entreprises F4-Dion Inc. 195 Highway #2, St. Augustin, Portneuf County, Quebec G3A 1W3 Tel.: 418-878-2115.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #11 Model: Komatsu PC 90

References

- Compendium article Cut-to-Length #15

Illustrations

- Komatsu PC 90 excavator with Hahn HSG 140 single-grip harvesting head (Figure 1)

Location

Part Cuts '97 Equipment Demonstration near Cranbrook, BC

Contractor

G. Berube Enterprises Ltd., Jaffray, BC

Equipment specifications

See Table 1. Additionally,

- excavator is narrow (2.6 m)
- economical fuel consumption

Manufacturer

Komatsu equipment is manufactured by Komatsu Canada, 1725 B Sismet Rd. Missisauga, ON L4W 1P9 Tel.: 905-625-6292 Fax: 905-625-3036.

Equipment distributors

Komatsu equipment is available through Terratech Equipment Ltd., for example, Terratech Equipment Ltd., Site 16-17, SS 3, 1903 Theatre Rd., Cranbrook, BC V1C

Table 1. Komatsu PC 90 Excavator with Hahn 140 Harvesting Head Specifications

	Komatsu excavator	Hahn harvesting head
Engine power (kW)	48	n.a.
Power transmission	hydrostatic	n.a.
Head capacity (cm)	n.a.	33.0
Width (m)	2.30	0.98
Overall length (m)	6.45	1.17
Height (m)	2.60	1.56
Weight (kg)	8 400	840
Boom reach (m)	5.40	n.a.
Ground clearance (m)	0.40	n.a.



Figure 1. Komatsu PC 90 excavator.

6H3 Tel.: 250-489-1715 Fax: 250-489-1775.

Hahn harvesting heads are available through Hahn Machinery, Inc., PO Box 220, Two Harbors, MN 55616 Tel.: 218-834-2156 Fax: 218-834-5640.

Approximate (1995) price of the Komatsu PC 90 excavator with the Hahn HSG 140 single-grip harvesting head with all the guarding is \$205 000.

For further information, contact:

Jack Berube, G. Berube Enterprises Ltd., Box 179, Jaffray, BC V0B 1T0 Tel.: 250-429-3293 Fax: 250-429-3937.

Terratech Equipment Ltd., Site 16-17, SS 3, 1903 Theatre Rd., Cranbrook, BC V1C 6H3 Tel.: 250-489-1715 Fax: 250-489-1775.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #12 Model: CombiCat 4.3s

Illustrations

- CombiCat 4.3s harvester (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997

Equipment specifications

See Table 1. Additionally,

- 1.6 m-wide excavator-based harvester can manoeuvre between trees at 2.0-2.5 m spacing
- fully rotating cab
- crane can rotate 130° in front of the cab
- boom swivels independently from the carrier
- Pan 828 harvesting head
- maximum felling diameter is 42-cm
- can replace harvesting head with site preparation equipment, cleaning heads or planting machine

Manufacturer

The CombiCat is manufactured by Storebro Forestry AB, Box 20, S-590 83, Storebro, Sweden Tel.: 46-0492-195 00 Fax: 46-0492-303 00.

Equipment Distributors

In Canada, the CombiCat 4.3s harvester is available through the Silvana Import Trading Inc., Suite 304,

Table 1. CombiCat 4.3s Harvester Specifications



Figure 1. CombiCat 4.3s harvester.

4269 Saint Catherine St. W, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3525 Fax: 514-939-3863.

Approximate (1997) price of the CombiCat 4.3s harvester is \$340 000.

For further information, contact:

Dick Johnsson, Silvana Import Trading Inc., Suite 304, 4269 Saint Catherine St. W, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3863 Fax: 514-939-3863.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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	CombiCat 4.3s harvester
Engine power (kW)	43 - 52
Engine	Kubota F2803
Head capacity (cm)	42
Approx. weight (tonnes)	5.2
Length (m)	5.0
Height (m)	2.7
Width (m)	1.6
Crane movement (degrees)	130
Ground clearance (m)	0.35
with rubber track	0.40



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #10
Model: F4-Dion

References

Compendium article Operations Cut-to-Length #15

Illustration

- F4-Dion Forwarder (Figures 1 and 2)

Location

Part Cuts '97 Equipment Demonstration near Cranbrook, BC

Contractor

G. Berube Enterprises Ltd., Jaffray, BC

Equipment specifications

See Table 1. Additionally,

- narrow
- tracked articulated forwarder
- travels same speed forward and reverse
- has two opposite seats for the operator
- can handle steep ground (65 - 80% slope)
- contractor designed a trailer for the F4-Dion forwarder to decrease ground pressure from 41 to 31 kPa (6.0 to 4.5 psi)
- forwarder has a clambunk for forwarding stems up

Table 1. F4-Dion Forwarder Specifications

F4-Dion forwarder	
Engine power (kW)	60
Power transmission	4 speed 4-cylinder diesel Deutz
Carrying Capacity (kg)	4 500
Width (m)	1.70
Length (m)	8.0
Height (m)	2.0
Weight (kg)	4 200
Crane reach (m)	4.0
Turning radius (m)	7.6
Ground clearance (m)	0.30
Ground pressure (kPa)* with trailer	41.0 31.0

*Calculated with a 10 000 lb. payload (Source: Jack Berube).

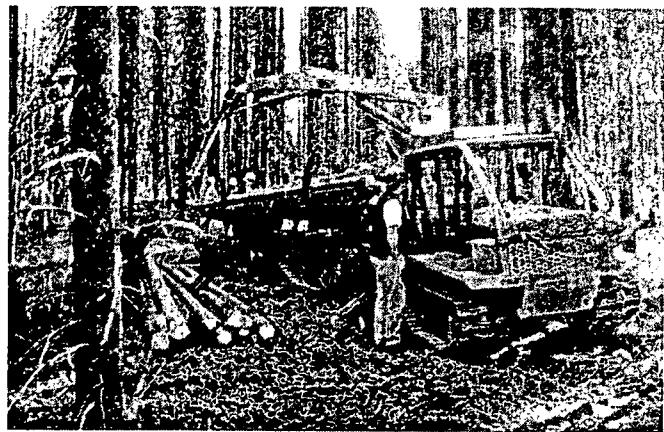


Figure 1. F4-Dion forwarder.

- to 9.0 m in length
- can switch between clambunk, trailer and forwarder configuration easily (5-10 min.)

Manufacturer

The F4-Dion forwarder is manufactured by A. Vohl and Sons Ltd., St. Mard des Carrières, PO Box 28, Portneuf County, Quebec G0A 4B0 Tel.: 418-268-3527.

Equipment distributors

F4-Dion forwarder is available through Entreprises F4-Dion Inc. 195 Highway #2, St. Augustin, Portneuf County, Quebec G3A 1W3 Tel.: 418-878-2115.

Approximate (1995) price of the F4-Dion forwarder is \$107 000.



Figure 2. F4-Dion forwarder, note trailer.

For further information, contact:

Jack Berube, G. Berube Enterprises Ltd., Box 179,
Jaffray, BC V0B 1T0 Tel.: 250-429-3293 Fax: 250-
429-3937.

Entreprises F4-Dion Inc. 195 Highway #2, St.
Augustin, Portneuf County, Quebec G3A 1W3 Tel.:
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #1
Model: Free-standing bunks

References

- Compendium articles Operations Cable #1, #12 and #13

Illustration

Free-standing bunks (Figures 1-3)

Location

Crown land in the Sayward Forest and private land, near Campbell River, BC.

Contractors

Enviro-Harvesting Inc., now Enviro Techniques
Timber Harvesting, Courtenay, BC
R. Caouette Trucking, Courtenay, BC

Equipment specifications

See Table 1. Additionally,

- designed and manufactured to be loaded directly by the forwarder at the side of the road
- decking phase is eliminated
- different set of bunks can be used for each sort
- once full, the bunks are transported by a roll-on truck (Figure 3)

Manufacturer

The free-standing bunks were designed by Bob Woods and manufactured by Versatile Industries, Courtenay, BC.

Equipment distributors

Bunks are available through Versatile Industries Ltd., 1109 Comox Road, Courtenay, BC V9N 3P7 Tel.: 250-334-2201 Fax: 250-334-9338.

Table 1. Free-Standing Bunks Specifications

Free-standing bunks	
Length (m)	6.0
Height to top of stakes (m)	2.4
Width (m)	2.6
Load capacity (m^3)	13.0



Figure 1. Empty free-standing bunks being unloaded.

The approximate (1997) price of the free-standing bunks is \$5 000.

For further information, contact:

Neil Blackburn, Enviro Techniques Timber Harvesting, RR 4, Site 465, C-10, Courtenay, BC V9N 7J3 Tel.: 250-338-9428.

Roy Hagg, R. Caouette Trucking, 306-1355 Cumberland Rd., Courtenay, BC V9N 2G1 Tel.: 250-338-1236.

Richard DeLuca, Enviroquip Sales Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-897-9050 Toll free: 1-800-496-6656 Fax: 250-334-9338.

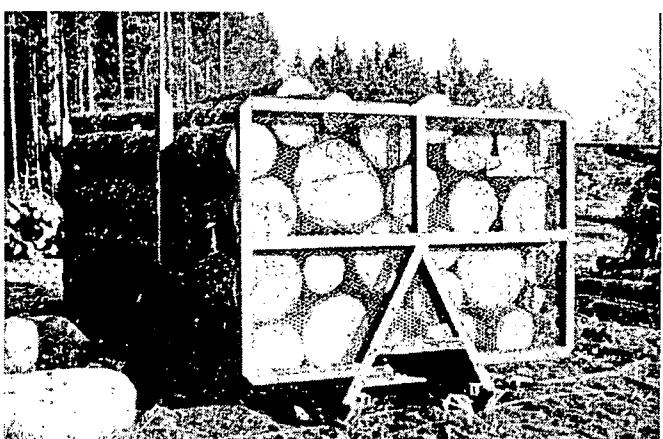


Figure 2. Full free-standing bunks.

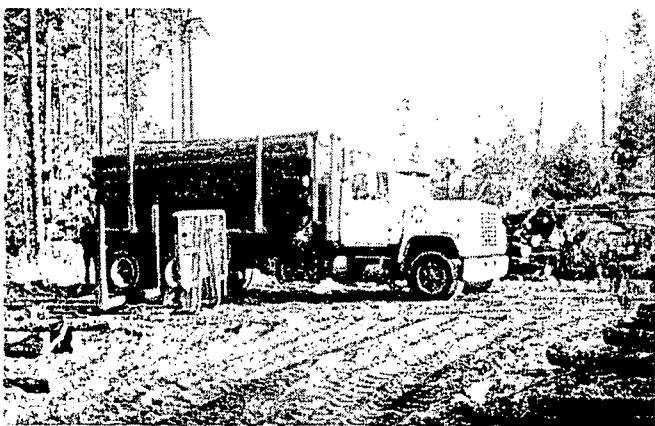


Figure 3. Bunks on roll-on truck.

Bill Hughes, BC Ministry of Forests, Campbell River Forest District, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9344 Fax: 250-286-9490.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #2
Model: Wood-Mizer

Illustrations

- Wood-Mizer sawmill (Figures 1 and 2)

Locations

The Wood-Mizer portable sawmill was demonstrated as part of Part Cuts '97 Equipment Demonstration in Cranbrook, BC. It was also viewed at the Pacific Logging Congress Logging Show in Bellevue, WA.

Contractors

Ophir Creek Milling Inc., Rossland, BC
Wood-Mizer Canada West, Salmon Arm, BC
Wood-Mizer Products, Wood Village, OR

Equipment specifications

See Table 1. Additionally,

- three basic sawmills, but with different configurations (bed length, power plant size, and power assistance) there are 25 different models available
- 3.2 cm-wide bandsaw blade
- portable and easy to relocate, mounted on a trailer and pulled by a pickup truck

Table 1. Wood-Mizer Sawmill Specifications



Figure 1. Wood-Mizer sawmill.

- options include electric feed system, bed extensions, remote operator station, manual winch and operator seat
- requires clean logs
- can produce up to 3000 board feet per day
- suitable for private landowner or small-scale salvage operation

Manufacturer

Wood-Mizer sawmills are manufactured by Wood-

Wood-Mizer sawmill *

	LT 25	LT 40	LT 40 Hydraulic
Length (m)	6.3	7.7	7.7
Width (m)	2.0	2.0	2.0
Height (m)	2.3	2.3	2.3
Weight (kg)			
with trailer	1140	1207	1629
Cutting capacity			
max. length, (m)	5.1	6.4	6.4
max. diameter (cm)	81	91	91
Power (kW), fuel source	8.2 - 11.2 gasoline	13.4 - 17.9 gasoline	17.9 gasoline
Log turner	manual	29.8 diesel manual	29.8 diesel hydraulic

* Only three of the models are listed.

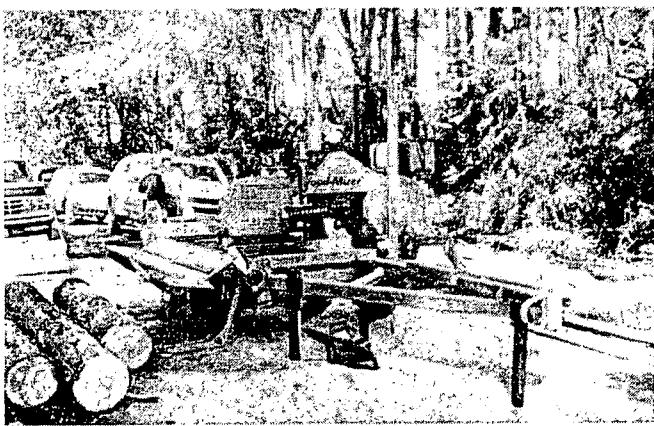


Figure 2. Wood-Mizer LT 40 portable hydraulic sawmill.

Mizer Canada West, 4770 46th Avenue SE, Salmon Arm, BC V1E 4M3 Tel.: 250-833-1944 Fax: 250-833-1945.

Equipment Distributors

In Western Canada, Wood-Mizer sawmills are available through Wood-Mizer Canada West, 4770 46th Avenue SE, Salmon Arm, BC V1E 4M3 Tel.: 250-833-1944 Fax: 250-833-1945.

In Oregon, Wood-Mizer sawmills are available through Wood-Mizer Products, 24435 NE Sandy Blvd., Wood Village, OR 97060 Tel.: 503-661-1939 Fax: 503-667-2961.

Approximate (1997) price of the Wood-Mizer sawmills are C\$16 000 - 40 000 depending on the configuration.

For further information, contact:

Calan Strom, Wood-Mizer Canada West, 4770 46th Avenue SE, Salmon Arm, BC V1E 4M3 Tel.: 250-833-1944 Fax: 250-833-1945.

Louis Gauthier, Ophir Creek Milling Inc., Box 1778, Rossland, BC V0G 1Y0 Tel.: 250-362-9090 Fax: 250-362-7375.

Wood-Mizer Products, 24435 NE Sandy Blvd., Wood Village, OR 97060 Tel.: 503-661-1939 Fax: 503-667-2961.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #3
Model: MicroMill SLP 1500

Illustrations

- MicroMill SLP 1500 sawmill (Figures 1 and 2)

Locations

The MicroMill portable sawmill was demonstrated as part of Part Cuts '97 Equipment Demonstration in Cranbrook, BC.

Contractors

MicroMill Mills Systems, New Westminster, BC

Equipment specifications

See Table 1. Additionally,

- original mill was called the Economizer, updated version is called the MicroMill SLP 1500, SLP 2500, and SLP 5000 (small log processor)
- SLP 1500 is mounted on a 6.0 m trailer
- trailer-model can be pulled by a 1-ton heavy-duty pickup truck
- SLP 2500 and SLP 5000 are permanently installed in a 20-foot shipping container or custom designed for interior installations
- optional 1 or combination of up to 3 horizontal splitting saws to process cants in one pass

Table 1. MicroMill SLP Sawmill Specifications.

MicroMill SLP 1500 sawmill

Engine power (kW)	119
Engine	Perkins turbo-charged diesel
Length (m)	6.40
Width (m)	2.44
Height (m)	2.08
Weight (kg)	5 000
Cutting capacity (cm)	
Min. log diameter	7.5
Max. log diameter	25.0
Max. log length (m)	3.65
Min. cant size	5 x 5
Max. cant size	15 x 15

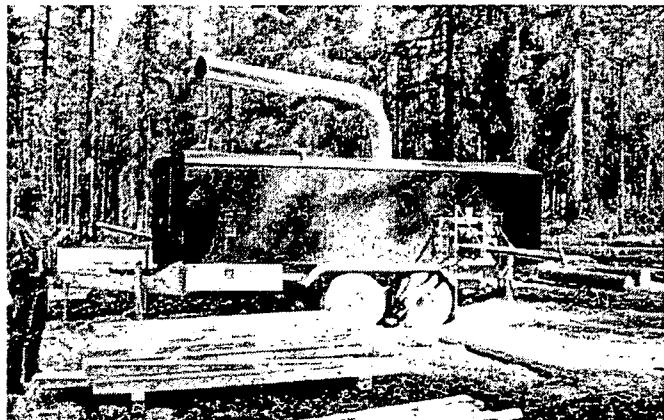


Figure 1. MicroMill SLP 1500 sawmill.

- suitable for private landowner or small-scale salvage operation
- can produce 1500, 2500 or 5000 board feet per hour, depending on model
- the MicroMill SLP 2500 is equipped with a 149 kW engine and can cut cants up to a maximum of 20 x 20 cm
- the MicroMill SLP 5000 is equipped with a 187 kW engine

Manufacturer

MicroMill sawmills are manufactured by Canadian Mill Systems, Box 255, 15804 Industrial Avenue, Summerland, BC V0H 1Z0 Tel.: 250-494-9238 Fax: 250-494-7236.

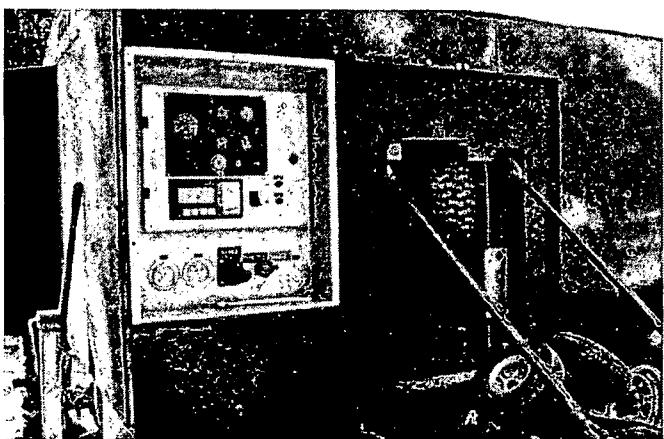


Figure 2. Control panel of the SLP 1500.

Equipment Distributors

In Western Canada, MicroMill sawmills are available through Canadian Mill Systems, 15804 Industrial Avenue, Summerland, BC V0H 1Z0 Tel.: 250-494-9238.

Approximate (1998) prices of the SLP 1500 and 2500 sawmills are \$179 000 and \$213 500 respectively. The MicroMill SLP 5000 is approximately \$274 000.

For further information, contact:

Don Causton, Canadian Mills Systems, 15804 Industrial Avenue, Summerland, BC V0H 1Z0 Tel.: 250-494-9238.

MicroMill Systems Inc., Box 397, New Westminster, BC V3L 4Y7 Tel.: 604-540-7911.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #4 Model: Nokka 400

References

- Compendium article Operations Cut-and-Skid #4

Location

The Nokka 400 tractor-mounted processor has worked in pre-logging, commercial thinning on Crown land south of Elko, BC. The processor worked in conjunction with a Nokka 3410 boom and grapple, mounted on a Belarus tractor.

Contractor

C&D Contracting, Cranbrook, BC

Equipment specifications

See Table 1. Additionally,

- tractor-mounted processor
- processor consists of dellimbing knives, spiked rollers and a chain saw for bucking and topping
- used in combination with a loader (boom and grapple) or felling head (boom, grapple and felling head)

Manufacturer

The Nokka 400 tractor-mounted processor is manufactured by Nokka-Koneet 40950 Muurame, Finland Tel.: 358-41-731522.

Table 1. Nokka 400 Tractor-mounted Processor Specifications

Nokka 400 tractor-mounted processor	
Engine power required (kW)	40
Hydraulic pump capacity (L/min.)	110
Head capacity (cm)	35.0
Approx. weight (kg)	950
Width (m)	2.13
Crane reach (m)	7.1
Ground clearance (m)	0.35

Equipment distributors

The Nokka 400 processor is available through Forest Harvesting Equipment, 466 Fisher St., New Westminster, BC V3L 3H9 Tel./Fax: 604-524-6469.

Nokka equipment is also available through Hakmet Ltd., PO Box 248, Dorion, Quebec J7V 7J5 Tel.: 514-455-6106.

Approximate (1996) price of the Nokka processor and loader, f.o.b. Vancouver, is \$60 000.

For further information, contact:

Dave Opper, C&D Contracting, Box 627, Cranbrook, BC V1C 4J2 Tel.: 250-489-5955.

Jack MacLeod, Forest Harvesting Equipment, 466 Fisher St., New Westminster, BC V3L 3H9 Tel./Fax: 604-524-6469 .

Gerry George, Planning Supervisor, Crestbrook Forest Industries Ltd., Box 998, Elko, BC V0B 1J0 Tel.: 250-529-7211 Fax: 250-529-7275.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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SR108-6

FOREST ENGINEERING
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OF CANADA
Western Division



INSTITUT CANADIEN
DE RECHERCHES
EN GÉNIE FORESTIER
Division de l'ouest

July, 1998

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108)

The enclosed material comprises the sixth issue of twenty-one, 1-page descriptions of commercial thinning operations. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you did not receive the first five issues, please complete the form below and send it to the address given.

The FRBC funding for the Commercial Thinning Compendium will end soon and FERIC is considering applying for further funding to continue the publication. Please take the time to complete the survey and return it by September 30, 1998, to FERIC at the address below.

The Compendium is funded in 1997/98 by Forest Renewal BC.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink, appearing to read "J. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — (SR-108)

Please return completed form to:

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid
Item: #5

Region

Alberta

Author

Janet Mitchell, RPF

Date

July 1998

Source

FERIC visit to field demonstration

Contractor

Tsuga Forestry Services, Edmonton, AB

Equipment

- hand falling
- Farmi JL 501 skidding winch (Figure 1)
- Valmet 865 tractor with a Farmi MPV 9000 4 wheel drive forwarding trailer with Farmi HK 5266 loader (Figure 2)

Location

Millar Western Forest Products Ltd., near Whitecourt, AB

Site and stand

- Lodgepole pine stand naturally regenerated after fire
- preharvest: 3425 trees/ha, 237 m³/ha, basal area of 36 m²/ha
- flat to gentle slopes

Prescription

- remove approximately 80 m³/ha, 30% by basal area by thinning from below
- leave approximately 1500 trees/ha

Operating procedure

- residual trees and forwarding trails were marked by Millar Western Forest Products Ltd.
- hand faller cut trees, and topped and bucked stems into short logs at the stump

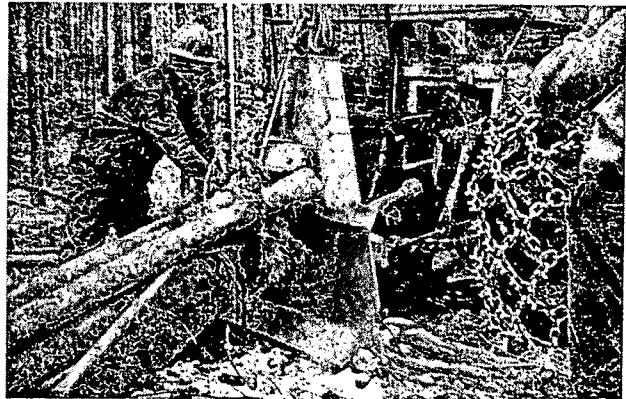


Figure 1. Farmi skidding winch on Valmet tractor.

- logs are skidded to the edge of the forwarding trail by the Farmi winch on the Valmet tractor and decked
- Valmet tractor with forwarding trailer then forwards them to the landing where they were decked for future hauling to the mill
- forwarding trails are 40 m apart, 3-4 m wide and are in a circuit to aid in turning
- maximum forwarding distances are 100 - 150 m

Equipment description and specifications

See Table 1. Additionally,

- Valmet tractor is shared between the Farmi winch for skidding and the Farmi trailer for forwarding
- mechanically very reliable, not good on slopes, but because it carries less load than conventional

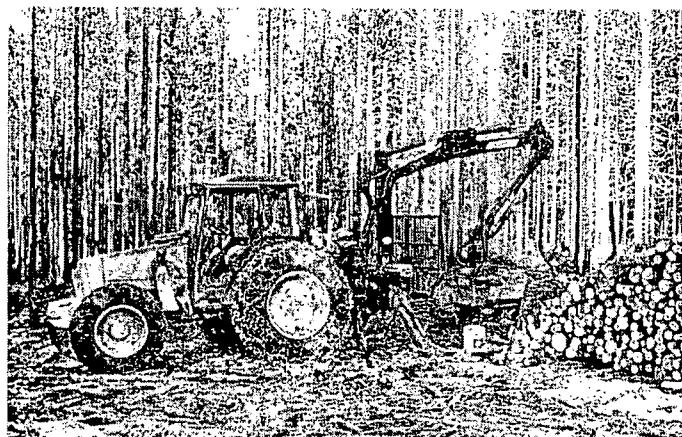


Figure 2. Valmet tractor with Farmi forwarding trailer.

Table 1. Equipment Specifications

	Farmi trailer	Farmi winch
Power required (kW)	52	44.8
Carrying capacity (m ³)	5.5	n.a.
Cable capacity (mm/m)	n.a.	10/130
Approx. weight (kg)	2 690	250
Width (m)	2.32	1.50
Length (m)	6.03	0.42
Height (m)	2.17	1.70
Crane reach (m)	6.6	130
Ground clearance (m)	0.59	n.a.

forwarder, ground pressure is less

- Valmet tractor needs to be modified to increase the safety aspects for use in the forest: replace glass windows with plexiglass or lexar
- Farmi forwarding trailer has a hydraulic drive sprocket between each set of rear wheels, 3 pairs of stakes and Nokia forestry tires
- Farmi HK 5266 loader requires a pump capacity of 55 - 65 L/min and a working pressure of 175 bar
- loader has a 6.6 m reach, telescopic boom and continuous rotator

Production

The three-person crew averaged 20 m³/day. Productivity was dependent on piece size and forwarding distances (Source: Millar Western).

Equipment suppliers

The Valmet tractor is available through Robin Farm Equipment Inc., Box 2880, Westlock, AB Tel.: 403-349-3598 and is approximately \$70 000.

Farmi equipment is manufactured by Orion Corporation Normet, Peltosalmi, Finland and distributed in western Canada by Enviroquip Sales Ltd., Courtenay, BC. The approximate (1998) prices of the trailer and loader are \$30 500 and \$31 500 respectively.

References

Compendium articles Operations Cable #12 and #13

For further information, contact:

Mark Davis, Tsuga Forestry Services, 8830 62 Ave., Edmonton, AB Tel.: 403-469-8215.

Steven MacPhail, Millar Western Forest Products Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 403-778-2221 Fax: 403-778-4631.

Richard DeLuca, Enviroquip Sales Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-897-9050 or Toll free: 1-800-496-6656 Fax: 250-334-9338.

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Region
Alberta

Author
Stephanie Sambo, FIT

Date
July 1998

Source
FERIC study completed in January 1998

Contractor
Double B Logging Ltd., Whitecourt, AB

Equipment

- Timberjack 1270 harvester with 762B single-grip harvesting head (Figure 1)
- Rottne 6 wheel drive harvester with EGS 85 single-grip harvesting head (Figure 2)
- Timberjack 1010 forwarder (Figure 3)

Location

Millar Western Forest Products Ltd., near Swan Hills, AB

Site and stand

- 107-year-old lodgepole pine/black spruce stand
- preharvest: low density - 1156 trees/ha, average dbh of 23.6 cm; high density - 2087 trees/ha, average dbh of 17.5 cm
- for both areas: average basal area was 49.6 m²/ha, and volume was 412 m³/ha
- flat to gentle slopes (0 to 19%)
- clay to sandy clay and clay loam
- few obstacles to machine travel
- 30-40 cm of snow covering the decks made it difficult for forwarders to collect all the logs

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- trails were marked 20 and 25 m apart with 1 ghost trail between those at 25 m spacing

Operating procedure

- initially, crop trees were pre-marked to calibrate the harvester operators, and later, were selected by

Harvesting System: Cut-to-Length
Item: #16

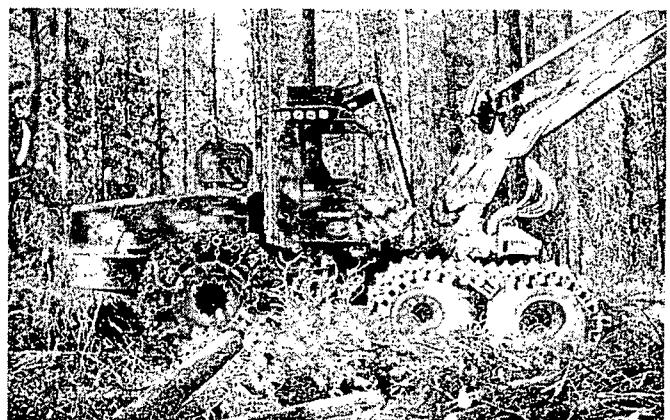


Figure 1. Timberjack 1270 harvester.

the operators and checked by Millar Western harvester could deviate around rough or wet ground and then return to the original trail stems were processed on the trail in front of the harvester to provide a debris mat for machine travel and logs were piled at the side of the trail harvesters tried to pile logs from the ghost trails close to the main trails but in the dense part of the stand it was difficult to move the logs around the residual trees so some logs were left in decks along the ghost trails forwarder followed the main harvesting trails and the ghost trails because logs were decked there forwarding operations were suspended when the ground thawed and resumed when it froze again

Equipment description and specifications

See Table 1. Additionally,



Figure 2. Rottne harvester.

Table 1. Harvesters and Forwarder Specifications

	Rottne harvester	Timberjack harvester	Timberjack forwarder
Engine power (kW)	125	128	82
Power transmission		6-wheel drive hydrostatic	
Head capacity (cm)	50	60	n.a.
Width (m)	3.0	3.1	2.7
Weight (kg)	17 000	16 410	13 300
Crane reach (m)	8.1	8.8	6.8
Ground clearance (m)	0.56	0.60	0.60

- on the Timberjack harvester, log specifications provided by the on-board computer were 5 m with minimum top diameter of 10 cm, however, the operator can override the computer
- on-board computer records number of stems cut

Study Results

The productivity and cost summaries (for both low- and high-density portions of the stand), based on FERIC's costing methods, are summarized in Table 2. The difference between the harvesters' overall productivities was significant, but there was no significant difference in their productivities between ghost and main trails. Similar results were found for the forwarder. Post-treatment stand conditions are listed in Table 3. The soil survey showed low disturbance levels across the stand but there were wet areas with deep wheel ruts. The tree damage survey showed higher levels of tree damage in areas harvested by the Timberjack 1270 operator than the Rottne.

Equipment suppliers

Timberjack equipment is available through Coneco Equipment Inc., 16116-111 Avenue, Edmonton, AB T5M 2S1 Tel.: 403-451-2630

Table 2. Productivity and Cost Summaries

	Rottne harvester	Timberjack harvester	Timberjack forwarder
Productivity (m^3/PMH)			
-Low density	21.1	37.2	
-High density	10.9	15.9	
-Average	13.5	24.0	21
Cost (\$/ m^3)	11.43	6.50	7.13

Table 3. Post-Treatment Stand Conditions

	Timberjack 1270		Rottne	
	low density	high density	low density	high density
Density (trees/ha)	875	1009	800	1181
Dbh (cm)	24.9	19.2	23.7	18.2

Rottne equipment is available through Rocan Forestry BC Ltd., 5339A Hartway Dr., Prince George, BC V2N 4T7 Tel.: 604-962-8244 Fax: 250-962-8892.

Approximate prices of the Timberjack harvester and forwarder are \$611 000 and \$365 000 respectively. The newer versions of the Rottne harvester are larger and more powerful and cost \$570 000.

References

FERIC Technical Note, TN-235.

Compendium article Operations Cut-to-Length #1, #2, #5 and #6.

For further information, contact:

Steven MacPhail, Millar Western Forest Products Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 403-778-2221 Fax: 403-778-4631.

Leo Berube, Double B Logging Ltd., Box 1719, Whitecourt, AB T7S 1P5 Tel.: 403-648-3759.

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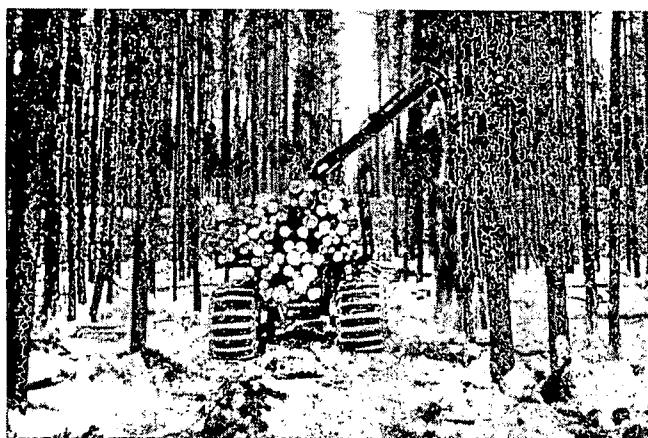


Figure 2. Timberjack 1010 forwarder.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #17

Region

Alberta

Author

Brian Bulley, FIT

Date

July 1998

Source

FERIC study completed in February 1998

Contractor

Kenmatt Logging, Whitecourt, AB

Equipment

- Timberjack 608 feller buncher with a 762B single-grip harvesting head (Figure 1)
- Timberjack 1210 forwarder (Figure 2)

Location

Millar Western Forest Products Ltd., near Swan Hills, AB

Site and stand

- 107-year-old lodgepole pine/spruce stand
- preharvest 2786 trees/ha, average dbh of 14.2 cm, volume of 275 m³/ha
- flat to gentle slopes (0 to 9%)
- approximately 40 cm of snow over frozen ground
- few obstacles to machine travel

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- trails are to be 20 m apart

Operating procedure

- initially crop trees were pre-marked to calibrate the harvester operator, and later, were selected by the operator and checked by Millar Western
- harvesting trails were selected and marked by Millar Western staff
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel

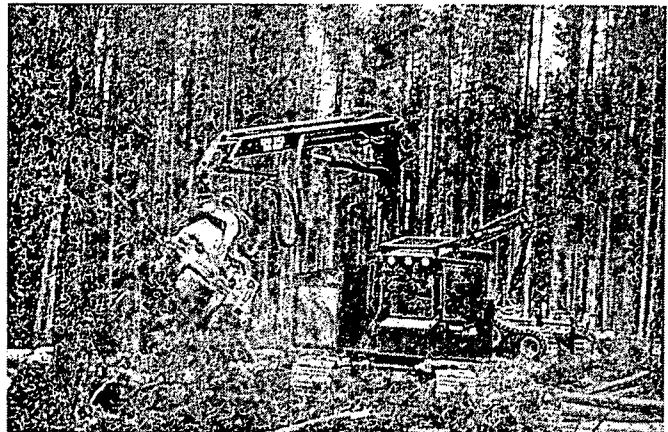


Figure 1. Timberjack 608 feller buncher with a 762B single-grip harvesting head.

- forwarder followed the harvesting trails

Equipment description and specifications

See Table 1. Additionally,

- on the Timberjack harvester, log specifications provided by the on-board computer were 5.03 m, 4.38 m, and 3.79 m lengths for sawlogs, and random lengths for pulplogs
- minimum top and butt diameters were 7 and 11 cm respectively; however, the operator can override the computer

Production

The harvester thinned a 2.23-ha trial area. The estimated production of the harvester for this area, is

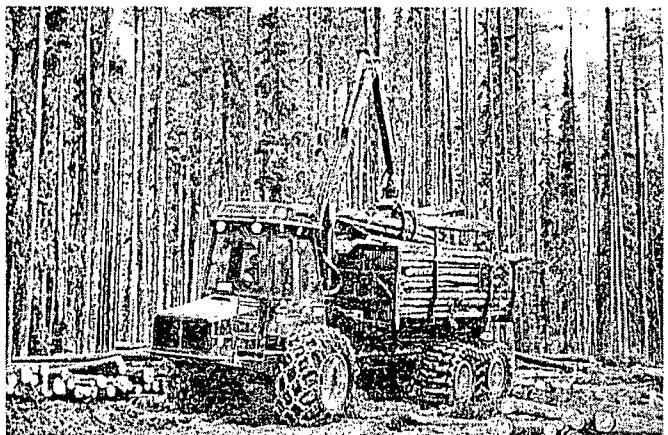


Figure 2. Timberjack 1210 forwarder.

Table 1. Timberjack 608 Feller-Buncher and Timberjack 1210 Forwarder Specifications

	Timberjack 608 feller-buncher	Timberjack 1210 forwarder
Engine power (kW)	125	114
Power transmission	2-speed drive motors	6-wheel drive, hydrostatic
Head capacity (cm)	55-cm diameter	n.a.
Carrying capacity (t)	n.a.	15
Approx. weight (kg)	27 000	15 000
Width (m)	2.9	2.8
Length (m)	4.0	10.2
Height (m)	3.0	3.6
Crane reach (m)	7.0	7.1
Ground clearance (m)	0.50	0.69

approximately 4.43 m³/PMH or 61 merchantable trees/PMH. The residual stand had 1414 trees/ha and low damage levels.

Equipment suppliers

Timberjack equipment is available through Coneco Equipment Inc., 16116 - 111 Avenue, Edmonton, AB T5M 2S1 Tel.: 403-451-2630 Fax: 403-451-2646.

References

Araki, Dennis. 1994. *Thinning Second-Growth with a Timberjack FMG System*. FERIC, Vancouver. Field Note No. Processing-40. 2p.

Hunt, J.A. 1995. *Commercial Thinning of Coastal Second-Growth Forest with a Timberjack FMG Harvester and Forwarder: An Evaluation*. FERIC, Vancouver. Technical Note. TN-235.

Compendium article Operations Cut-to-Length #1, #2, #5, #6 and #16.

For further information, contact:

Steven MacPhail, Millar Western Forest Products Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 403-778-2221 Fax: 403-778-4631.

Ken van Gundy and Matt Curtis, Kenmatt Logging, Box 2134, Whitecourt, AB T7S 1M8 Tel.: 403-778-0278.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #18

Region

Alberta

Author

Brian Bulley, FIT

Date

July 1998

Source

FERIC study completed in March 1998

Contractor

Brinkman & Associates Reforestation Ltd.,
Edmonton, AB

Equipment

- Rocan-T thinning harvester with Pan 828 single-grip harvesting head (Figure 1)
- Rottne 6 wheel drive forwarder (Figure 2)

Location

Blue Ridge Lumber (1981) Ltd., near Whitecourt, AB

Site and stand

- 47-year-old lodgepole pine stand
- preharvest 1320 trees/ha, average dbh of 15.6 cm, volume was 173 m³/ha
- flat topography
- approximately 40 cm of snow over frozen ground
- few obstacles to machine travel

Prescription

- remove small-diameter, suppressed, short stems regardless of species, and trees with scars and forks
- trails were to be 25 m apart with 1 ghost trail between

Operating procedure

- Blue Ridge Lumber and Brinkman initially pre-marked crop trees to calibrate the harvester operator, and later, were selected by the operator
- harvesting trails were selected and marked by staff from Blue Ridge Lumber and Brinkman
- stems were processed on the trail in front of the

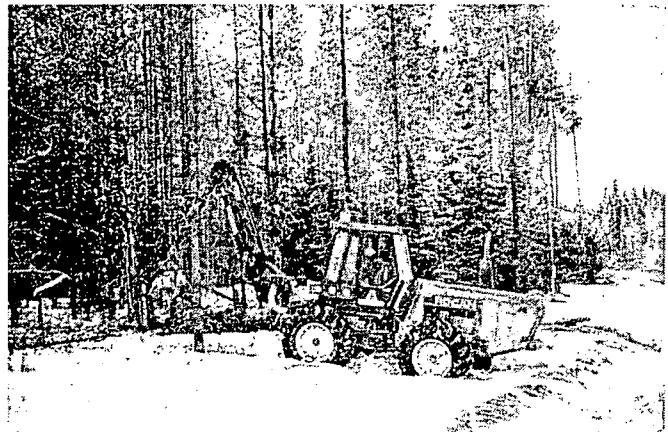


Figure 1. Rocan-T thinning harvester.

- machine to provide a debris mat for machine travel
- forwarder followed the harvesting trails, but did not travel on the ghost trail

Equipment description and specifications

See Table 1. Additionally,

- on the Rocan-T harvester, log specifications provided by the on-board computer were 5.03 m, 4.38 m, and 3.79 m lengths for sawlog, and random lengths for pulplog
- minimum top and butt diameters were 6 and 8 cm respectively; however, the operator can override the computer
- Ford Versatile 9030 tractor chassis
- Mowi 465 loader with parallel boom configuration

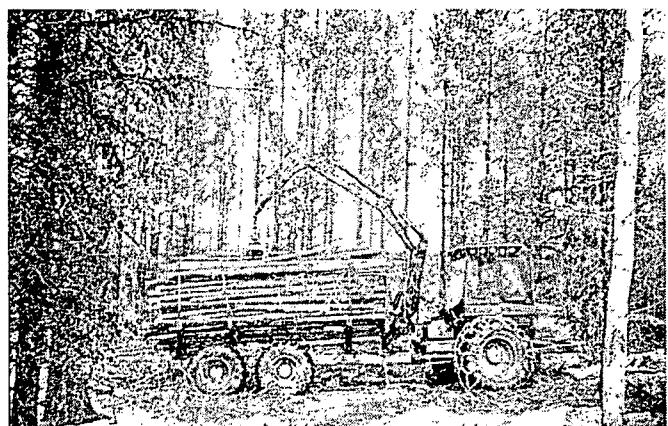


Figure 2. Rottne 6 wheel drive forwarder.

Table 1. Rocan-T Thinning Harvester and Rottne 6 Wheel Drive Forwarder Specifications

	Rocan-T thinning harvester	Rottne 6 wheel drive forwarder
Engine power (kW)	74	125
Power transmission	4-wheel drive, hydrostatic	6-wheel drive, hydrostatic
Head capacity (cm)	41-cm diameter	n.a.
Carrying capacity (t)	n.a.	10
Approx. weight (kg)	6 000	13 700
Width (m)	2.1	2.4
Length (m)	5.1	8.5
Height (m)	3.2	3.5
Crane reach (m)	6.6	6.0
Ground clearance (m)	0.60	0.56

- because of its narrow width, can be used with "ghost trails"

Production

The harvester thinned a 2.42-ha trial area. The estimated production of the harvester for this area is approximately 5.85 m³/PMH or 67 merchantable trees/PMH. The residual stand had 660 trees/ha.

Equipment suppliers

The Rocan-T thinning harvester and Rottne forwarder are available through Rocan Forestry BC Ltd./., 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892 and Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.

The approximate price of the Rocan T thinning harvester is \$330 000. The newer versions of the Rottne forwarder are larger and more powerful and cost approximately \$425 000.

References

Compendium article Operations Cut-to-Length #5, and #16

For further information, contact:

Mark Dewey, Blue Ridge Lumber (1981) Ltd., PO Box 1079, Whitecourt, AB T7S 1P9 Tel.: 403-648-6348 Fax: 403-648-6396.

Diego Dipieri, Brinkman & Associates Reforestation Ltd., PO Box 4065, Edmonton, AB T6E 1V1 Tel./Fax: 403-440-0025.

Brent MacLeod, Rocan Forestry BC Ltd., 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #14

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

July 1998

Source

FERIC visit to field demonstration

Contractor

Enviro-Harvesting Inc., Courtenay, BC

Equipment

- hand falling
- Caterpillar E70 excavator with a collapsible extension on the boom for cable yarding (Figure 1)
- Farmi 9000 kg powered forwarding trailer, Farmi HK 4166 loader and Kubota M9580 tractor (Figure 2)

Location

Crown Land harvested under the BC Ministry of Forest's Small Business Forest Enterprise Program near Campbell River, BC.

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 60-year-old Douglas-fir plantation that had been heavily juvenile spaced and fertilized 15 years ago
- preharvest - 535 trees/ha, average dbh of 27.2 cm

Prescription

- remove approximately 115 m³ /ha, 40% by basal area by thinning from below
- root rot centres are to be clearcut and stumped
- leave approx. 300 trees/ha and understory cedar

Operating procedure

- residual trees were marked by silvicultural contractors for the BC Ministry of Forests
- forwarding trails were marked by the harvesting contractor in conjunction with the BC Ministry of Forests at approximately 80 m apart
- hand faller cut trees, and topped and bucked stems into short logs at the stump

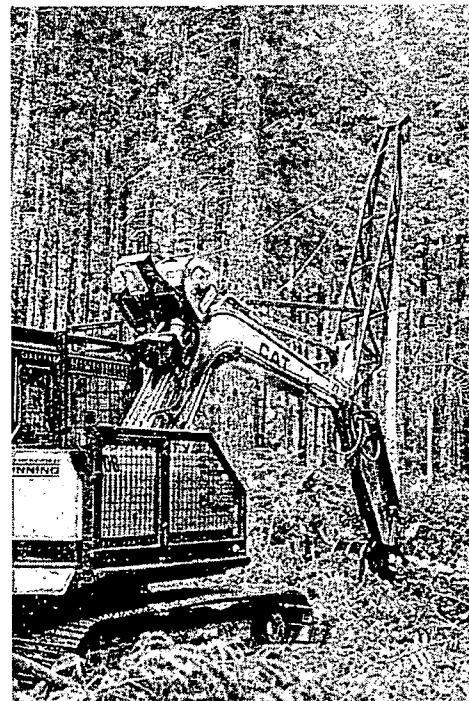


Figure 1. Caterpillar E70 excavator.

- limbs are placed on forwarding trails
- excavator/yarder remains on the forwarding trail and yards from both sides
- the 6 chokers are carried back out for the next turn
- logs are decked at the edge of the forwarding trail until they are forwarded (up to 1000 m) to the landing where they were unloaded directly into free-standing bunks; only small landings are



Figure 2. Farmi forwarding trailer and Kubota tractor.

Table 1. Farmi Forwarder Specifications

Farmi forwarder	
Engine power (kW)	52*
Carrying capacity (kg)	9 000
Approx. weight (kg)	2 690
Width (m)	2.32
Length (m)	6.03
Height (m)	2.17
Max. yarding distance (m)	n.a.
Tower height (m)	n.a.
Ground clearance (m)	0.59

*Power required

required

- once full, the bunks were transported by a roll-on truck to the mill
- contractor uses portable ramps constructed from wooden beams bolted together to cross wet areas (Figure 3)

Equipment description and specifications

See Table 1. Additionally,

- excavator has 42 kW engine power
- a collapsible tower was mounted on the boom of the excavator to give more lift during yarding
- yarder has 2 drum, remote-controlled winch
- yarder is not guylined, and is able to move along the road as needed and can use the bucket to manoeuvre logs at the trail edge
- Farmi forwarding trailer has a hydraulic drive sprocket between each set of rear wheels, 3 pairs of stakes and Nokia forestry tires
- Farmi HK 4166 loader requires a pump capacity of 30-55 L/min. and a working pressure of 195 bar
- loader has 6.6 m reach, telescopic boom and continuous rotator

Production

The three-person crew averaged 50 m³ /day. Productivity was dependent on piece size and forwarding distances (Source: BC Ministry of Forests).

Equipment suppliers

The modified excavator is available through Cougar Pacific Ltd., (Mike Stoldt), 4485 Trans Canada Hwy., Duncan, BC V9L 6L8 Tel.: 250-748-2809 Fax: 250-748-9696 and is approximately \$140 000 complete with winches, highlead kit and guarding.

The Kubota tractor is distributed by Worrall Supply, Courtenay, BC and is approximately \$62 000.

Farmi equipment is distributed in western Canada by Enviroquip Sales Ltd. (Richard DeLuca), 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-897-9050 Toll Free: 1-800-496-6656 Fax: 250-334-9338.

The approximate prices of the trailer and loader are \$30 500 and \$21 500 respectively.

References

Compendium articles Operations Cable #1, #12, and #13

For further information, contact:

The Timber Sale is held by Bob Woods, Enviro-Harvesting Inc., 4962 Cotton Road, Courtenay, BC V9N 5X9 Tel./Fax: 250-334-3554.

The Caterpillar excavator is owned by Allan Lanyon, 8075 Memory Lane, PO Box 219, Merville, BC V0R 2M0 Tel.: 250-337-2115.

The forwarding trailer is owned by Robert Caouette / Roy Hagg, RR#4, Site 425 Comp. 29, Courtenay,, BC V9N 7J3 Tel.: 250-337-8721.

Bill Hughes, BC Ministry of Forests, Campbell River Forest District, 370 S Dogwood St., Campbell River, BC V9W 6Y7 Tel.: 250-286-9439 Fax: 250 286-9490.

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Figure 3. Portable bridge.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cable
Item: #15**

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

July 1998

Source

FERIC visit to field demonstration

Contractor

Mike Prowse, Courtenay, BC

Equipment

- hand falling
- Kubota KH 191 excavator with a custom collapsible extension on the boom for cable yarding, grapple, bucket and radio control winch (Figure 1)
- Case 450 crawler tractor with a forwarding trailer (Figure 2 and 3)

Location

Crown Land harvested under the BC Ministry of Forests' Small Business Forest Enterprise Program near Campbell River, BC.

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 60-year-old plantation
- Douglas-fir, (western hemlock, western red cedar, western white pine)
- preharvest - 575 trees/ha, average dbh of 30 cm

Prescription

- remove approximately 105 m³ /ha, 40% by basal area by thinning from below
- root rot centres are to be clearcut and stumped
- leave approximately 300 trees/ha
- leave understory cedar

Operating procedure

- residual trees were marked by a silvicultural contractor for the BC Ministry of Forests

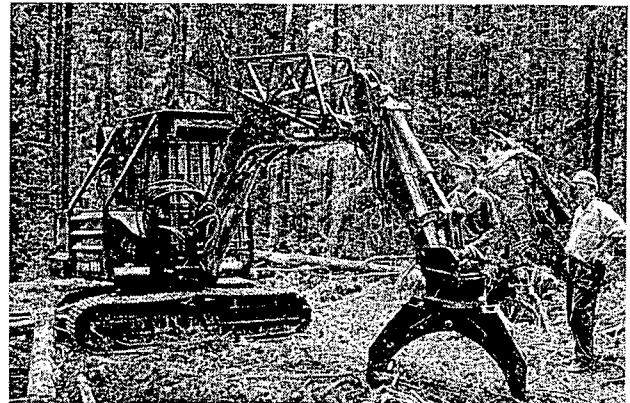


Figure 1. Kubota excavator with a custom collapsible extension on the boom for cable yarding.

- forwarding trails were marked by the harvesting contractor in conjunction with the BC Ministry of Forests and are laid out in a loop
- hand faller cut trees, and topped and bucked stems at the stump
- process stems to tree length
- can handle logs 12 m long
- many forwarding trails are old railway and skidder grades
- excavator stays on the forwarding trail and yards 40 m to either side with radio controlled winch
- chokers are carried back out for the next turn
- logs are decked along the trail until Kubota loads the logs onto the forwarding trailer and the



Figure 2. Case 450 crawler tractor pulling a forwarding trailer.

Table 1. Equipment Specifications

	Kubota excavator	Case crawler
Engine power (kW)	44	43
Approx. weight (kg)	7 000	5171
Width (m)	2.15	2.2
Length (m)	5.9	3.7
Height (m)	2.6	2.5
Max. yarding distance (m)	160	n.a.
Ground clearance (m)	0.35	0.27

forwarder forwards them to the landing

- Case 450 is unhooked from the trailer at the landing and then unloads the logs with the grapple on the Case
- contractor uses portable ramps constructed from wooden beams bolted together to cross wet areas moving them to where they are needed (Figure 4)

Equipment description and specifications

See Table 1. Additionally,

- excavator has a 3-m extension that can be raised hydraulically for yarding
- radio controlled winch is mounted on back of yarder for counter weight
- 160 m line on winch
- yarder is not guylined, and is able to move along the road as needed, and can use the grapple to manoeuvre and load logs at the trail edge
- forwarding trailer has 3 pairs of bunks that can slide to adjust the distance between them
- trailer can carry 10 m³ and 12 m log lengths

Observed production

The ideal crew size is three, one to fall, one to run the forwarder and one to run the yarder. A three-person crew could produce 80 m³/day (Source: Mike Prowse).

Equipment suppliers

The modified excavator and the Case tractor are available through Cougar Pacific Ltd., Duncan, BC. The approximate price of the Kubota excavator complete with winches, highlead kit and guarding is \$140 000.

The Case crawler tractor and trailer are approximately \$15 000 and \$10 000 respectively.

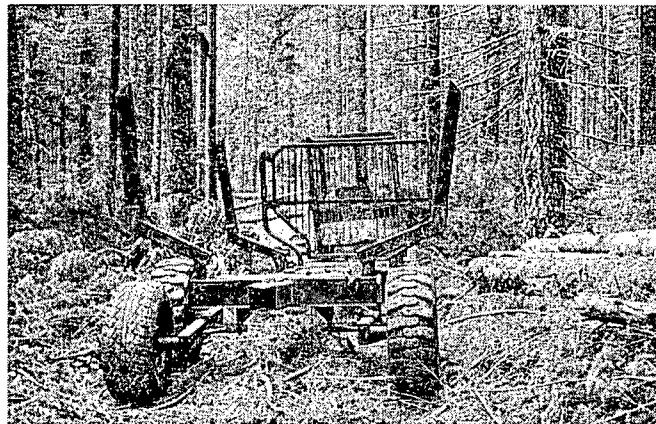


Figure 3. Forwarding trailer.

References

Compendium articles Operations Cable#1, #12 and #13

For further information, contact:

Mike Prowse, PO Box 3532, Courtenay, BC V9N 6Z8 Tel.: 250-338-0296 Cell: 250-334-7227.

Mike Stoldt, Cougar Pacific Ltd., 4485 Trans Canada Hwy., Duncan, BC V9L 4W4 Tel.: 250-748-2809 Fax: 250-748-9696.

Bill Hughes, Commercial Thinning Coordinator, BC Ministry of Forests, Campbell River Forest District, 370 S Dogwood Street, Campbell River, BC V9W 6Y7 Tel.: 250-286-9439 Fax: 250 286-9490.

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Figure 4. Portable bridge.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Buncher #2
Model: John Deere 653E

Illustration

- John Deere 653E feller-buncher (Figure 1)

Location

Pacific Logging Congress Equipment Demonstration,
Bellevue, Washington, September 1997.

Equipment specifications

See Table 1. Additionally,

- purpose built feller-buncher
- upper sky light for increased visibility
- Cameco felling head can handle up to 45.7 cm diameter trees
- can also use a shear, intermittent disk saws, accumulating bar saw, directional bar saw or feller-processor head
- no tail swing over rear idler, 10 cm over the side

Manufacturer

The John Deere 653E feller-buncher is manufactured by John Deere.

Equipment Distributors

John Deere equipment is available through Coast Tractor and Equipment Ltd. 9500 - 190th Street, Surrey, BC V4N 3S2 Tel.: 604-882-8888 Fax: 604-882-0242.

Table 1. John Deere 653E Feller-Buncher Specifications

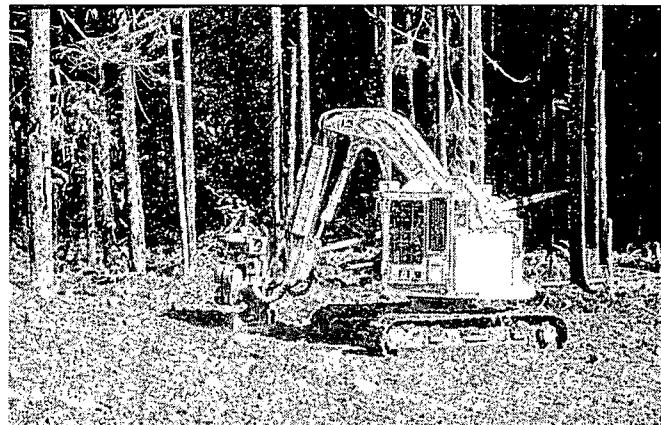


Figure 1. John Deere 653E feller-buncher.

Approximate (1998) price of the John Deere 653E feller-buncher is \$390 000.

For further information, contact:

Coast Tractor and Equipment Ltd. 9500 190th Street, Surrey, BC V4N 3S2 Tel.: 604-882-8888 Fax: 604-882-0242.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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John Deere 653E feller-buncher

Engine power (kW)	116
Engine	John Deere 6068T turbo charged
Power transmission	hydraulic
Approx. weight (kg)	15 807
Length (m)	3.96
Height (m)	3.23
Width (m) *	2.9 - 3.2
Ground clearance (m)	0.56

* Depending on track width.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Buncher #3

Model: Hydro-Ax 321 Tri-Wheel Feller-Buncher

Illustration

- Hydro-Ax 321 tri-wheel feller-buncher (Figure 1)

Equipment specifications

See Tables 1 and 2. Additionally,

- two control system options: single joystick or dual foot pedals
- two hydrostatically-driven wheels are located at the front of the machine, powered independently of each other, and a freewheeling small tire is positioned at the rear
- Lexan windows
- very manoeuverable within the stand because the machine is skid-steered and can turn in its own length
- 3 wheels and light frame make it unstable on slopes or rough ground

Manufacturer

The Hydro-Ax 321 tri-wheel feller-buncher is manufactured by Blount Inc., Forestry and Industrial Equipment Division, PO Box 568 Owatonna, MN Tel.: 507-451-8654.

Distributor

The Hydro-Ax 321 tri-wheel feller-buncher is distributed in BC by Wajax Industries Limited, 1880 Kryczka Pl., Kamloops, BC V1S 1S4 Tel.: 250-374-

Table 1. Hydro-Ax 321 Tri-Wheel Feller-Buncher Specifications

	Hydro-Ax 321 feller-buncher
Engine power (kW)	86
Engine *	Cummins 4BTA 3.9
Power transmission	hydrostatic
Approx. weight (kg)	7 600
Length (m)	5.46
Height (m)	3.02
Width (m)	2.84
Ground clearance (m)	0.51

*Optional John Deere 4045T engine is 90 kW.

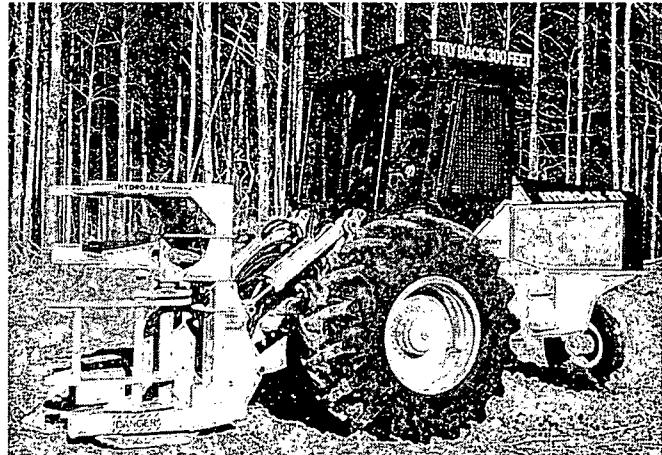


Figure 1. Hydro-Ax 321 feller-buncher.

5055 Fax: 250-374-8775.

For further information, contact:

Wajax Industries Limited, 1880 Kryczka Pl., Kamloops, BC V1S 1S4 Tel.: 250-374-5055 Toll Free: 1-800-819-2529 Fax: 250-374-8775.

Blount Inc., Forestry and Industrial Equipment

Table 2. Attachments for the Hydro-Ax 321 Tri-Wheel Feller-Buncher

	Thinning saw	Bunching shear	Thinning shear
Cutting capacity (cm)			
multicut	50.8		
single cut	35.6 - 43.2	41	38.1
Bunching capacity: (No. of trees @ diam. in cm)	9 @ 15 5 @ 23 2 @ 30		15 @ 2.5 n.a. 3 @ 25
Bunching capacity (m^2)	n.a.	0.23	0.26
Saw disc speed (rpm)	2 100	n.a.	n.a.
Weight (kg)	1 519	1 905	1 519
Height (m)	1.96	1.7	1.67
Width (m)	1.57	2.11	1.35
Depth (m)	1.40	1.12	1.12

Division, PO Box 568 Owatonna, MN Tel.: 507-451-8654.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #13 Model: Steber 865 / 875

Illustrations

- Steber 875 harvester (Figure 1)
- Steber 250 harvesting head (Figure 2)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 8-wheel drive, articulated harvester
- front and rear bogies lift to level harvester on uneven terrain
- Iveco 7450 si 10, turbo engine, 88 kW, hydrostatic
- Mowi 667 or 675 loader with parallel action and side-tilt and Steber 250 harvesting head

Manufacturer and distributor

Steber equipment is manufactured and distributed by Bruks Steber AB, PO Box 46, SE-820 10 Arbrå, Sweden Tel.: 46-278-64-25-50 Fax: 46-278-64-25-51.

For further information, contact:

Bruks Steber AB, PO Box 46, SE-820 10 Arbrå, Sweden Tel.: 46-278-64-25-50 Fax: 46-278-64-25-51.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

Table 1. Steber Harvesters Specifications

	Steber 865 harvester	Steber 875 harvester
Approx. weight (kg)	8700	8750
Length (m)	6.0	6.0
Width (m) *	1.8 - 2.1	1.8 - 2.1
Height (m)	3.3	3.3
Loader	Mowi 667	Mowi 675
Crane reach (m)	6.6	7.5
Turning radius (m)	4.7	4.7
Ground clearance (m)	0.55	0.55

* Depending on the tires.

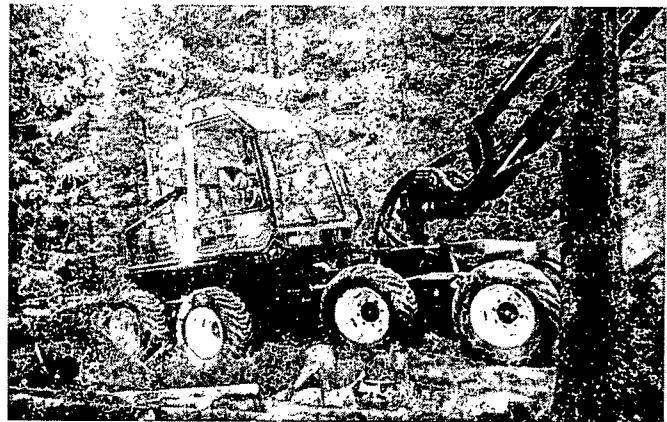


Figure 1. Steber 875 harvester.

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Figure 2. Steber 250 harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #14
Model: Rottne 2002

Illustration

- Rottne 2002 harvester (Figure 1)

Locations

The Rottne 2002 was observed during a field demonstration near Whitecourt, Alberta, October 1996.

Contractor

Rocan Forestry, BC Ltd., Prince George, BC

Equipment specifications

See Table 1. Additionally,

- pendulum wheel arms with level control can be controlled manually, the front independently of each other and the rear in parallel
- automatic self-leveling capability
- ground clearance can range from 20 - 100 cm
- parallel-acting knuckle boom
- GM 828 harvesting head
- Rottne 2002 has been upgraded and is now sold as the Rottne 2004
- base machine can be used for cleaning, scarifying and transportation of equipment

Manufacturer

Rottne equipment is manufactured by Rottne Industri

Table 1. Rottne 2002 Harvester Specifications

	Rottne 2002 harvester
Engine power (kW)	88
Engine	Ford turbo 4-cylinder diesel
Power transmission	hydrostatic
Head capacity (cm)	35 cm diameter
Approx. weight (kg)	6050
Length (m)	8.1
Width (m)	2.1
Crane reach (m)	6.5
Ground clearance (m)	0.2 - 1.0

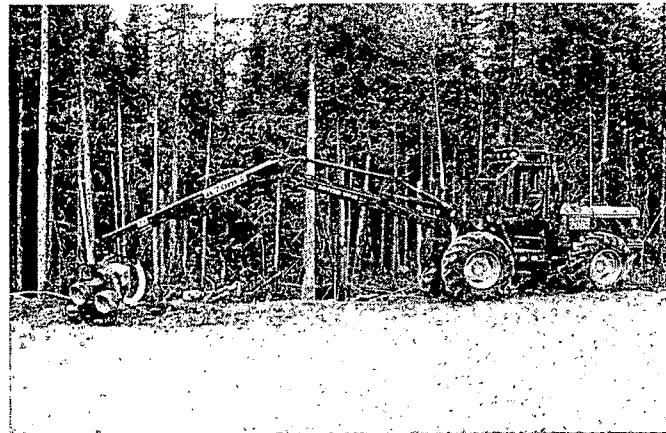


Figure 1. Rottne 2002 harvester.

AB, S-360 40 Rottne, Sweden Tel.: 0470-911-70
Fax: 0470-922-68.

Equipment Distributors

Rottne equipment is available through Rocan Forestry, BC Limited, Box 2940, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

Approximate price of the Rottne 2002 is \$400 000.

For further information, contact:

Brent MacLeod, Rocan Forestry BC Limited, Box 2940 - 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #15 Model: Neuson 5001 / 8002 RD

Illustration

- Neuson 5001 RD harvester (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- tracked harvester
- can work on slopes up to 58%
- very good visibility
- Yanmar turbo-diesel engine
- Pan 828 harvesting head with 0.41-cm maximum cutting diameter

Manufacturer and distributor

Neuson equipment is manufactured and distributed by Neuson, Gaisbergerstrabe 52, A-4030 Linz, Austria, Tel.: 0-732-66-73-31 Fax: 0732-66-01-25.

For further information, contact:

Neuson, Gaisbergerstrabe 52, A-4030 Linz, Austria, Tel.: 0-732-66-73-31 Fax: 0-732-66-01-25.



Figure 1. Neuson 5001 harvester.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Table 1. Neuson 5001 and 8002 RD Harvesters Specifications

	Neuson 5001 RD harvester	Neuson 8002 RD harvester
Engine power (kW)	40	46
Approx. weight (kg)	5 300	7 900
Length (m)	2.8	3.0
Width (m)	1.85	2.15
Height (m)	2.8	2.8
Crane reach (m)	6.0	9.0
Track width (m)	0.40	0.45
Ground clearance (m)	0.34	0.39



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #16 Model: Logman 801

Illustrations

- Logman 801 harvester (Figure 1)
- Keto 150 harvesting head (Figure 2)
- Keto 51 harvesting head (Figure 3)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Tables 1 and 2. Additionally,

- 4-wheel drive, articulated harvester
- very good visibility
- Keto 51, 100, or 150 harvesting head
- self-leveling cab for working on slopes or rough ground

Manufacturer and distributor

Logman equipment is manufactured and distributed by Logman Oy, Yrittajantie 3, Fin - 61300 Kurikka, Finland Tel.: 358-6-4504 801 Fax: 358-6-4504 802.

For further information, contact:

Logman Oy, Yrittajantie 3, Fin - 61300 Kurikka, Finland Tel.: 358-6-4504 801 Fax: 358-6-4504 802.

Table 1. Logman 801 Harvester Specifications

Logman 801 harvester	
Engine power (kW)	100
Engine	Iveco 4-cylinder diesel turbo
Power transmission	hydrostatic mechanical
Approx. weight (kg)	10 000
Length (m)	5.75
Width (m)	2.6 - 2.8
Height (m)	3.90
Crane reach (m)	9.0
Ground clearance (m)	0.62

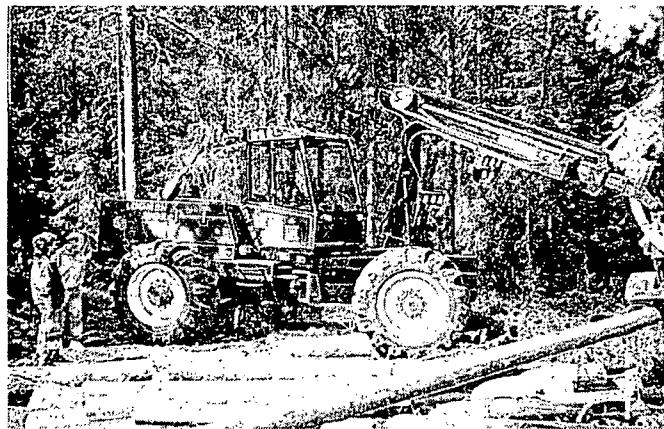


Figure 1. Logman 801 harvester.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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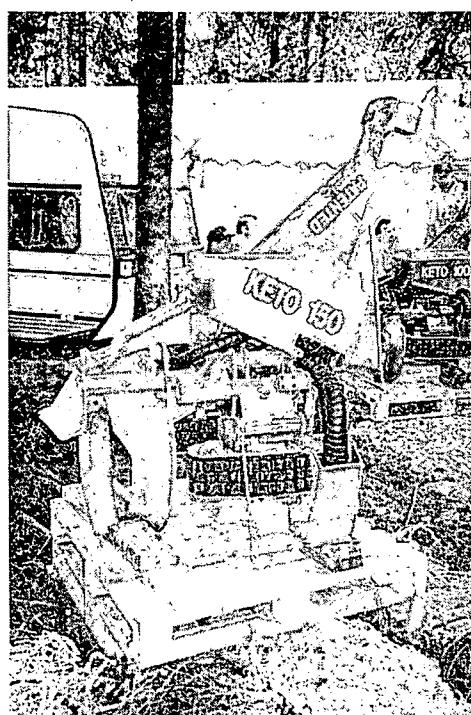


Figure 2. Keto 150 harvesting head.

Table 2. Keto Harvesting Heads Specifications

	Keto 51	Keto 100	Keto 150
Weight (kg)	390	600	1040
Cutting capacity (cm)	37	45	50
Oil flow requirement (l/min)	160	190	240
Type of feed	tracks	tracks	tracks
Traction force (kN)	15	18	24
Max feed speed (m/s)	3.8	3.8	3.8
Saw bar (cm)	46	46	56
Motor power base machine (kW)	60	70	80

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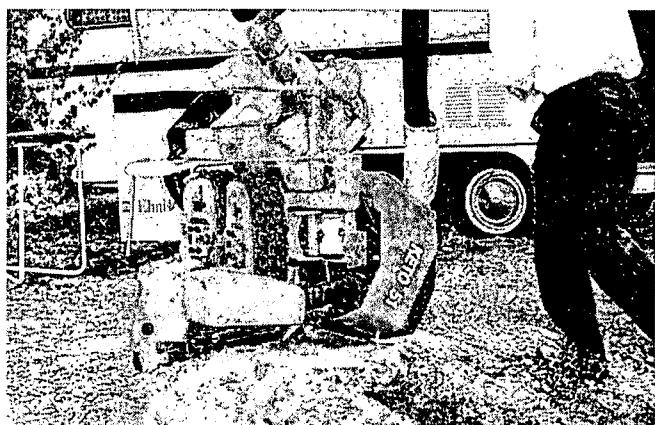


Figure 3. Keto 51 harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #17
Model: Silvatec 856 TH / 866 TH

Illustrations

- Silvatec 856 TH harvester (Figure 1)
- Silvatec harvesting head (Figure 2)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 8-wheel drive, articulated harvester
- very good visibility
- Silvatec harvesting head

Manufacturer and distributor

Silvatec equipment is manufactured and distributed by Silvatec, Skovmaskiner Aps, Fabriksvej 6, DK-9640 Farso Tel.: 45-98-63-24-11 Fax: 45-98-63-25-22.

In North America, Silvatec is sold under the name Rotobec and is distributed by Rotobec Inc., 200 Industrielle, St. Justine, Quebec G0R 1Y0 Tel.: 418-383-3002 Fax: 418-383-5334.

Table 1. Silvatec Harvesters Specifications

	Silvatec 856 TH harvester	Silvatec 866 TH harvester
Engine power (kW)	128	160
Engine	Perkins 1006 TW 6 cycle	Volvo TD 71
Power transmission	hydrostatic/ mechanical	hydrostatic/ mechanical
Approx. weight (kg)	12 000	15 000
Length (m)	5.7	7.7
Width (m) *	2.1 - 2.6	2.3 - 2.8
Height (m)	3.05	3.20
Crane reach (m)	7.0 - 9.0	7.0 - 9.0
Ground clearance (m)	0.58	0.63

* depending on the tires



Figure 1. Silvatec 856 TH harvester.

In western USA: Rotobec, West USA Inc. 6505 NE Columbia Blvd., Portland OR 97218 Tel.: 503-288-3115 Fax: 503-288-3436.

For further information, contact:

Silvatec, Skovmaskiner Aps, Fabriksvej 6, DK-9640 Farso Tel.: 45-98-63-24-11 Fax: 45-98-63-25-22.

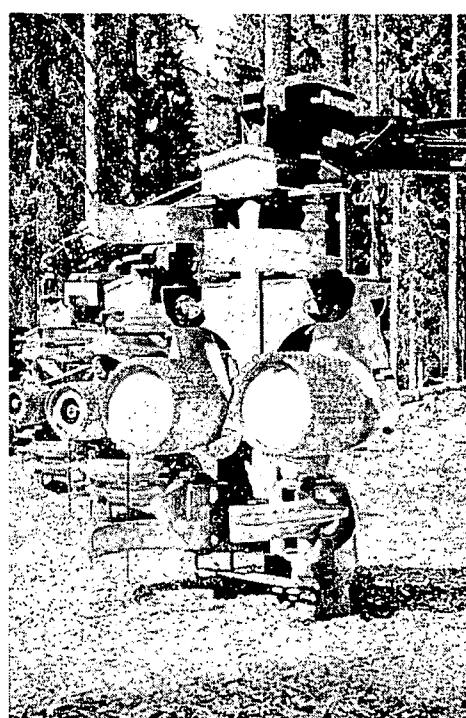


Figure 2. Silvatec harvesting head.

Table 2. Silvatec Harvesting Heads Specifications

	235 MD 35	335 MD 40	445 MD50	555 MD60
Feeding power KP	1800	1900	2300	2500
Delimbng knives	4 movable 2 fixed	4 movable 2 fixed	4 movable 2 fixed	4 movable 2 fixed
Delimbng diameter (cm)	0.5 - 35.0	0.5 - 40.0	0.5 - 50.0	0.5 - 60.0
Max. felling diameter (cm)	45.0	55.0	55.0	63.5
Rec. pump capacity (l/min)	130	140	190	200
Working pressure (bar)	210	210	210	230
Width (m)				
Closed	0.85	0.89	0.95	1.14
Open	1.08	1.21	1.24	1.46
Height (m)	1.40	1.59	1.61	1.90
Weight (kg)	600	790	930	1280

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #18 Model: Logset 506H

Illustration

- Logset 506H harvester (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 8-wheel drive, articulated harvester
- wheels can be equipped with chains or tracks to aid traction and reduce ground pressure
- high visibility cab
- bogies front and rear equipped with wheel motors in all wheels
- Logset 5-55 harvesting head
- crane has 236° operating radius

Manufacturer and distributor

Logset equipment is manufactured and distributed by Logset, Hännisentie 2, Fin - 66530 Koivulahti, Finland Tel.: 358-6-210-3200 Fax: 358-6-210-3216.

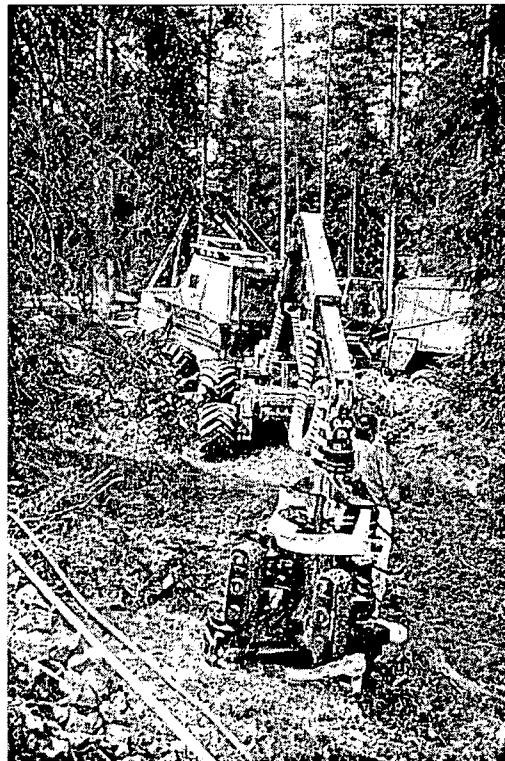


Figure 1. Logset 506H harvester with a Logset 5-55 harvesting head.

Table 1. Logset 506H Harvester Specifications

	Logset 506H harvester
Engine power (kW)	119
Engine	Perkins 1006-6T
Power transmission	turbo diesel
Cutting capacity (cm)*	hydrostatic
Approx. weight (kg)	55 -65-cm diameter
Length (m)	13 500
Width (m)	7.0
Height (m)	2.7
Crane reach (m)	3.60
Turning radius (m)	10.1
Ground clearance (m)	4.5
	0.70

*Depending on cutting saw.

For further information, contact:

Logset, Hännisentie 2, Fin - 66530 Koivulahti, Finland Tel.: 358-6-210-3200 Fax: 358-6-210-3216.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #3

Model: John Deere 440C with modified grapple

Illustrations

- John Deere 440C line skidder with a modified Hydrawrap grapple (Figure 1)
- modified Hydrawrap grapple (Figure 2)

Location

Riverside Forest Products Limited's operating area near Williams Lake, BC

Contractor

Norm Porter, Williams Lake, BC

Equipment specifications

See Table 1. Additionally,

- modifications to the Hydrawrap grapple were designed and manufactured by Norm Porter
- grapple slides along a 2.0 m pipe
- disk braking system from a small car keeps the grapple from moving along slide while a turn is being dragged
- winch from original line skidder is connected to the Hydrawrap chain
- hydraulic system of grapple is completely separate from that of the carrier, therefore there are no over heating problems or extra load on the

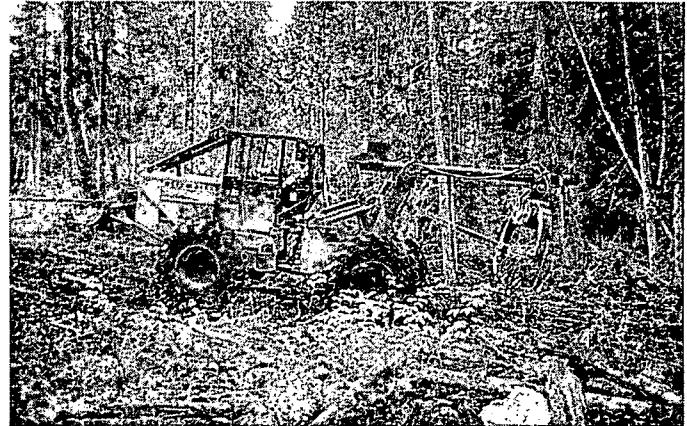


Figure 1. John Deere 440C skidder with Hydrawrap grapple.

- carrier's hydraulic pump when the grapple is in use
- hydraulic system is from a TD 8 tracked crawler

Manufacturer

The base grapple was manufactured by Hydrawrap Equipment Ltd. and subsequently modified by the contractor.

Equipment distributors

John Deere skidders with Hydrawrap grapples are available from local John Deere distributors, such as Coast Tractor and Equipment Ltd., 1090 Eastern St., BCR Industrial Park, Prince George, BC V2N 2K8 Tel.: 250-562-1151 Fax: 250-562-7266.

Table 1. John Deere Skidder Specifications

	John Deere 440C
Engine power (kW)	52.2
Power transmission	turbocharged 6 speed 4 cylinder
Approx. weight (kg)	6430
Width (m)	2.4
Height (m)	2.8
Grapple reach (m)	2.0
Grapple area (m ²)	0.72
Grapple weight (kg)	477
Ground clearance (m)	0.48

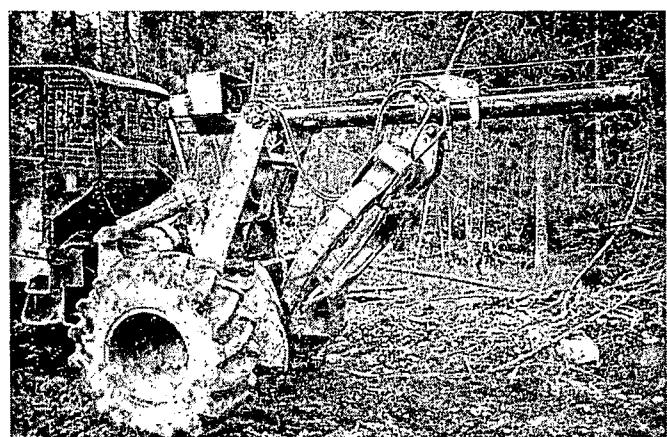


Figure 2. Modified Hydrawrap grapple.

A used John Deere 440C skidder can be purchased for \$20 000. A new Hydrawrap grapple model 106 is approximately \$29 500 not including installation.

For further information, contact:

Carl Hennig, Riverside Forest Products Limited,
Williams Lake Division, 110 Hodgson Road,
Williams Lake BC V2G 3P6 Tel.: 250-392-9296.

Jason Porter, Williams Lake, BC Tel.: 250-296-3267.

Craig Evans, FERIC, 2601 East Mall, Vancouver, BC
V6T 1Z4 Tel.: 604-228-1555.
E-mail: craig-e@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #4
Model: Caterpillar D4H and 527 (D5H)

References

- Compendium articles Operation Mechanical #2 and Cut-to-Length #3
- FERIC Special Report SR-94
- FERIC Technical Note TN-271

Illustrations

- Caterpillar D4H tracked skidder with ESCO 210 grapple (Figure 1)
- Caterpillar 527 skidder (Figure 2)

Locations

TimberWest Forest Limited, private land near Campbell River on Vancouver Island

In Pope and Talbot Ltd. operating area on Crown land near Midway, BC

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Contractors

TimberWest Forest Limited, Campbell River, BC
Reid Hedlund, Midway, BC

Equipment specifications

See Table 1. Additionally,

- Caterpillar DSH is now the 527
- skidder has elevated drive sprocket

Table 1. Caterpillar Skidder Specifications

	D4H	527
Engine power (kW)	67	124
Power transmission	3-speed power-shift	3-speed power-shift
Approx. weight (kg)	13 600	21 477
Width (m)	2.5	3.1
Length (m)	5.4	4.9
Height (m)	3.2	3.3
Grapple reach (m)	2.5	2.6 - 3.4*
Ground clearance (m)	0.56	0.52

* For single function arch and swing boom respectively.

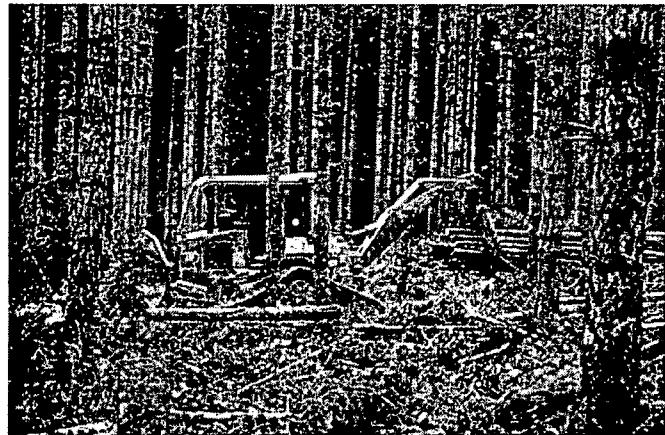


Figure 1. Caterpillar D4H tracked skidder with ESCO 210 grapple.

- 527 has two arch configurations available: single-function arch and swing boom

Manufacturer

Caterpillar equipment is manufactured by Caterpillar Inc. Peoria, IL, USA.

Equipment distributors

Caterpillar equipment is available from local Finning dealers, such as Finning Ltd., 555 Great Northern Way, Vancouver, BC V5T 1E2 Tel.: 604-872-4444 Fax: 604-872-2994.



Figure 2. Caterpillar 527 tracked skidder.

For further information, contact:

Barry Gibson, TimberWest Forest Limited, Oyster River Operation, North Island Region, PO Box 2500, 5705 North Island Hwy., Campbell River, BC V9W 5C5 Tel.: 250-287-8118.

Reid Hedlund, Box 188, Midway, BC V0H 1M0
Tel./Fax: 250-449-2322.

George Delisle, Pope and Talbot Ltd., PO Box 70, Midway, BC V0H 1H0 Tel.: 250-449-2212 Fax: 250-449-2388.

Finning Ltd., 555 Great Northern Way, Vancouver, BC V5T 1E2 Tel.: 604-872-4444 Fax: 604-872-2994.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #11
Model: Terri ATD / S2000

Illustration

- Terri ATD forwarder (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Tables 1 and 2. Additionally,

- all track drive (ATD)
- can be equipped with a Kubota, 3-cylinder or a Lombardini 4-cylinder diesel engine
- three wheel bogie on trailer
- regular track width is 0.48 m and winter track width is 0.67 m
- can use a Terri or Mowi 1742 or 1943 loader
- Terri S 2000 uses a wheeled trailer

Table 1. Terri ATD Forwarder Specifications

	Terri ATD forwarder	
Engine power (kW)	21	26
Engine	Kubota D1105	Lombardini LDW 1204
	3-cylinder diesel	4-cylinder diesel
Power transmission	hydrostatic	
Weight without loader (kg)	2400	
Length (m)	6.5 - 7.0	
Width (m)		
	Terri forwarder	1.47
	Trailer	1.60
Crane reach (m)		
	Terri	4.2
	Mowi 1742	4.1
	Mowi 1943	4.3
Grapple opening (m)		
	Terri	0.97
	Mowi 1742	0.91
	Mowi 1943	0.91

Table 2. Terri S 2000 Forwarder Specifications

	Terri S 2000 forwarder	
Engine power (kW)	17	18
Engine	Kubota D905	Lombardini LDW 903
	3-cylinder diesel	3-cylinder diesel
Power transmission	variator	
Weight without loader (kg)	1700	
Length (m)	6.5 - 7.0	
Width (m)		
	Terri forwarder	1.47
	Trailer	1.60

- Terri S 2000 cab can be a protective frame or completely enclosed
- seat swivels 180° on both models for forward and rearward steering and loading
- trailer has three pairs of stakes

Manufacturer and distributor

Terri forwarders are manufactured and distributed by Terri Heby Terrängfordon, THT AB, S-744 51 Morgongåva, Sweden Tel.: 46-224-600 70 Fax: 46-224-608 11.



Figure 1. Terri ATD forwarder.

Table 3. Approximate Prices of the Terri ATD and S 2000 Forwarders and Attachments

	Approximate price (\$)
Terri ATD	
Kubota engine	83 000
Lombardini engine	86 000
Terri S 2000	
Protective frame	41 000
Enclosed cab	48 000
Mowi 1943 loader	12 000
Mowi 1742 loader	9 000
Terri loader	9 000
Trailer	
Wheeled	8 500
Tracked	10 000

Approximate (1997) prices of the Terri ATD and S 2000 forwarders are presented in Table 3.

For further information, contact:

Terri Heby Terrängfordon, THT AB, S-744 51
Morgongåva, Sweden Tel.: 46-224-600 70 Fax: 46-
224-608 11.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4, Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #12 Model: Scorpion

Illustration

- Scorpion (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- front and rear bogies
- hydraulically movable rear bogie
- electrically heated driver's seat swivels 180° for forward and rearward steering and loading
- extendable bunk
- cab available

Manufacturer

The Scorpion is manufactured in Sweden by Compaktskotaren I Årjäng AB, Box 93, Bondegatan 3, S-672 22 Årjäng, Sweden Tel.: +46-0573-130-40 Fax: +46-0573-130-80

Equipment distributors

In BC the Scorpion is available through West Coast Logging Shows, Squamish, BC.

Table 1. Scorpion Forwarder Specifications



Figure 1. Scorpion 903 forwarder.

For further information, contact:

Bryan Couture, West Coast Logging Shows, PO Box 1035, Squamish, BC V0N 3G0 Tel.: 604-898-9493 Fax: 604-898-9495.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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	Scorpion 903	Scorpion 1205
Engine power (kW)	17.2	25.5
Engine	Lombardini diesel	Kubota 3-cylinder diesel
Power transmission	hydrostatic	hydrostatic
Carrying capacity (kg)	2 000	2 500
Approx. weight (kg)	1 860	2 125
Length with trailer (m)	5.95	5.95
Height (with ROPS) (m)	2.05	2.17
Width (m)	1.5	1.5
Crane reach (m)	4.0	4.2



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #13
Model: Trans-Gesco TG 206 / 88

Illustration

- Trans-Gesco TG-206 forwarder (Figure 1)

Location

Pacific Logging Congress Equipment Demonstration,
Bellevue, Washington, September 1997

Equipment specifications

See Table 1. Additionally,

- Trans-Gesco TG-206 and TG-88 forwarders available
- Trans-Gesco TG-88 clambunk skidder available
- articulated with tandem axle bogie on the back section
- tiltable cab for servicing
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- stable on steep slopes
- effective on deep snow and tough ground
- Trans-Gesco knuckleboom loader with telescopic extension of 1.2 m
- continuous rotation on grapple
- 4 pairs of stakes
- TG-206 has various basket configurations to haul lengths of up to 10.5 m

Table 1. Trans-Gesco TG-88 and TG-206 Forwarders Specifications

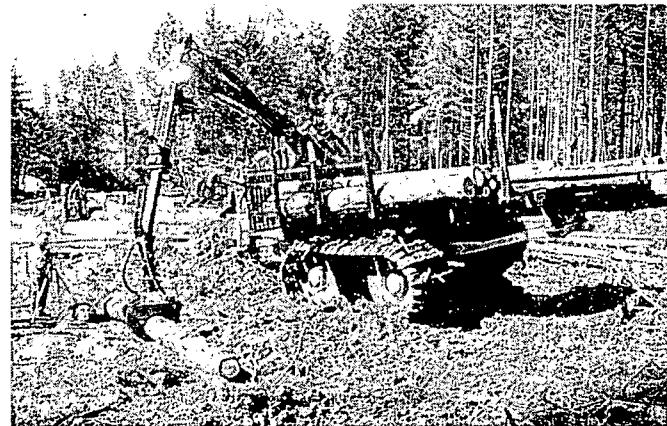


Figure 1. Trans-Gesco TG-206 Forwarder.

- seat swivels 180° for forward and rearward steering

Manufacturer

Trans-Gesco forwarders are manufactured by Trans-Gesco Inc., 625 Airport Road, Roberval, Que. G8H 2M9 Tel.: 418-275-6808 Toll free: 1-800-472-3527 Fax: 418-275-5058.

Distributor

Trans-Gesco forwarders are distributed by Parker Pacific Equipment Sales, 20239 Logan Ave., Langley, BC V3A 4L8 Tel.: 604-534-8511 Fax: 604-534-3515.

For further information, contact:

Parker Pacific Equipment Sales, , 20239 Logan Ave., Langley, BC V3A 4L8 Tel.: 604-534-8511 Fax: 604-534-3515.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #14 Model: Hemek 700 / 750 / 800

Reference

- FERIC Field Note Silviculture-63

Illustrations

- Hemek 800 forwarder (Figure 1)
- Hemek Ciceron TD-81 forwarder (Figure 2)

Locations

Prince Albert, Saskatchewan July 1993 and Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- Hemek Ciceron TD-81 forwarder was used as a prime mover for the Bräcke B-390 moulder in Saskatchewan
- Iveco 8361, 6-cylinder engine
- Hemek 700 forwarder has 6 forward gears and 3 reverse
- Hemek 800 forwarder has Pendo-cab that is horizontally self-aligning, vertically damped,



Figure 1. Hemek 800 forwarder.

hydraulically rotational

- 6 or 8 wheel drive articulated forwarder
- bogie on rear
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- Cranab 650 XL crane has telescoping extension and a reach of 6.85 m
- grapple has continuous rotation
- 3 pairs of stakes
- seat swivels 180° for forward and rearward steering
- cab of the Hemek 700 and 750 tilts for service

Table 1. Hemek Forwarders Specifications

	Hemek 700 forwarder	Hemek 750 forwarder	Hemek 800 forwarder
Engine power (kW)	147	147	147
Power transmission	electro-hydraulic power shift gearbox	hydrostatic mechanical drive with 3-gear power shift gearbox	
Carrying capacity (kg)	14 000	14 000	14 000
Width (m)	2.8	2.8	2.8
Length (m)	8.6	8.6	8.9
Height (m)	3.7	3.7	3.7
Weight (kg)	13 500	13 500	13 900
Ground clearance (m)	0.58	0.58	0.58

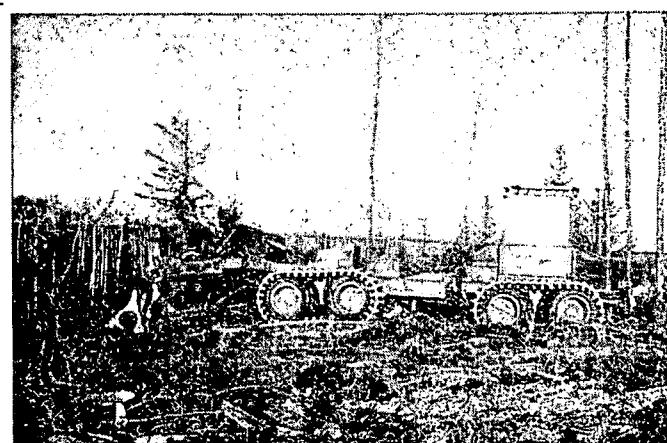


Figure 2. Hemek forwarder with Bräcke B-390 moulder.

Manufacturer

Hemek forwarders are manufactured by Hemek, Box 139, 840 93 Hede, Sweden Tel.: 46-684-105-25 Fax: 46-684-108-58.

For further information, contact:

Hemek, Box 139, S-840 93 Hede, Sweden Tel.: 46-684-105-25 Fax: 46-684-108-58.

Jeff McKnight, KBM Forestry Consultants Inc., 360 Mooney Street, Thunder Bay, ON P7B 5R4 Tel.: 807-344-0811 Fax: 807-345-3440.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #15 Model: Logset 504F / 6F

Illustration

- Logset 504F forwarder (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 8-wheel drive, articulated forwarder
- double bogies on front and rear
- chains and tracks available to aid in traction and reduce ground pressure
- Logset 504F has Cranab 450 Combi loader
- Logset 6F has Loglift 71 crane, could use Cranab 800
- very good visibility

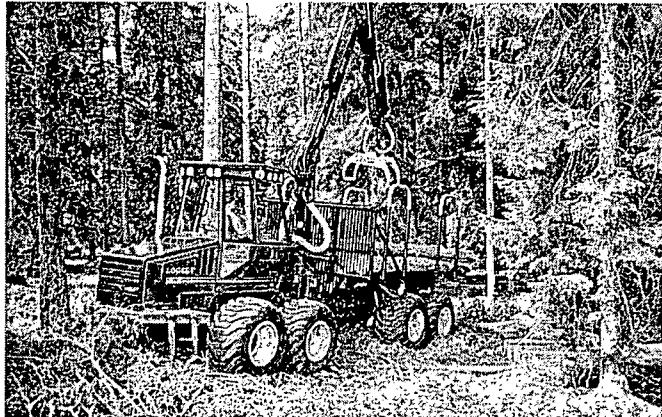


Figure 1. Logset 504F forwarder.

Manufacturer and distributor

Logset equipment is manufactured and distributed by Logset, Hännisentie 2, Fin - 66530 Koivulahti, Finland Tel.: 358-6-210-3200 Fax: 358-6-210-3216.

For further information, contact:

Logset, Hännisentie 2, Fin - 66530 Koivulahti, Finland Tel.: 358-6-210-3200 Fax: 358-6-210-3216.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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Table 1. Logset Forwarders Specifications

	Logset 6-F forwarder	Logset 504F forwarder
Engine power (kW)	136	84
Engine	Perkins turbo diesel 1006-6TW	Perkins turbo diesel 1004 4T
Power transmission	electric controlled hydrostatic mechanical	hydrostatic
Load capacity (kg)	12 000	9 500
Approx. weight (kg)	13 750	9 300
Length (m)	9.4	8.1
Width (m)	2.6	2.4
Height (m)	3.9	3.4
Crane reach (m)	10.0	7.6
Turning radius (m)	n.a.	4.7
Ground clearance (m)	0.66	0.68

September, 1998

FOREST ENGINEERING
RESEARCH INSTITUTE
OF CANADA
Western Division



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Re: Compendium of Commercial Thinning Operations and Equipment (SR-108)

The enclosed material comprises the seventh and final issue of eighteen, 1-page descriptions of commercial thinning operations and equipment. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). A second index has been enclosed to replace the index provided with Issue 5. If you did not receive the first six issues, please complete the form below and send it to the address given.

FERIC will be reapplying for funding to continue the Compendium and your name will be kept on the mailing list in the event of future issues being printed. Thank you for your support.

The Compendium was funded in 1997/98 by Forest Renewal BC.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink, appearing to read "Janet L. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — (SR-108)

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Forest Engineering Research Institute of Canada, Western Division
Compendium of Commercial Thinning - Index

Commercial Thinning - Operations Index

(September 98)

Harvesting System	Item	Location	Equipment
I-A Cut-and-Skid	1	Southern Coastal BC	Hand falling and Iron Horse mini-skidder
	2	Southern Coastal BC	Hand falling and ASV Posi-Track mini-skidder with Farmi JL 501 winch
	3	Southern Interior BC	Hand falling, Tree Farmer C-7 line-skidder and John Deere 544 rubber-tired loader
	4	Southern Interior BC	Hand falling, John Deere 540 rubber-tired skidder, Nokka 400 processor and Hitachi EX 60 excavator
	5	Alberta	Hand falling, Farmi JL 501 winch, Farmi forwarding trailer and Valmet tractor
	6	Southern Coastal BC	Hand falling, horse skidding
I-B Mechanical	1	Southern Interior BC	Morbark Wolverine feller-buncher, Caterpillar 518 rubber-tired grapple-skidder and Steyr processor
	2	Southern Interior BC	Timbco T445 excavator with Quadco harvesting head and Caterpillar D4H custom tracked skidder with Hydrawrap grapple
I-C Cut-to-Length	1	Southern Coastal BC	Timberjack 1270 harvester and Timberjack 910 forwarder
	2	Southern Interior BC	Timberjack 1270 harvester and Timberjack 1010 forwarder
	3	Southern Coastal BC	Timbco T445 excavator with Keto 500 harvesting head and Caterpillar D4H tracked skidder with ESCO 210 grapple
	4	Southern Coastal BC	Norcar 490 harvester and Norcar 600H forwarder
	5	Alberta	Timberjack 608 feller-buncher with 762B harvesting head, Rottne single-grip harvester and Rottne forwarder
	6	Washington, USA	Timberjack 1270 harvester and Timberjack 1210B forwarder
	7	Washington, USA	Bell TH 120 tracked harvester and Bell T12B forwarder
	8	Washington, USA	Komatsu PC 128UU tracked thinning harvester and Timberjack 230A forwarder
	9	Washington, USA	Valmet 500T harvester and Valmet 546 forwarder
	10	Northern Interior BC	Valmet 546H harvester
	11	Northern Interior BC	John Deere 290D excavator with HTH 14 Pan harvesting head and Kubota M8580 tractor with an Enviroquip B-Line 9000 forwarding trailer
	12	Northern Coastal BC	Valmet 546H harvester and Valmet 546H forwarder

Harvesting System	Item	Location	Equipment
I-C Cut-to-Length Cont.	13	Alberta	Bell TH 120 tracked harvester and Bell T12B forwarder
	14	Alberta	Valmet 901C harvester
	15	Southern Interior BC	Komatsu PC 90 excavator with Hahn HSG 140 harvesting head and F4-Dion forwarder
	16	Alberta	Timberjack 1270 harvester, Rottne harvester and Rottne forwarder
	17	Alberta	Timberjack 608 feller-buncher with 762B harvesting head and Timberjack 1210 forwarder
	18	Alberta	Rocan T thinning harvester with a Pan 828 harvesting head and Rottne forwarder
I-D Cable	1	Southern Coastal BC	Hand falling, Kubota KH191 excavator, Nokka forwarding trailer and loader and free-standing bunks
	2	Southern Coastal BC	Hand falling and Washington 78-40 swing yarder
	3	Southern Coastal BC	Hand falling and Igland Jones Trailer Alp yarder
	4	Chile	Hand falling and Urus I-Uni yarder with Stuefer HSK 2000 carriage
	5	Washington, USA	Hand falling and Diamond D210 swing yarder
	6	Lower Mainland of BC	Hand falling, 1980 Washington 78SL swing yarder, Maki Mini-Mak II carriage and Kobelco 200LC loader
	7	Washington, USA	Dahlvester harvester, ThinLine monocable system and John Deere 70D hydraulic loader
	8	Washington, USA	Hand falling, trailer mounted Koller K-300 yarder with Koller SKA-1 carriage, Caterpillar 235 and Linkbelt LS2800 hydraulic loader
	9	Lower Mainland of BC	Hand falling and Timbermaster 4-drum yarder
	10	Washington, USA	Hand falling, Howe-Line yarder, Maki carriage and Hitachi EX200 hydraulic loader
	11	Southern Coastal BC	Hand falling and Urus I Uni 300 yarder with Stuefer HSK 2000 carriage
	12	Southern Coastal BC	Hand falling, Kubota excavator, Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks
	13	Southern Coastal BC	Hand falling, Farmi JL2/601 winch, Farmi forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks
	14	Southern Coastal BC	Hand falling, Caterpillar excavator, Farmi tractor and Nokka forwarding trailer



Forest Engineering Research Institute of Canada, Western Division
Compendium of Commercial Thinning - Index

Commercial Thinning - Operations Index Cont.

(September 98)

Harvesting System	Item	Location	Equipment
I-D Cable cont.	15	Southern Coastal BC	Kubota excavator, Case crawler tractor, and Farmi forwarding trailer
	16	Northern Interior BC	Hand falling, Skylead C-40 16000 skyline yarder and Maki II carriage
	17	Southern Coastal BC	Hand falling, Skylead C-40 16000 skyline yarder and Eaglet carriage
	18	Lower Mainland of BC	Hand falling, Washington 078 yarder, with Hitachi UH18 mobile back spar
	19	Northern Interior BC	Hand falling, Owren 400 yarder, Koller SKA 2.5 carriage, and Cat LL 229 loader
	20	Southern Coastal BC	Hand falling and Timbco 415 excavator with Pierce single-grip harvesting head, Diamond D210 swing yarder with Maki II carriage, Link-Belt hydraulic log loader and Ranger 667 grapple skidder



Forest Engineering Research Institute of Canada, Western Division
Compendium of Commercial Thinning - Index

Commercial Thinning - Equipment Index

(September 1998)

Equipment	Item	Model
II-A Feller-Bunchers	1	Morbark Wolverine 6300 feller-buncher
	2	John Deere 653 feller-buncher
	3	Hydro-Ax tri-wheel feller-buncher
II-B Feller-Processors	1	Timberjack 1270 harvester with 762B harvesting head
	2	Timberjack 608 feller-buncher with 762B harvesting head
	3	Valmet 546H harvester with 948 harvesting head
	4	Valmet 500T harvester with 960 harvesting head
	5	Timbco T445 excavator with Keto 500 harvesting head
	6	Norcar 490 harvester
	7	Bell TH 120 tracked harvester with SP 550 harvesting head
	8	Komatsu PC 128UU tracked harvester with HTH 14 Pan harvesting head
	9	Rocan T thinning harvester with Pan 828 harvesting head
	10	Valmet 901C with 942 harvesting head
	11	Komatsu PC 90 with Hahn HSG 140 harvesting head
	12	CombiCat 4.3s with Pan 828 harvesting head
	13	Steber 865 / 875 harvester with Steber 250 harvesting head
	14	Rottne 2002 harvester with GM 828 harvesting head
	15	Neuson 5001 / 8002 RD harvester with Pan 828 harvesting head
	16	Logman 801 harvester with Keto harvesting head
	17	Silvatec 856 TH harvester with Silvatec harvesting head
	18	Logset 506H harvester with Logset 5-55 harvesting head
	19	Ponsse Cobra / Ergo harvesters with Ponsse harvesting heads
	20	Skogsjan 695 harvester with Skogsjan harvesting head
	21	Rocan Enviro-Can harvester with a Logmax GM 828 harvesting head
	22	Prosilva 605 harvester with a Keto harvesting head
	23	Hemek 880 harvester with Woodking harvesting head
	24	Sifor 616 harvester with Sifor 500 harvesting head
	25	Pendo Eva / Master harvesters
II-C Skidders	1	Iron Horse mini-skidder
	2	ASV Posi Track mini-skidder with Farmi winch
	3	John Deere 440C with modified grapple
	4	Caterpillar D4H / 527
	5	Turboforest mini-skidder

Equipment	Item	Model
II-D Forwarders	1	Timberjack 910/1010/1210B forwarders
	2	Valmet 546 forwarder
	3	Norcar 600H forwarder
	4	Rottne forwarder
	5	Bell T12B forwarder
	6	Farmi 9000 forwarding trailer
	7	Enviroquip B-Line 9000 forwarding trailer
	8	Nokka 36 forwarding trailer
	9	Timbco TF815 forwarder
	10	F4-Dion forwarder
	11	Terri ATD / 2000 forwarder
	12	Scorpion 903 forwarder
	13	Trans-Gesco TG-206 / TG-88 forwarder
	14	Hemek 700 / 750 / 800 forwarder
	15	Logset 504F 6F forwarder
	16	Turboforest mini-forwarder TF-605
	17	Ponsse Buffalo, Caribou, Ergo forwarders
II-E Yarders	1	Kubota KH 191 excavator with tower
	2	Koller K300 yarder with Koller SKA-1 carriage
	3	Timbermaster yarder
	4	Urus I-Uni yarder with Stuefer HSK 2000 carriage
	5	Howe-Line yarder with Maki II carriage
	6	Washington 78-40/78SL swing yarders
	7	Farmi JL2/601 winch with extension
	8	Igland Jones Trailer Alp yarder
	9	Komatsu excavator with tower with a Christy carriage
	10	Skylead C-40 16000 series yarder with an Eaglet and Maki II carriage
II-F Other	1	Free-standing bunks
	2	Wood-Mizer portable sawmill
	3	Micromill SLP 1500 small log processor
	4	Nokka 400 tractor-mounted processor
	5	Niab 5-15B tractor-mounted processor



Harvesting System: Cut-and-Skid
Item: #6

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

September 1998

Source

FERIC visit to field demonstration September 1998

Contractor

Wes Passingham, Black Creek, BC

Equipment

- hand falling
- team of horses (Figure 1)
- skidding arch (Figure 2)

Location

Crown land harvested under the BC Ministry of Forest's Small Business Forest Enterprise Program near Campbell River, BC

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 46-year-old Douglas-fir plantation
- preharvest - 1067 trees/ha, average dbh of 26.0 cm
- flat to gentle slopes

Prescription

- remove approximately 183 m³ /ha, 30% by basal area by thinning from below
- root rot centers are to be clearcut and stumped
- leave approximately 300 trees/ha and understory cedar

Operating procedure

- residual trees were marked by silvicultural contractors for the BC Ministry of Forests
- main trail is old railway grade
- hand faller cut trees, and topped and bucked stems at the stump



Figure 1. Horses skidding.

- logs are skidded to the landing by the team of horses
- skidding arch is also used (Figure 2)

Equipment description and specifications

- horses were 15 and 20 years old Suffolk Punch

Production

The one-person, two-horse crew averaged 20 m³/day. Productivity was dependent on piece size and skidding distances.

For further information, contact:

Wes Passingham, 4416 McCauley Road, Black Creek, BC V9J 1E2 Tel.: 250-337-8292.



Figure 2. Horses with skidding arch.



Figure 3. Horses at landing waiting for next turn.

Bill Hughes, Commercial Thinning Coordinator, BC
Ministry of Forests, Campbell River Forest District, 370
South Dogwood Street, Campbell River, BC V6W 6Y7
Tel.: 250-286-9300 Fax: 250-286-9490.

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**Harvesting System: Cable
Item: #16**

Region

Northern Interior British Columbia

Author

Mihai Pavel, M.F.

Date

September 1998

Source

FERIC study completed in 1998

Contractor

Kitwanga Lumber Co., (Skeena Cellulose Inc., Carnaby Operations), South Hazelton, BC

Equipment

- hand falling
- Skylead C-40 16000 yarder (Figure 1)
- Maki II radio-controlled carriage

Location

Crown land, near Kitwanga, BC

Site and stand

- Interior Cedar-Hemlock (ICH) ecosystem
- 130-year-old western red cedar, western hemlock, subalpine fir, hybrid spruce stand
- preharvest - 808 trees/ha, 600 m³/ha, average basal area of 76.5 m²/ha, average dbh of 32.0 cm, average stem size of 0.7 m³
- slopes ranged from 10 - 60% and averaged 32%
- topography was relatively steep and broken, with frequent benches throughout the area

Prescription

- group-selection system
- remove 40%, with future entries at about 30 years intervals removing up to 30% of the stand basal area and volume at each subsequent entry
- yarding corridors spaced approx. 50 m apart and oriented perpendicular to the contours
- 10 m-wide corridors were clearfelled (Figure 2)
- group-selection or occasionally single-stem removals were applied to the 40 m-wide strips of residual stand between corridors

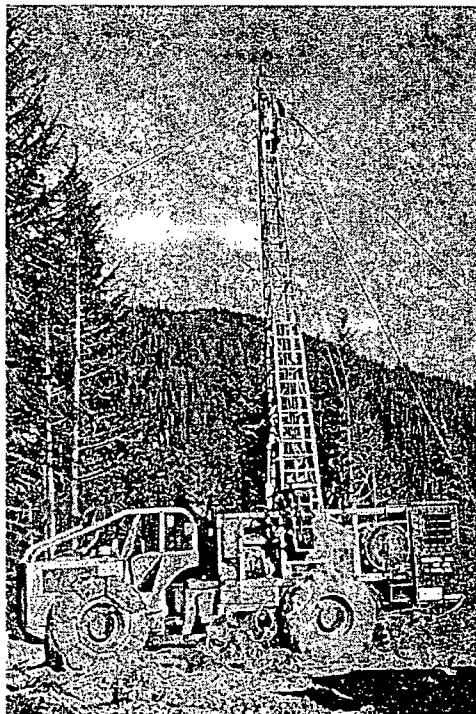


Figure 1. Skylead C-40 16000 yarder.

Operating procedures

- engineering crew determined the corridor location, marked the centerline of each corridor and selected backspar and intermediate support trees (multi-span yarding was used for 21% of total corridor length)
- faller marked corridor boundaries and felled both corridor and small pockets of 1 to 5 trees off the corridor in a one pass operation
- no pre-marking was done
- no delimiting or bucking at the stump except for very large trees
- maximum corridor lengths were 350 m for single-span and 420 m for multi-span yarding
- lateral yarding distances were 0 - 50 m

Equipment description and specifications

See Table 1. Additionally,

- 4 drum guyline system
- rigging intermediate supports require 1.5-2.0 hours labour
- can be mounted on a trailer, truck or skidder

Table 1. Skylead C-40 Yarder Specifications

Skylead C-40 16000 yarder	
Engine	Cummins diesel, 6 cylinder
Engine power (kW)	174
Power transmission (Allison, automatic)	4 speeds forward 1 speed reverse mechanical
Winch drive	
Line capacity	
Skyline	610 m - 19 mm
Mainline	610 m - 12 mm
Haulback	1280 m - 12 mm
Guyline	60 m - 19 mm
Maximum line speed (m/min)	
Mainline	714
Haulback	714
Maximum line pulls (kg)	
Skyline	20 530
Mainline	15 950
Overall tower height (m)	12.2

- tightening side on guyline drums reduces cable wear and hang-ups
- can be used for both uphill and downhill yarding

Observed production

The faller produced an average of 99 m³ in a 6.5-hour shift. The yarding crew consisted of a yarder operator, a chaser and one or two chokersetters. The average productivity for the yarding crew was 102 m³ for an 8-hour shift.

Study results

The average harvesting cost was \$32.95/m³ on the truck. The stand damage survey showed 25 trees/ha (5% of residual stand) were wounded by harvesting activities, most of them near yarding corridors. The soil survey showed site disturbance was minimal (1.5 % of points analyzed were recorded as disturbed).

This project was funded by Forest Renewal BC. A report is being produced and will be available in 1999.

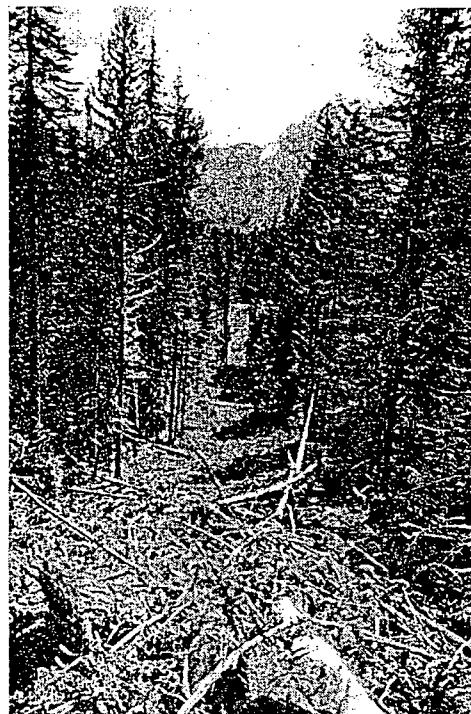


Figure 2. View along a corridor.

Equipment suppliers

The Skylead yarder is manufactured and distributed by Skylead Logging Equipment Corp., Enderby, BC.

For further information, contact:

Bill Varner, Skylead Logging Equip. Corp., Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

Philip Carruthers, Forestry Superintendent, Kitwanga Lumber Co., (Skeena Cellulose Inc., Carnaby Operations), #10 North Boundary Road, South Hazelton, BC V0J 2R0 Tel.: 250-842-5399 Fax: 250-842-5123.

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**Harvesting System: Cable
Item: #17**

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

September 1998

Source

FERIC visit to a field demonstration, September 1998

Contractor

Low Impact Forest Harvesting Ltd., Courtenay, BC

Equipment

- hand falling
- Skylead C-40 16000 yarder (Figure 1)
- Eaglet radio-controlled carriage

Location

Crown land harvested under the BC Ministry of Forest's Small Business Forest Enterprise Program near Campbell River, BC

Site and stand

- Coastal Western Hemlock (CWH) ecosystem
- 53-year-old Douglas-fir plantation
- preharvest - 628 trees/ha, average dbh of 33.0 cm

Prescription

- remove approximately 237 m³ /ha, 25% by basal area by thinning from below
- root rot centers are to be clearcut and stumped
- leave approximately 300 trees/ha and understory cedar
- corridors were clearfelled

Operating procedures

- residual trees were marked by silvicultural contractors for the BC Ministry of Forests
- maximum corridor lengths were 350 m for single-span and 420 m for multi-span yarding
- one intermediate support tree was being used during the demonstration



Figure 1. Skylead C-40 16000 yarder with Eaglet carriage.

Equipment description and specifications

See Table 1. Additionally,

- 4 drum guyline system
- can use intermediate supports to reduce road construction, overcome physical obstacles, access more ground per setting, and reduce yarding and rigging time where ground clearance is a problem
- rigging intermediate supports require 1.5-2.0 hours labour
- Skylead yarder can be mounted on a trailer, truck or skidder
- can be used for both uphill and downhill yarding
- radio controlled carriage can be moved up or down the skyline to adjust for hang-ups when lateral yarding

Observed production

The crew produced approximately 75 m³ / shift.

Table 1. Skylead C-40 Yarder Specifications

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Skylead C-40 16000 yarder	
Engine	Cummins diesel, 6 cylinder
Engine power (kW)	174
Power transmission (Allison, automatic)	4 speeds forward 1 speed reverse
Winch drive	mechanical
Line capacity	
Skyline	610 m - 19 mm
Mainline	610 m - 12 mm
Haulback	1280 m - 12 mm
Guyline	60 m - 19 mm
Maximum line speed (m/min.)	
Mainline	714
Haulback	714
Maximum line pulls (kg)	
Skyline	20 530
Mainline	15 950
Overall tower height (m)	12.2

Equipment suppliers

The Skylead yarder is manufactured and distributed by Skylead Logging Equipment Corp., Enderby, BC.

For further information, contact:

Bill Varner, Skylead Logging Equip. Corp. Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

Murray Coulter, Low Impact Forest Harvesting Ltd., RR#3, S-335, C-1, Courtenay, BC V9N 5M8 Tel.: 250-334-2433

Bill Hughes, Commercial Thinning Coordinator, BC Ministry of Forests, Campbell River Forest District, 370 South Dogwood Street, Campbell River, BC V6W 6Y7 Tel.: 250-286-9300 Fax: 250-286-9490.

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**Harvesting System: Cable
Item: #18**

Region
Coastal British Columbia

Author
Janet Mitchell, RPF

Date
September 1998

Source
FERIC visit to field demonstration, March 1998

Contractor
LCL Construction, Squamish, BC

Equipment

- hand falling
- Washington 078 yarder (Figure 1)
- Hitachi UH18 mobile backspur (Figure 2)

Location
Crown land harvested under the BC Ministry of Forest's Small Business Forest Enterprise Program in the Mamquam River drainage near Squamish, BC: Timber Sale Licence (TSL) A48541

Site and stand

- 55-year-old naturally regenerated stand of western hemlock (55%) western red cedar (31%), Douglas-fir (13%) by volume
- preharvest - 954 trees/ha, 450 m³/ha, average dbh of 25.2 cm

Prescription

- remove approximately 200 m³ /ha, 40% by volume with thinning from below
- 20-25% pulp and 80-75% sawlog
- final harvest in 35 years

Operating procedure

- residual trees and corridors were premarked by a contractor for the BC Ministry of Forests
- corridors were spaced at 40 m

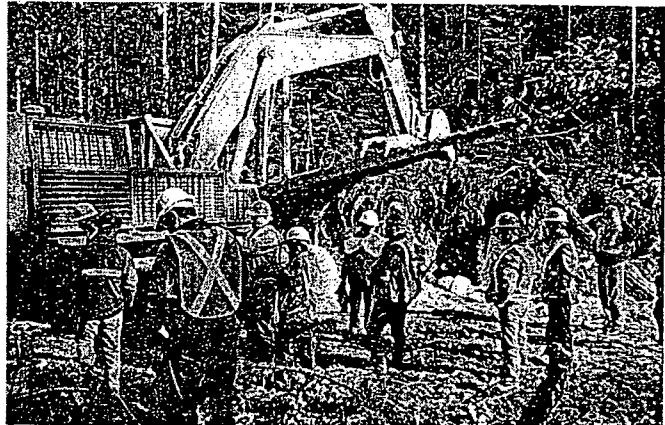


Figure 1. Hitachi UH18 mobile backspur.

Equipment description and specifications
See Table 1. Additionally,

- yarder has interlock and was configured as a running skyline with 125 feet of dropline
- 3-speed Allison transmission
- 750 m mainline

Productivity

The 3-person yarding crew produced 70-80 m³/day while the 2-person falling crew produced 50 m³/day. The contractor estimated his yarding cost at \$50/m³, roughly three times the cost in a clearcut with same tree size.



Figure 2. Stand after harvesting, note corridor.

Equipment suppliers

Washington yarders are no longer manufactured, but many used ones are available. They are still well supported by Trican Machinery Ltd. in New Westminster, BC.

The replacement cost of the yarder and backspar would be approximately \$400 000.

For further information, contact:

Dave McRae, LCL Construction, Squamish, BC Tel.: 604-892-3973.

Julian Grzybowski, Resource Officer Small Business, BC Ministry of Forests, Squamish Forest District, 42000 Loggers Lane, Squamish, BC V0N 3G0 Tel.: 604-898-2100 Fax: 604-898-2191.

Trican Machinery Ltd. 455 Brunette Street, New Westminster, BC V3L 3G1 Tel.: 604-540-0826 Fax: 604-540-0855.

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**Harvesting System: Cable
Item: #19**

Region

Northern Interior British Columbia

Author

Kris Kosicki, Ph.D.

Date

September 1998

Source

FERIC short-term study

Equipment

- hand falling
- Owren 400 yarder (Figure 1)
- Koller SKA 2.5 carriage (Figure 2)
- Cat LL 229 loader with the butt-'n-top rotating grapple

Location

Crown land at Kitsuns/Kitseguecla Creek, about 60 km south of New Hazelton, BC

Site and stand

- Interior Cedar-Hemlock moist cold (ICHmc2) subzone
- 170-year-old stand age, 35 m height
- western hemlock (45%), hybrid spruce (40%), western red cedar (10%), subalpine fir (3%), and lodgepole pine (2%) by volume
- preharvest - 634 trees/ha, 618 m³/ha, average stem size of 0.97 m³
- broken topography, long continuous slopes with gradients ranging from 30-60%, dissected by deep gullies
- silt-clay loam and clay-loam soils with 20-40% coarse fragment content

Prescription

- clearcut with reserve subareas and Riparian Management Areas (RMA)
- retain immature timber for future logging operations in deferred subareas
- remove only danger trees and large, windthrow prone trees in RMAs



Figure 1. Owren 400 yarder.

- cable skyline yarding system only; no backspar trails permitted

Operating procedures

- hand falling, no delimiting or bucking in the bush, except for very large trees and those yarded across reserve subareas and RMAs
- skyline corridors ranged from 70-330 m (slope distance) in length
- roads longer than 150 m employed one intermediate single-tree support
- when FERIC observed the operation, the yarder was rigged in standing skyline (gravity outhaul) configuration with the Koller SKA 2.5 clamping type carriage
- the 3-person crew consisted of a yarder operator/chaser, rigging slinger, and a chokersetter; a feller/bucker assisted the crew during installation and dismantling phase
- commonly 3 chokers were preset
- maximum observed lateral yarding distance was 45 m; however, 75% of lateral yarding was less than 15 m

- trees were partially suspended during inhaul
- at roadside, unhooked turns were moved by the Cat LL 229 loader for processing and piling

Equipment description and specifications

See Table 1. Additionally,

- Owren 400 yarder is a separate cable crane unit mounted on a Kockum 850 forwarder carrier
- hydrostatic drive system contains no mechanical components; each drum is powered by its own hydraulic motor
- Owren 400 yarder can be used in clearcutting, partial cutting and thinning applications; it can yard uphill, downhill or on flat terrain using running skyline, standing skyline, and gravity configurations
- all configurations can employ intermediate supports to improve deflection
- Owren 400 yarder can work with an original (Owren) mechanical slackpulling carriage or other compatible type of carriage (e.g., Koller SKA 2.5)
- Owren 400 yarder mounted on a Kockum 850 forwarder carrier can work off-road, e.g., on skid trails

Study results

The results of the shift-level studies and detailed timing of yarding cycle are summarized in Table 2.

Equipment suppliers

Owren yarders are manufactured by Trygve Owren AS, N-2607 Vingrom, Lillehammer, Norway, Tel.: 47 61 26 22 00 Fax: 47 61 26 23 58. In Canada, Owren yarders are available through Owren Yarding System Ltd., PO Box 255, Prince George, BC V2L 4S1 Tel.: 250-563-1529 Fax: 250-562-6198.

Table 1. Owren 400 Yarding Specifications

Engine	Deutz, turbodiesel water cooled
Engine power (kW)	134
Line capacity	
Skyline	400 m - 19 mm (3/4")
Mainline	400 m - 12 mm (1/2" swedge)
Haulback	800 m - 12 mm (1/2" swedge)
Slackpulling	400 m - 12 mm (1/2" swedge)
4 Guylines	50 m - 19 mm (3/4")
Maximum line speed (m/s)	variable 0-8
Maximum line pull (kg)	6000
Overall tower height (m)	12.8
Weight with Kockum 850 carrier (kg)	24 000

Table 2. Summary of Yarding Productivity

Average yarding distance (m)	168
Average payload (trees/turn)	2.75
Average payload (m ³ /turn)	2.07
Average cycle time (min)	6.6
Productivity (m ³ /PMH)*	20.8
Productivity (m ³ /SMH)**	17.7

*Productive Machine Hours include yarding time and road-change time but do not include delays.

**Scheduled Machine Hours include yarding time, road-change times, and delays.

Koller SKA 2.5 carriages are available through Koller USA Corporation, 8828 NE Killingsworth Street, Portland, OR 97220 USA Tel.: 503-257-9778 Toll free: 1-800-821-1475 Fax: 503-257-9780.

References

Araki, D.S. 1993. *Observations of a Koller K301 yarder*. FERIC, Vancouver. Field note Cable Yarding-13. 2p.

Kosicki, K.T. 1998. *Owren Yarding Evaluation: Productivity and Cost*. FERIC, Vancouver. Technical Note (in process).

For further information, contact:

George Burns, Corduroy Creek Contracting Ltd., PO Box 586, New Hazelton, BC V0J 2J0 Tel.: 250-842-6842.

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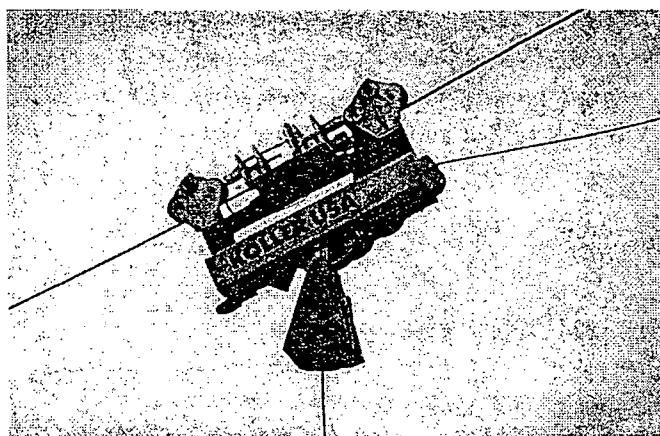


Figure 2. Koller SKA 2.5 carriage.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cable
Item: #20**

Region

Coastal British Columbia

Author

Marv Clark, RPF

Date

September 1998

Source

FERIC study in progress

Contractor

Millstone Contracting Ltd., Nanaimo, BC

Equipment

- hand falling
- Timbco 415 excavator with Pierce single-grip harvesting head
- Diamond D210 swing yarder (Figure 1)
- Link-Belt hydraulic log loader (Figure 2)
- Ranger 667 grapple skidder

Location

MacMillan Bloedel's private land near Port McNeill, BC

Site and stand

- Coastal Western Hemlock (CWHvm1) ecosystem
- 50-year-old unmanaged second growth stand
- western hemlock (80 %), amabilis fir (15 %), Sitka spruce (4 %), and western red cedar (1 %)
- preharvest - 1290 trees/ha, 950 m³/ha, average dbh of 28 cm, average height of 27 m
- site index is 33 m (hemlock at 50 years)
- silty loam soils with a low coarse fragment content
- no measurable slopes
- some yarding obstacles in the form of large stumps from first harvest and some old windthrow-derived hummocks

Prescription

- the Diamond D210 swing yarder was used to harvest 3 treatment blocks to different residual



Figure 1. Diamond D210 swing yarder.

stocking levels: 200 trees/ha, 300 trees/ha, and 450 trees/ha

- dominant, well rooted trees of good form were retained as crop trees.

Operating procedure

- two falling methods were employed: hand falling on the 450 trees/ha block and mechanical falling and processing on the 200 and 300 trees/ha blocks
- 3-m wide yarding corridors were located approximately 35 to 40 m apart
- logs were prebunched in, and adjacent to, the yarding corridors using a small Link-Belt hydraulic log loader (Figure 2)
- the yarder was rigged with a standing skyline. Back spars were rigged on all corridors and intermediate lift trees were used on corridors longer than 200 m
- turns were partially suspended during yarding
- a Maki II motorized slack pulling carriage was used with both hot and preset chokers (usually 3)

Table 1. Yarding Specifications

Diamond D210 swing yarder	
Engine (Cummins 6CT8.3C)	157 kW
Transmission (Funk 2000)	6 speeds forward 3 speeds reverse
Line capacity	
Mainline/haulback	550 m - 16 mm
Skyline	610 m - 21 mm
Maximum line speed (m/min)	1150
Maximum line pull (kg)	20 500
Approx. weight (kg)	30 000
Max. track width (m)	3.3
Operating tower height (m)	12.5
Max. swing radius (m)	2.9
Max. travel speed (km/h)	4.8
Ground clearance (m)	0.44

- a Ranger 667 grapple skidder was used to skid logs away from the landing chute and to deck logs into 5 grade sorts along the road
- a self-loading log truck was employed intermittently to deliver the presorted loads to the sortyard

Equipment description and specifications

See Table 1.

The Diamond D210 worked well on all 3 treatment blocks monitored, however the capacity of the machine was in excess of the requirements for the Port McNeill study block. Turn size and cycle time were controlled more by the need to minimize residual tree damage than machine capacity.

Table 2. Study Results

Residual density (trees/ha)	Average productivity		Average piece size (m ³)
	Scheduled (m ³ /SMH)	Productive (m ³ /PMH)	
200	11.1	15.3	0.34
300	11.2	16.6	0.27
450	7.5	10.5	0.25



Figure 2. Link-Belt hydraulic log loader.

Study results

Results of the study are summarized in Table 2. This project was funded by Forest Renewal BC and a report will be available in 1999.

Equipment suppliers

Diamond D210 yarders are available through Parker Pacific, 2470 North Island Hwy., Campbell River, BC, V9W 2H1, Tel.: 250-287-8878 Fax: 250-287-2317.

The suggested base price for the Diamond D210 yarder is \$575 000, not including lines and carriage.

For further information, contact:

Dave Douglas, Parker Pacific, 2470 North Island Hwy., Campbell River, BC V9W 2H1 Tel.: 250-287-8878 Fax: 250-287-2317.

Glen Sawden, Millstone Contracting Ltd., Nanaimo, BC Tel.: 250-756-0708.

References:

FERIC Compendium article Equipment Yarding 10.

FERIC Compendium article Operations Cable #5.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #19 Model: Ponsse Cobra / Ergo

Illustration

- Ponsse Cobra HS 10 harvester (Figure 1)

Locations

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997 and Pacific Logging Congress Equipment Demonstration, Bellevue, Washington, September 17-21, 1997.

Equipment specifications

See Table 1. Additionally,

- 6- or 8-wheel drive, articulated harvester
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- active suspension system keeps the cab upright on uneven terrain
- Ponsse HN 125 crane can reach from 2.4 to 10.0 m
- crane platform can be hydraulically tilted for operating on uneven or sloping terrain
- Ponsse H53, H60 and H73 single-grip harvesting heads with cutting capacities of 55, 65 and 70 cm respectively

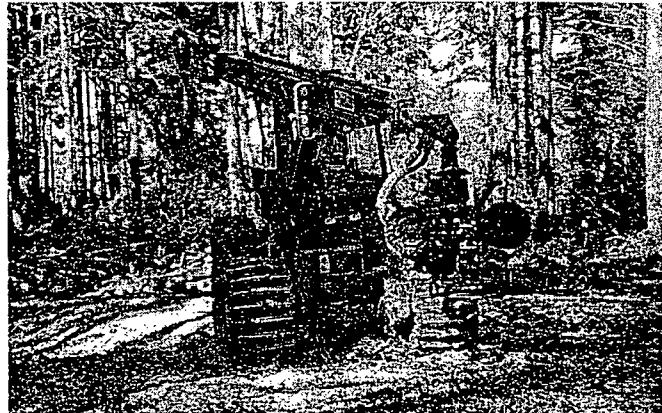


Figure 1. Ponsse Cobra HS 10 harvester.

Manufacturer

Ponsse equipment is manufactured by Ponsse FIN-74200 Vierema, Finland Tel.: 358-17-768-461 Fax: 358-17-768-4690.

Distributor

Ponsse equipment is available through Ponsse USA, Inc. 2310 Peachford Road, PO Box 88390, Atlanta, GA 30338 Tel.: 770-454-7799 Fax: 770-454-7090.

For further information, contact:

Ponsse USA, Inc. 2310 Peachford Road, PO Box 88390, Atlanta, GA 30338 Tel.: 770-454-7799 Fax: 770-454-7090.

Ponsse FIN-74200 Vierema, Finland Tel.: 358-17-768-461 Fax: 358-17-768-4690.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Table 1. Ponsse Harvester Specifications

	Cobra HS 10 harvester	Ergo HS 16 harvester
Engine power (kW)	134	157
Engine	Perkins 6-cylinder diesel	Caterpillar 6-cylinder diesel
Power transmission	hydrostatic/ mechanical 8-wheel drive	6-wheel drive
Width (m)	2.60	2.64
Length (m)	7.16	7.54
Height (m)	3.46	3.74
Weight (kg)	13 600	15 400
Crane reach (m)	10.0	10.0
Ground clearance (m)	0.63	0.61



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #20 Model: Skogsjan 695

Illustrations

- Skogsjan 695 harvester (Figures 1 and 2)
- Skogsjan 655 single-grip harvesting head (Figure 3)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997 and Pacific Logging Congress Equipment Demonstration, Bellevue, Washington, September 17-21, 1997.

Equipment specifications

- wheels are individually adjustable up to 40 cm
- can manually compensate for slopes up to 15° fore and aft and 25° side to side (Figure 2)
- 4-wheel drive, articulated harvester
- on-board DASA computer aids bucking and measuring system manually or automatically
- very good visibility
- cab moves with the harvesting head
- Caterpillar 3126 engine, 165 kW
- Skogsjan single-grip harvesting heads (Table 1)
- Skogsjan 1800 and 2200 knuckleboom cranes with

Table 1. Skogsjan Single-Grip Harvesting Heads Specifications

	Skogsjan harvesting heads			
	645	655	665	675
Max. cutting diameter (cm)	45/55	55	63	63/73
Max. dellimbing diameter (cm)	43	53	53	58
Dellimbing knives:				
1 fixed plus		3 moveable		4 moveable
Rubber feedrollers with chains, diameter (cm)	36	45	45	51
Weight (kg)	710	950	1000	1460



Figure 1. Skogsjan 695 harvester.

- telescopic extensions
- approximate weight 17 500 kg

Manufacturer

Skogsjan equipment is manufactured by Caterpillar Forest Products Inc.

Equipment distributors

In North America, Skogsjan equipment is available through Caterpillar dealers for example, Finning Ltd., 20150 10 Langley By-Pass, Langley, BC V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

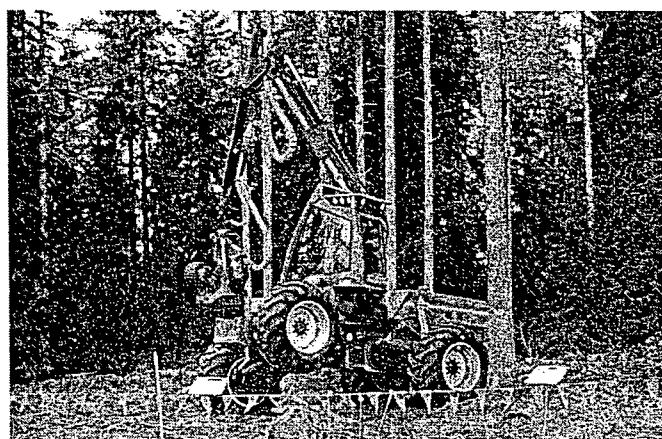


Figure 2. Skogsjan 695 harvester, note wheel position.

For further information, contact:

Finning Ltd., 20150 10 Langley By-Pass, Langley, BC
V3A 5E7 Tel.: 604-533-1244 Fax: 604-533-0374.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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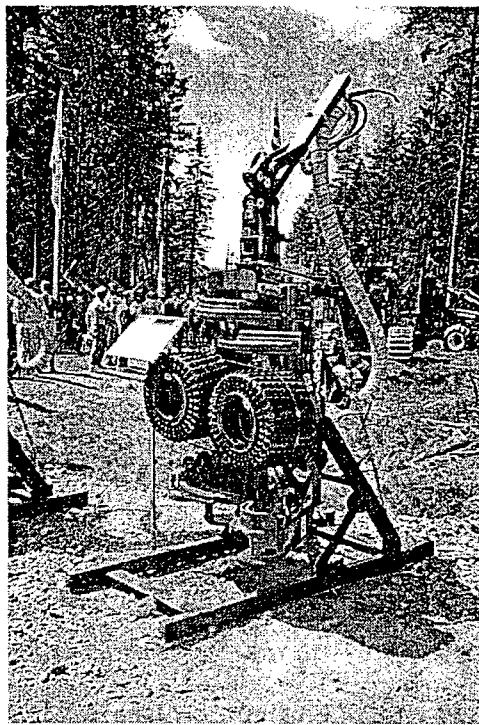


Figure 3. Skogsjan 655 single-grip harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #21 Model: Rocan Enviro-Can Harvester

Illustration

- Rocan Enviro-Can harvester with a Logmax GM-828 single-grip harvesting head (Figure 1)

Location

Commercial Thinning Workshop II, Miramichi City East, NB, August 11-12, 1998

Contractors

Rocan Forestry Service Ltd., Dieppe, NB

Equipment specifications

See Table 1. Additionally,

- articulated harvester, steering angle of 45° with mid-joint oscillation of 20°
- short wheel base of 2.6 m, 4-wheel drive
- two separate hydraulic systems: one for the working hydraulics and one for the transmission
- side tilt of 15° on operator cab
- can use Rottne RK-42, Mowi 465, or Cranab 290 HL loader
- Logmax GM-828 single-grip harvesting head has 1500 kg feeding force, welded steel frame, case hardened pins, and hard bronze bushings
- harvesting head has fully integrated hydraulics to simplify the crane mount and is compatible with

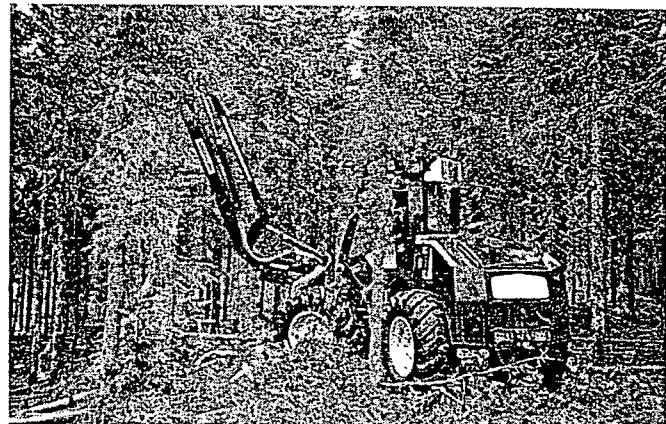


Figure 1. Rocan Enviro-Can harvester.

the Log Mate 392 computer control system with optional diameter measuring feature

Equipment Manufacturer and Distributor

The Rocan Enviro-Can harvester and Log Max GM-828 single-grip harvesting head are available through Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.

For further information, contact:

Alan Anderson, Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.

Brent MacLeod, Rocan Forestry, BC Limited, Box 2940 - 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Rocan Enviro-Can harvester	
Engine power (kW)	88
Engine	4-cycle water cooled turbo engine IVECO 7450
Power transmission	4-speed hydrostatic/mechanical
Head capacity (cm)	41-cm diameter
Approx. weight (kg)	7580
Length (m)	4.3
Height (m)	3.2
Width (m)	2.0
Crane reach (m)	6.5
Ground clearance (m)	0.625



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #22 Model: Prosilva 605 / 710 / 815

Illustration

- Prosilva 605 harvester (Figure 1)
- Keto 100 single-grip harvesting head (Figure 2)

Location

Commercial Thinning Workshop II, Miramichi City East, NB, August 11-12, 1998

Contractors

Hakmet Ltd., Dorion, QC

Equipment specifications

See Table 1. Additionally,

- articulated carrier
- turning radius of 4.65 m
- can use Keto 51, 100 or 150 single-grip harvesting head (Table 2)

Equipment Manufacturer and Distributor

The Prosilva carrier is available through Hakmet Ltd., PO Box 248, Dorion ,QC J7V 7J5 Tel.: 1-800-361-2288 Fax: 450-455-1890.

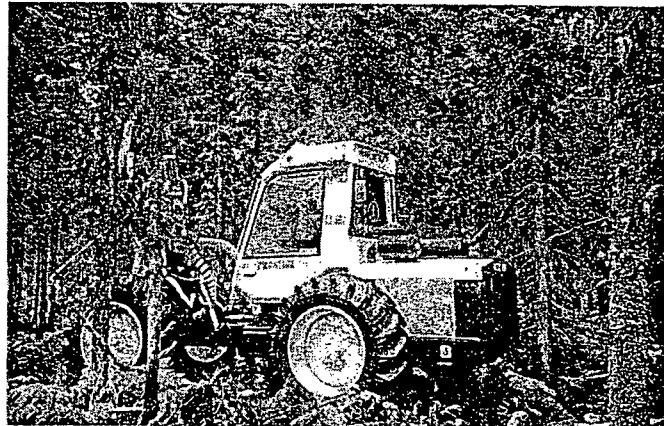


Figure 1. Prosilva 605 harvester with Keto 100 single-grip harvesting head.

The approximate (1998) price of the Prosilva 605 carrier is \$375 000. The Keto 51 single-grip harvesting head is approximately \$90 000.

For further information, contact:

Hakmet Ltd., PO Box 248, Dorion, QC J7V 7J5

Table 1. Prosilva 605 Harvester Specifications

Table 2. Keto Single-Grip Harvesting Heads Specifications*

	Prosilva 605 harvester	Keto 51	Keto 100	Keto 150	
Engine power (kW)	114	400	560	810	
Engine	6-cylinder turbo charged Perkins 1006-6T	Height (m)	110	120	135
Power transmission	4 WD 4-speed hydrostatic	Depth (m)	80	95	105
Approx. weight (kg)	8500	Width (m)	70	78	96
Length (m)	5.3	Max. saw bar (cm)	54	54	64
Height (m)	3.1	Max. knife opening (cm)	37	42	52
Width (m)	2.35-2.75*	Feeder type	2 tracks	2 tracks	2 tracks
Crane reach (m)	8.0	Max. feeding speed (m/s)	5.3	5.2	5.3
Ground clearance (m)	0.60	Tractive force (kN)	24.7	30.2	31.1
		Recommended carrier size (kW)	45-67	56-75	63-97

* Depending on tires.

* Specifications have been updated since Compendium article Equipment Feller-Processor # 16.

Tel.: 1-800-361-2288 Fax: 450-455-1890. E-mail:
Kukkonen@msn.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
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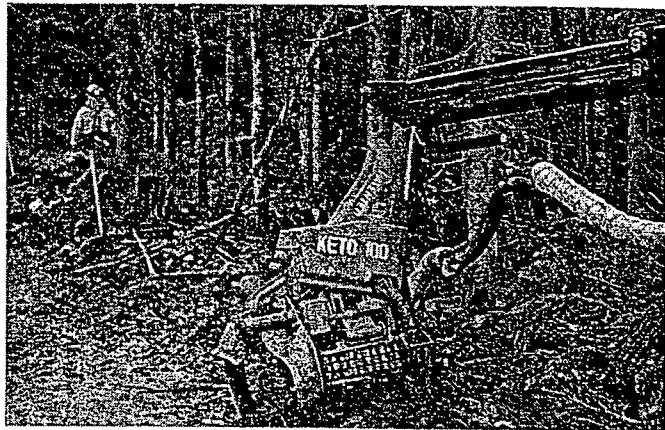


Figure 2. Keto 100 single-grip harvesting head.



**Equipment: Feller-Processor #23
Model: Hemek 880**

Illustration

- Hemek 880 harvester (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair,
Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive, articulated harvester
- bogie on rear
- Pendo-cab is horizontally self-aligning, vertically damped, hydraulically rotational
- Mowi 135 L crane with 10.2 m reach
- DASA 380B measuring system
- Woodking 550 single-grip harvesting head

Manufacturer

Hemek equipment is manufactured by Hemek, Box 139, 840 93 Hede, Sweden Tel.: 46-684-105-25 Fax: 46-684-108-58.

For further information, contact:

Hemek, Box 139, 840 93 Hede, Sweden Tel.: 46-684-105-25 Fax: 46-684-108-58.

Table 1. Hemek 880 Harvester Specifications

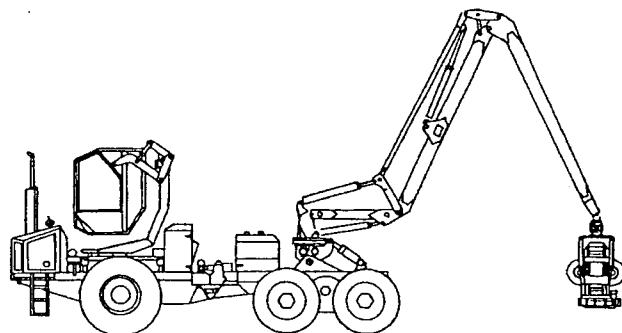


Figure 1. Hemek 880 harvester, note Pendo cab (Photo from Hemek brochure).

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**Hemek 880
harvester**

Engine power (kW)	147
Engine	Iveco 8361
Power transmission	6-cylinder TD 8.1
Cutting capacity (cm)	hydrostatic/ mechanical 55.0 cm diameter
Width (m)	2.80
Length (m)	7.60
Height (m)	3.70
Weight (kg)	16 600
Crane reach (m)	10.2
Ground clearance (m)	0.58



Equipment: Feller-Processor #24
Model: Sifor 616

Illustrations

- Sifor 616 harvester (Figure 1)
- Sifor 500 single-grip harvesting head (Figure 2)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive, articulated harvester
- Loglift 200V crane with parallelogram and 0.8-m telescopic extension
- Sifor 500 single-grip harvesting head has continuous rotator
- very good visibility
- low center of gravity
- on board computer with data printer or memory card

Manufacturer and distributor

Sifor equipment is manufactured and distributed by Equip Forêt, 17, Boulevard des Charpentiers, Zone

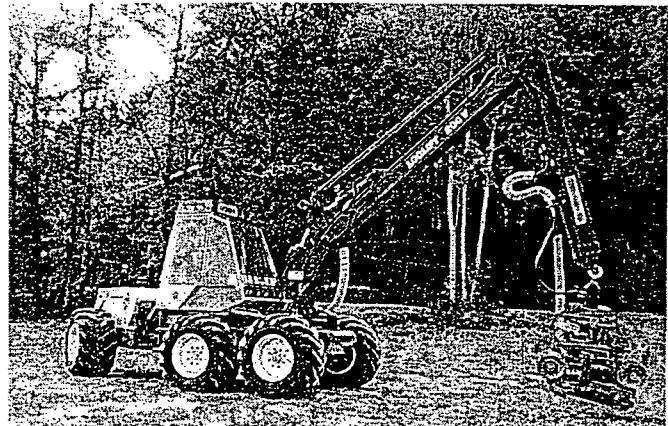


Figure 1. Sifor 616 harvester (photo from Sifor brochure).

Artisanale, 19250 Meymac, France Tel.: 33-05-55-46-16-16 Fax: 33-05-55-46-16-17.

For further information, contact:

Equip Forêt, 17, Boulevard des Charpentiers, Zone Artisanale, 19250 Meymac, France Tel.: 33-05-55-46-16-16 Fax: 33-05-55-46-16-17

Table 1. Sifor 616 Harvester Specifications

	Sifor 616 harvester
Engine power (kW)	125
Engine	Iveco turbo charged 6-cylinder diesel
Power transmission	hydrostatic
Cutting capacity (cm)	5.0 - 60.0
Maximum delimiting diameter (m)	0.55
Approx. weight (kg)	13 000
Length (m)	6.6
Width (m)	2.8
Height (m)	3.27
Crane reach (m)	8.3
Ground clearance (m)	0.61

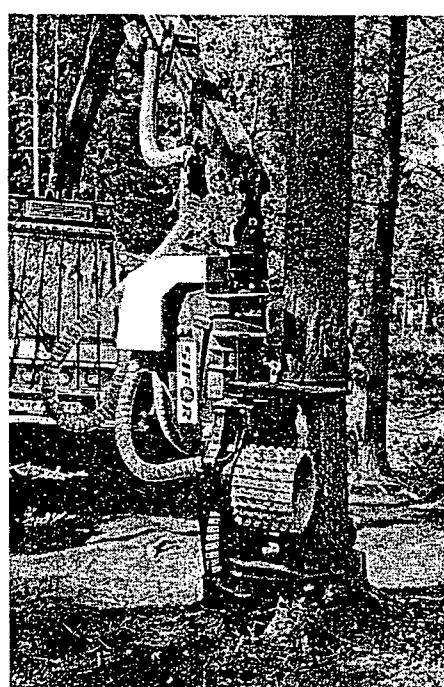


Figure 2. Sifor harvesting head.

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BC V6T 1Z4 Tel.: 604-228-1555.
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Equipment: Feller-Processor #25
Model: Pendo Eva / Master

Illustration

- Pendo Eva Harvester (Figure 1)

Location

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997.

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive, articulated harvester
- pendo cab is self-leveling and can rotate 270°
- operator is always facing the right direction
- Mowi or Loglift crane with 8.3 to 10.7 m reach
- a larger Pendo Master is also available

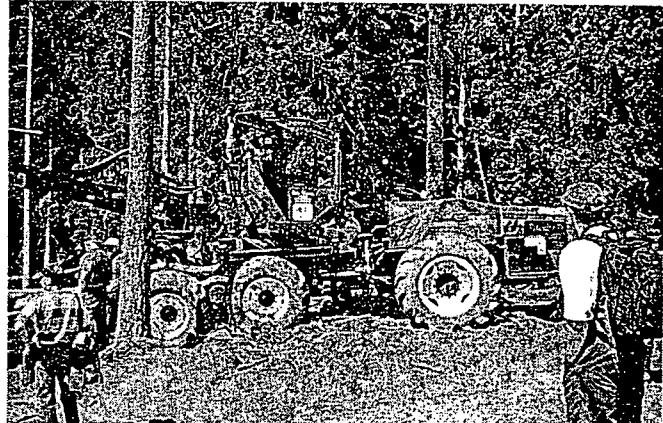


Figure 1. Pendo Eva harvester.

Manufacturer and Distributor

Pendo equipment is manufactured by SRG Alfta Ab, Runemovagen, Box 12, SE-822 21 Alfta, Sweden Tel.: 46-0271-554 20 Fax: 46-0271-107 70.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Table 1. Pendo Harvesters Specifications

	Pendo Eva harvester	Pendo Master harvester
Engine power (kW)	167	167
Engine	Caterpillar diesel	Caterpillar diesel
Power transmission	6-cylinder hydrostatic/ mechanical	6-cylinder hydrostatic/ mechanical
Width (m)	2.85	2.80
Length (m)	7.20	8.11
Height (m)	3.67	3.95
Weight (kg)	15 500	20 000
Crane reach (m)	10.0	10.7



Equipment: Skidder #5

Model: Turboforest T-30 / T-42 Mini-skidder

Illustration

- Turboforest Mini-skidder TF-42C with double drum winch (Figure 1)

Locations

Commercial Thinning Workshop II, Miramichi City East, NB, August 11-12, 1998

Contractors

Turboforest Nova Silva Inc., Asbestos, QC

Equipment specifications

See Table 1. Additionally,

- Turboforest T-30 model also available
- 4-wheel drive articulated: 35° and 41° each side for T-30 and T-42C
- central joint oscillation 14°
- short wheel base 2.3 m
- maximum grade 75%
- radio controlled double drum winch



Figure 1. Turboforest Mini-Skidder TF-42C with double drum winch.

For further information, contact:

Turboforest Nova Silva Inc., 73 St Georges Road N, Asbestos, QC J1T 3M7 Tel./Fax: 819-821-4617 Toll Free: 1-800-567-7318
E-mail: novasylv@microtec.net

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

Equipment Manufacturer and Distributor

Turboforest skidders are manufactured and distributed by Turboforest Nova Silva Inc., Asbestos, QC.

Table 1. Turboforest Mini-Skidders Specifications

	Turboforest TF-30	Turboforest TF-42C
Engine power (kW)	37	37
Engine	4 cylinders water cooled	
Perkins 104-22		
Power transmission	hydrostatic	hydrostatic
Approx. weight (kg)	3410	4155
Width (m)	1.9	1.9
Length (m)	4.4	5.1
Height (m)	2.42	2.55
Turning radius (m)	4.03	4.16
Winch line pull (kg)	4000	5227
Line speed (m/min)	37-195	20
Ground clearance (m)	0.56	0.50

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #16 Model: Turboforest Mini-Forwarder TF-605

Illustrations

- Turboforest mini-forwarder TF-605 (Figures 1 & 2)

Locations

Commercial Thinning Workshop II, Miramichi City
East, NB, August 11-12, 1998

Contractors

Turboforest Nova Silva Inc., Asbestos, QC

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive, articulated: 36° each side
- maximum speed 25 km/h
- Mowi parallel loader 2046

Equipment Manufacturer and Distributor

Turboforest equipment is manufactured and distributed
by Turboforest Nova Silva Inc., Asbestos, QC.

For further information, contact:

Turboforest Nova Silva Inc., 73 St. Georges Road N,
Asbestos, QC J1T 3M7 Tel./Fax: 819-821-4617
Toll Free: 1-800-567-7318
E-mail: novasylv@microtec.net

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.

Table 1. Turboforest Mini-Forwarder Specifications

Turboforest TF-605 mini-forwarder	
Engine power (kW)	55
Engine	3 cylinders, turbo charged Detroit Diesel D-703 LT
Power transmission	2-speed full power shift reversible
Carrying capacity (ton)	4.5
Crane reach (m)	4.6
Width (m)	2.0
Length (m)	5.7
Height (m)	2.75
Turning radius (m)	4.25
Ground clearance (m)	0.46

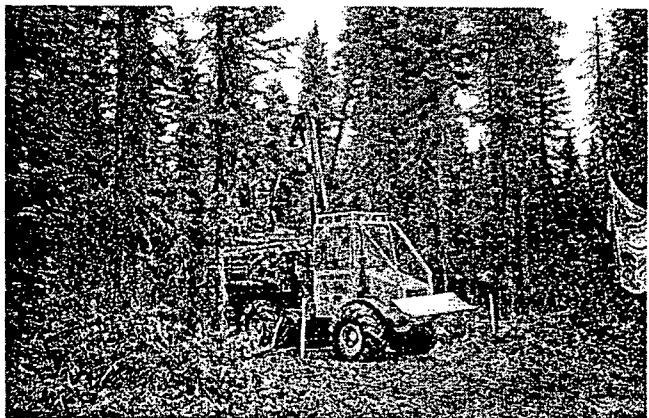


Figure 1. Turboforest mini-forwarder TF-605.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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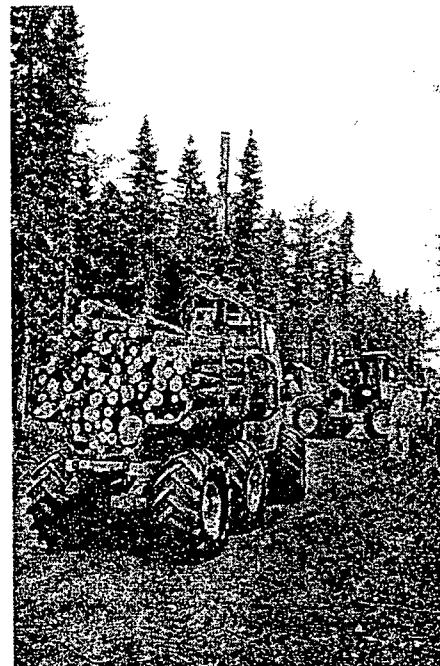


Figure 2. Turboforest mini-forwarder.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #17 Model: Ponsse Buffalo / Caribou / Ergo

Illustrations

- Ponsse Buffalo S16 Forwarder (Figure 1)
- Ponsse Ergo S15 Forwarder (Figure 2)

Locations

Elmia Wood 97: International Forestry Trade Fair, Sweden, June 4-7, 1997 and Pacific Logging Congress Equipment Demonstration, Bellevue, Washington, September 17-21, 1997.

Equipment specifications

See Table 1. Additionally,

- 6- and 8-wheel drive articulated forwarders
- double bogies on rear of Buffalo and Caribou models
- flexible steel track available for the bogies to aid traction and reduce ground pressure
- Ponsse K 70 and 75 crane
- grapple has continuous rotation
- rear frame of Buffalo and Caribou model is made of two sections, making it possible to vary the length of the load

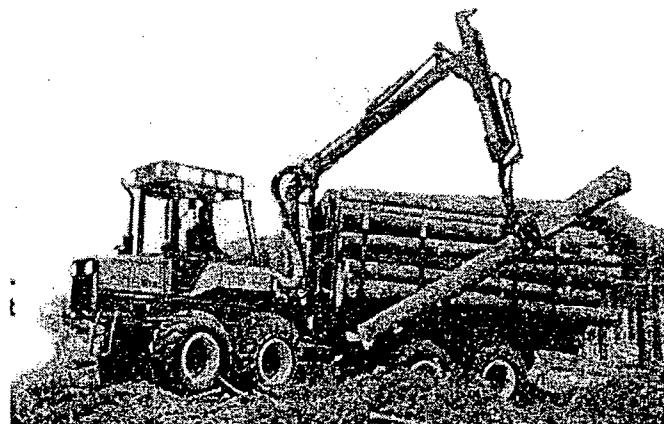


Figure 1. Ponsse Buffalo S16 forwarder (Photo from Ponsse brochure).

- seat swivels 180° for forward and rearward steering

Manufacturer

Ponsse forwarders are manufactured by Ponsse FIN-74200 Vierema, Finland Tel.: 358-17-768-461 Fax: 358-17-768-4690.

Table 1. Ponsse Forwarders Specifications

	Buffalo S16 forwarder	Caribou S10 forwarder	Ergo S15 forwarder
Engine power (kW)	157	91	112
Engine	Caterpillar 6-cylinder diesel	Perkins 4-cylinder diesel	Perkins 6-cylinder diesel
Power transmission	hydrostatic/ mechanical 8-wheel drive	hydrostatic/ mechanical 8-wheel drive	hydrostatic/ mechanical 6-wheel drive
Carrying capacity (kg)	14 000	10 000	12 000
Width (m)	2.96	2.65	2.83
Length (m)	9.8	8.8	9.05
Height (m)	3.75	3.63	3.60
Weight (kg)	15 700	11 900	13 500
Crane reach (m)	9.4	9.1	9.4
Turning radius (m)	7.8	6.5	7.3
Ground clearance (m)	0.70	0.63	0.56

Distributor

Ponsse forwarders are available through Ponsse USA, Inc. 2310 Peachford Road, PO Box 88390, Atlanta, GA 30338 Tel.: 770-454-7799 Fax: 770-454-7090.

For further information, contact:

Ponsse USA, Inc. 2310 Peachford Road, PO Box 88390, Atlanta, GA 30338 Tel.: 770-454-7799 Fax: 770-454-7090.

Ponsse FIN-74200 Vierema, Finland Tel.: 358-17-768-461 Fax: 358-17-768-4690.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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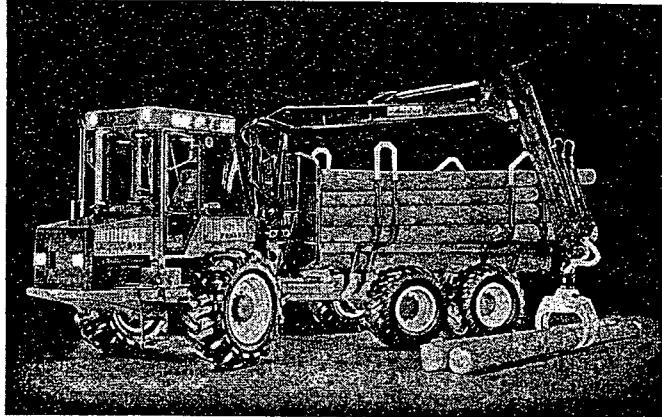


Figure 2. Ponsse Ergo S15 forwarder (Photo from Ponsse brochure).



Equipment: Yarder #10
Model: Skylead C-40 16000 series

Reference

Compendium articles Operations Cable #16 and #17

Illustrations

- Skylead C-40 16000 yarder (Figure 1)
- Eaglet carriage (Figure 2)
- intermediate support tree (Figure 3)

Locations

The yarder was viewed on Crown land near Campbell River, BC in a commercial thinning operation. It was also viewed on Weyerhaeuser's Timber Sale Licence near Clearwater, BC in a clearcut operation and on Crown land near Kitwanga, BC harvesting in a group selection. Skylead yarders have been used in commercial thinning and partial cutting operations since 1987 in Canada and 1991 in the USA.

Contractors

Low Impact Forest Harvesting Ltd., Courtenay, BC
Red Hot Forestry Services, Clearwater, BC
Kitwanga Lumber Co., South Hazelton, BC

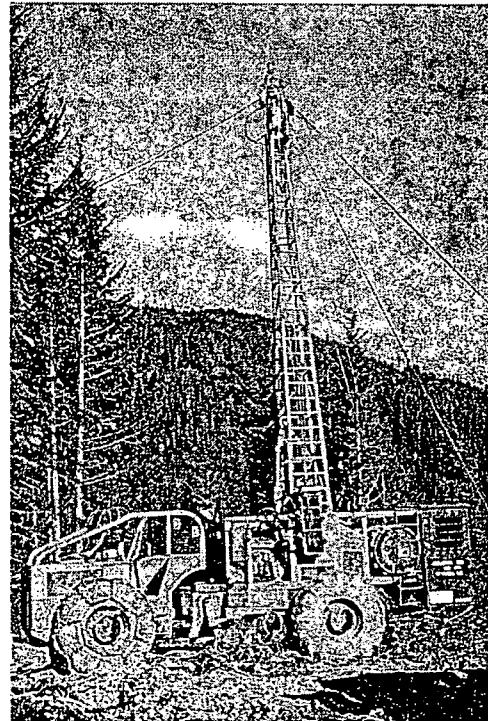


Figure 1. Skylead C-40 yarder.

Table 1. Skylead C-40 Yarder Specifications

Engine	Cummins diesel, 6 cylinder
Engine power (kW)	174
Power transmission (Allison, automatic)	4 speed forward 1 speed reverse
Winch drive	mechanical
Line capacity	
Skyline	610 m - 19 mm
Mainline	610 m - 12 mm
Haulback	1280 m - 12 mm
Guyline	60 m - 19 mm
Max. line speeds (m/min)	
Mainline	714
Haulback	714
Max. line pulls (kg)	
Skyline	20 530
Mainline	15 950
Overall tower height (m)	12.2



Figure 2. Eaglet carriage at the yarder.

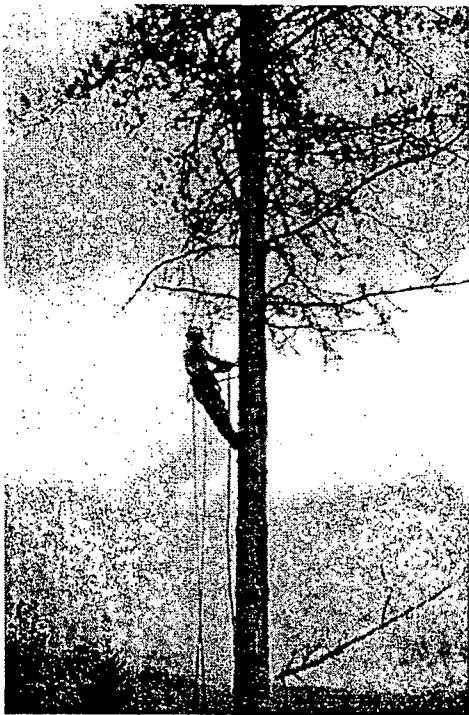


Figure 3. Intermediate support tree being prepared for rigging.

Equipment description and specifications

See Table 1. Additionally,

- 12.2 m lightweight latticed tower
- 4 drum guyline system
- can use intermediate supports to reduce road construction, overcome physical obstacles, access more ground per setting, and reduce yarding and rigging time where ground clearance is a problem
- rigging intermediate supports require 1.5-2.0 hours labour
- can be trailer, truck or skidder mounted
- tightening side on guyline drums reduces cable wear and hang-ups
- can be used for both uphill and downhill yarding
- radio controlled carriage (Maki II or Eaglet) can be moved up or down the skyline to adjust for hang-ups when lateral yarding
- average productivity, depending on terrain and piece size, is 100-250 m³/day

Equipment Manufacturer and Distributor

The yarder is manufactured and distributed by Skylead Logging Equipment Corp. Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

The approximate (1998) price for the Skylead yarding system is \$430 000 including cable, rigging, radios and a carriage.

For further information, contact:

Murray Coulter, Low Impact Forest Harvesting Ltd., RR#3, S-335, C-1, Courtenay, BC V9N 5M8 Tel.: 250-334-2433.

Gordie Bryan, Red Hot Forestry Services, Clearwater, BC Tel.: 250-674-3804.

Philip Carruthers, Forestry Superintendent, Kitwanga Lumber Co., (Skeena Cellulose Inc., Carnaby Operations), #10 North Boundary Road, South Hazelton, BC V0J 2R0 Tel.: 250-842-5399 Fax: 250-842-5123.

Bill Varner, Skylead Logging Equip. Corp. Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877. E-mail: skylead@junction.net

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #5 Model: Niab 5-15B

Reference

FERIC Field Note Partial Cutting-12

Illustration

Niab 5-15B processor mounted on a Zetor 8145 tractor (Figure 1)

Location

Canadian Woodlands Forum Commercial Thinning Workshop: Amherst, NS, August 1997.

Equipment specifications

See Table 1. Additionally,

- attaches to tractor by the three-point hitch
- hydraulic pump is attached to the tractor power take off (PTO)
- winch controlled either remotely or by means of a button on the control panel
- equipped with a length meter, and lengths are shown on the control panel display
- limbing knife pressure can be modified
- control panel height is adjustable

Manufacturer

Niab 5-15B tractor-mounted processors are manufactured by Niab, Box 153, S-830 47 Trangsviken, Sweden Tel.: 46-640-402-10 Fax: 46-

Table 1. Niab 5-15B Tractor-Mounted Processor Specifications.



Figure 1. Niab 5-15 tractor-mounted processor (photo courtesy of J. Lurette).

640-403-70.

Equipment Distributors

Niab 5-15B tractor mounted processors are available through Silvana Import Trading Inc. Suite 304, 4269 West Ste-Catherine Street, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3523 Fax: 514-939-3863.

Approximate (1997) price of the Niab 5-15B tractor-mounted processor is \$45 000.

For further information, contact:

Dick Johnsson, Silvana Import Trading Inc. Suite 304, 4269 West Ste-Catherine Street, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3523 Fax: 514-939-3863.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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	Niab 5-15B processor
Power required (kW)	30
Hydraulic flow rate (l/min)	60
Maximum stem diameter (cm)	50.0
Length of winch rope (m)	40.0
Winch effort (tonnes)	2.50
Width (m)	2.45
Height (m)	2.30
Length (m)	2.00
Weight (kg)	1030

SR108-8

FOREST ENGINEERING
RESEARCH INSTITUTE
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Western Division



INSTITUT CANADIEN
DE RECHERCHES
EN GENIE FORESTIER
Division de l'ouest

December, 1999

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108)

The Compendium of Commercial Thinning Operations and Equipment in Western Canada has received funding for 1999/2000 from Forest Renewal BC.

The enclosed material comprises the eighth issue of fourteen, 1-page descriptions of commercial thinning operations and equipment. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you did not receive the first seven issues, please complete the form below and send it to the address given.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING OPERATIONS AND EQUIPMENT — (SR-108)

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid Item: #7

Region

Coastal British Columbia

Author

Craig Evans, A.Sc.T.

Date

November 1999

Source

FERIC field visit in July 1999

Contractor

Salix Trading Inc., North Vancouver, BC

Equipment

- hand falling
- LKT 50 line skidder (Figure 1)

Location

Kevco Timber Ltd.'s Woodlot 085, near Union Bay, BC

Site and stand

- Coastal Western Hemlock (CWHxm1) ecosystem
- 80-year-old second-growth Douglas-fir
- preharvest - 541 trees/ha, 500 m³/ha, average dbh of 39.2 cm
- < 10% slope
- scattered residual old-growth stumps

Prescription

- spacing to reduce crown closure and for volume removal
- target stand of 265 trees/ha with average dbh of 46.7 cm

Operating procedure

- LKT 50 was demonstrated to perspective dealers and woodlot operators. A factory-trained operator from ZTS of Slovakia was on site to assist new operators with details on the operation of the machine.
- FERIC's study results were derived from detailed timing data collected while the machine was being



Figure 1. LKT 50 line skidder.

operated by Kevco Timber personnel who had no previous experience with the LKT 50.

- skid trails were perpendicular to existing roads
- stems were manually felled away from or along the trails whenever possible so the butts could be hooked
- ideally, an operator would stand in the clear behind the turn and use the remote control to winch in the turn. The operator could then rehook any stems that became disconnected while winching without having to enter and leave the machine each time the rehooking was required.
- however, the operator was new and not used to line skidding with a remote control

Equipment description and specifications

See Table 1. Additionally,

- 4-wheel drive with differential lock
- remote control operated the skidder RPM and the speed and direction of the double-drum winch
- three chokers, with offset bell and 11-mm cable, on each winch
- PTOs located at front and rear of machine for flexibility of mounting attachments for use in silviculture, harvesting, road maintenance and agriculture

Study results

Results of FERIC's study are summarized in Table 2. The productivity of the skidder may have increased if the operator had used the remote, since many turns did disconnect. The lower tractive ability of the small tires when pushing larger turns into the deck affected the decking productivity because the tires would slip on the ground.

Mechanical delays were minor, but the empty choker bells were inadvertently pulled through the fairlead after the turn had been unhooked, causing the choker bells to wrap with the line around the winch drum. A small modification to the fairlead to allow only the line to get through could easily remedy this minor inconvenience.

Equipment suppliers

LKT skidders are manufactured by ZTS TEES Lesné traktory Ltd., in the Slovak Republic and are distributed in Canada by Salix Trading Inc., North Vancouver, BC.

The approximate (1999) price of the LKT 50 line skidder is \$99,000 complete with guarding necessary for forestry.

Reference

Compendium article Equipment Skidder #6.

Table 2. FERIC Study Results

Total productive time (h)	2.5
Total volume skidded (m^3)	25.88
Production (m^3/h)	10.30
Average piece size (m^3)	0.56
Average skidding distance (m)	75.8

For further information, contact:

Dr. Vlado Butora, Salix Trading Inc., 800 Hendry Avenue, North Vancouver, BC V7L 4C9 Tel.: 604-980-1182 Fax: 604-980-1142.
E-mail: latcan@istar.ca

Kevco Timber Ltd., 5370 Langlois Rd., Courtenay, BC V9N 5M9 Tel./Fax: 250-334-9649.
E-mail: kevco@island.net

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Table 1. LKT 50 Line Skidder Specifications

LKT 50 line skidder	
Engine power (kW)	47
Engine - Perkins 704-30	diesel, 4 stroke
Power transmission	hydrostatic
Maximum speed (kph)	20
Approximate weight (kg)	4 560
Width (m)	1.95
Length (m)	4.98
Height (m)	2.92
Turning radius (m)	3.68
Winch line pull (kg)	3600 each
Line speed (m/min)	60
Ground clearance - with standard tires (m)	0.40



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region

Central Interior British Columbia

Author

Janet Mitchell, RPF

Date

November 1999

Source

FERIC field visit in November 1998

Contractor

Alfa Fab Ventures, 100 Mile House, BC

Equipment

- hand falling
- Hi-Skid log forwarder (Figure 1)
- breakaway block (Figure 2)

Location

British Columbia Institute of Technology Forest Society's Woodlot 007, near Maple Ridge, BC

Site and stand

- Coastal Western Hemlock (CWHdm) ecosystem
- 70-year-old second-growth stand of Douglas-fir, western red cedar, and western hemlock
- preharvest - average dbh of 22 cm, average height of 35 m
- average slopes of 0-10%
- frequent obstacles (old stumps and windthrow), uneven ground roughness and medium ground strength (thick moss)

Prescription

- residual trees were pre-marked by the woodlot forester at approximately 9-m spacing

Operating procedure

- trees were hand felled, top towards the road
- stems were delimbed and topped at the stump
- stems close to the road were bucked into short logs (5.6, 6.25, and 6.86 m), but stems further from the road edge were left tree length and bucked at roadside

Harvesting System: Cut-and-Skid
Item: #8

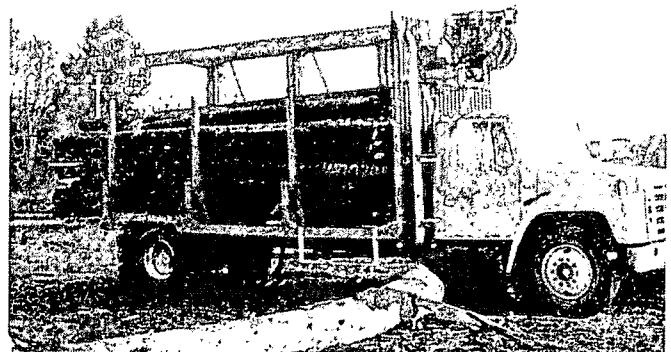


Figure 1. Hi-Skid log forwarder.

- operator carried three chokers, a breakaway block, and the mainline to the prepared logs (Figure 2)
- operator attached the turn to the mainline, returned to the landing and, using a hand-held remote control, operated the yarding and loading functions
- breakaway block was used to deflect logs around hang-ups and to increase lift
- block was strapped to a tree and released through a latching mechanism that was triggered as the rigging passed through the block and followed the rigging into the landing (Figure 2)
- during yarding, a trolley-mounted fairlead was suspended from a track assembly extending out over the back of the truck
- as the turn reached the truck, the fairlead moved forward along the track, and pulled the logs onto the truck bed

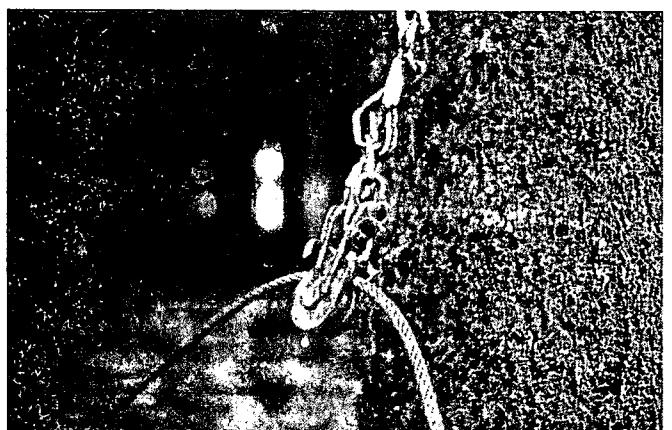


Figure 2. Breakaway block.

- dumping was accomplished with three hydraulic cylinders vertically mounted on the driver's side of the truck
- cylinders tension three open-link chain slings, which extend under the load to pivoting stakes on the opposite side (Figures 3 and 4)
- partially activated, the slings were used to realign the load

Equipment description and specifications

See Table 1. Additionally,

- mounted on a truck rated to 15 250 kg gross vehicle weight
- hydraulically-driven winch with 100 m of 13-mm diameter cable and three chokers

Productivity

During the demonstration, the Hi-Skid was able to yard and load 4.16 m³/h (piece size of 0.24 m³). The estimated average and maximum yarding distances were 30 and 80 m, respectively. At this production rate, including travel time to the log dump and unloading time, the Hi-Skid could deliver a load to the log dump every 4 hours, or 24 m³/8-hour shift.

The obstacles on the site and the inability of the Hi-Skid to pull the logs free without intervention by the operator or faller affected yarding productivity. Loading productivity was affected by the alignment of the previously loaded logs and the operator had to periodically re-align the load through partial activation of the unloading function.

Equipment supplier

The Hi-Skid log forwarder was designed and built by John Schulte, Alfa Fab Ventures, with technical assistance from FERIC and financial assistance from Forest Renewal BC's Forest Innovation Development Program, delivered by BC Advanced Systems Institute.

Approximate (1999) price of the Hi-Skid, depending on the options, is between \$50 000 and \$60 000.

Table 1. Hi-Skid Log Forwarder Specifications

Log forwarder	
Carrying capacity	15 250
Maximum yarding speed (m/min)	69
Line pull - average/maximum (kN)	18.8 / 26.7
Width of bunks (m)	2.43

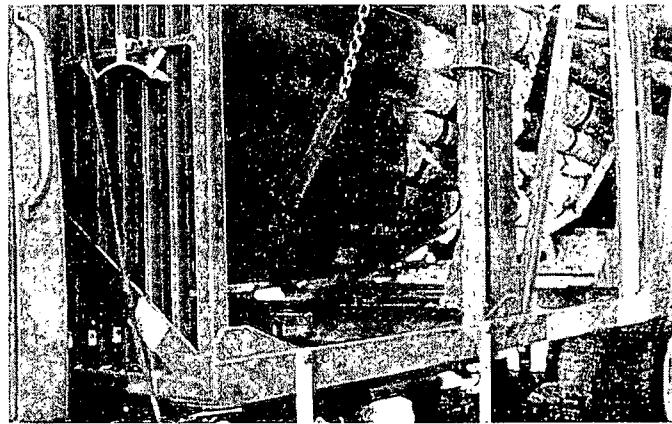


Figure 3. Chain slings realign or dump the load.

References

Compendium article Operations Forwarder #18
FERIC Field Note General-73

For further information, contact:

John Schulte, Alfa Fab Ventures, C-70 Young Road
RR#1, 100 Mile House, BC V0K 2E0 Tel.: 250-395-4249 Fax: 250-395-1872.
E-mail: schulte@bcinternet.net

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999.

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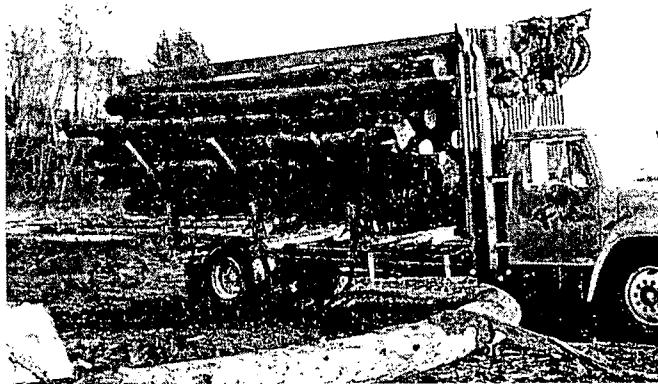


Figure 4. Load being dumped at the sortyard.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region
Québec

Author
Janet Mitchell, RPF

Date
November 1999

Source
FERIC field visit in August 1999

Equipment

- hand falling, processing
- Turboforest T-42C line skidder (Figure 1)

Location
Private woodlot, near Asbestos, Québec

Site and stand

- stand of mixed hardwood species on a private woodlot
- 100% of the trees had been damaged by the ice storm in 1998 and exhibited various degrees of damage from missing branches, broken tops to stems bent to the ground or snapped off above ground
- gentle to rolling slopes
- obstacles from bent trees, large branches scattered across the site and windthrown trees criss-crossing the ground

Prescription

- remove severely damaged trees and minimize damage to the residual trees
- this was a very dangerous operation, and many experienced fallers would not work on the operation

Operating procedure

- hand faller fell trees and limbed the stems at the stump
- skidder operator winched logs to trail edge and then to the landing
- skidder operator processed the logs into pulp wood (2.4-m lengths) (Figure 2)

Harvesting System: Cut-and-Skid
Item: #9



Figure 1. Turboforest skidder.

- processed logs were then manually stacked into piles until hauling to the mill by another subcontractor

Equipment description and specifications
See Table 1. Additionally,

- 4-wheel drive
- central joint oscillation 14°
- short wheel base (2.3 m)

Table 1. Turboforest Skidder Specifications

Turboforest T-42C skidder

Engine power (kW)	37
Engine	4 cylinders
Perkins 104-22	water cooled
Power transmission	hydrostatic
Approximate weight (kg))	4155
Width (m)	1.90
Length (m)	5.10
Height (m)	2.55
Turning radius (m)	4.16
Winch line pull (kg)	5227
Line speed (m/min)	20
Articulation	± 41°
Ground clearance (m)	0.50

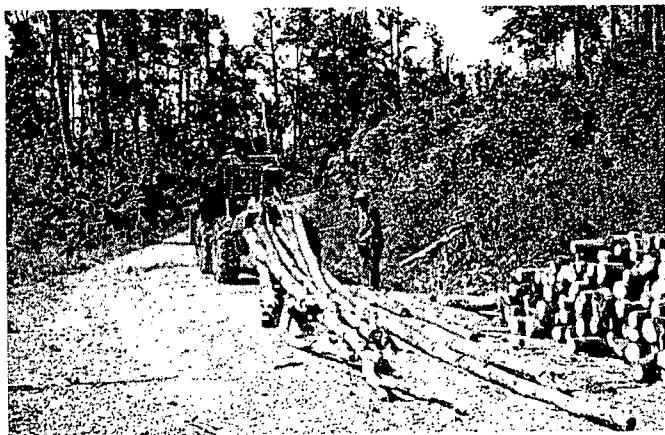


Figure 2. Turboforest with turn waiting to be processed.

- maximum grade 75%
- radio-controlled engine and double-drum winch (Figure 3)
- operator's seat is now 10 cm higher than in the original models to improve frontal visibility
- dual drum winch was redesigned to improve the winch speed and minimize cable buildup inside the drum housing
- engine will be upgraded to a 47 kW model

Equipment supplier

The Turboforest line skidder is manufactured and distributed by Turboforest NovaSylva, Asbestos, Québec.

The approximate (1999) price of the Turboforest T-42C line skidder is \$90 000.

Reference:

FERIC Compendium article Equipment Skidder #5

Meek, P. 1998. *Evaluation of Two Semi-Mechanized Cut-to-Length Systems in Commercial Thinning*. FERIC, Pointe-Claire. Field Note Partial Cutting-20.

For further information, contact:

Pierre Roy, Turboforest Nova Sylva Inc., 73 St-Georges N. Road, Asbestos, Québec J1T 3M7 Tel.: 819-879-4343 Toll-free 1-800-567-7318 Fax: 819-879-4999 E-mail: proy@turboforest.com.

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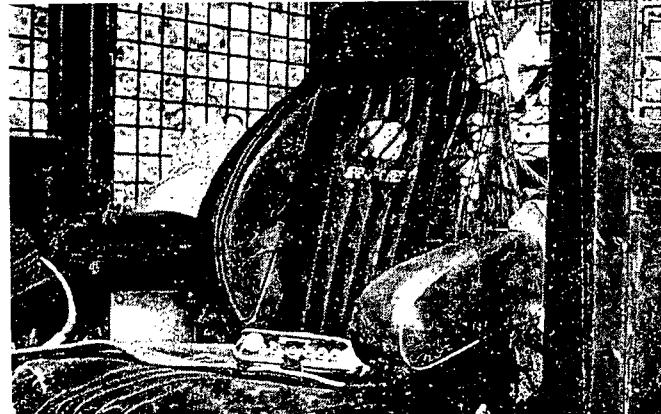


Figure 3. Inside cab of Turboforest skidder, note belt with remote controls sitting on the seat.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region
Québec

Author
Janet Mitchell, RPF

Date
November 1999

Source
FERIC field visit in August 1999

Contractor
Donald Fortin, St.-Edmond des Plaines, Québec

Equipment

- 3 Samsung 130 LCM excavators with DT telebooms, 2 with Pan 828 feller processor heads and 1 with a Valmet 946 feller processor head
- 3 forwarders were a Rotobec F2000, a JM 2000 and an International S8 skidder converted into a forwarder

Location

Carton St Laurent's private land between St.-Félicien and Chibougamau, Québec

Site and stand

- 55-year-old natural stand
- 35% jack pine
- 0-5 % slopes

Prescription

- first thinning with final clearcut in 25 years

Operating procedure

- operator cut the trail and thinned on the right side of machine working away from the road
- left side of machine had a blind spot and the operator did not have a clear view, so he then turned and cut on the other side of the trail working towards the road
- operator was allowed up to 10% damage to residual stems without penalty

Harvesting System: Cut-to length
Item: #19



Figure 1. Samsung 130 LCM with PAN 828 harvesting head.

Production

Contractor estimated the harvester was able to cut 110 stems or 7-9 m³/8-hour shift.

Equipment description and specifications

See Table 1.

Table 1. Samsung 130 LCM Excavator Specifications

Samsung 130 LCM excavator	
Engine power (kW)	74
Engine - Cummins	4 cylinder water cooled
Power transmission	hydrostatic 2 speed
Approximate weight (kg)	15 000
Cutting capacity (m) ^a	0.40
Width (m)	2.74
Length (m)	4.30
Height (m)	3.02
Tail swing radius (m)	2.26
Boom reach (m)	10.0
Ground clearance (m)	0.65

^a Pan 828 harvesting head.

Table 2 Forwarder Specifications

	Robotec F2000 forwarder	JM 2000 forwarder
Engine power (kW)	87	74.6
Engine	Cummins 4 cylinder hydrostatic	Ford diesel 4 cylinder hydrostatic 3-range gear box
Power transmission		
Approximate weight (kg)	5 500	6 530
Width (m)	2.60	2.28
Bunk width (m)	2.00	2.13
Length (m)	7.60	6.88
Bunk length (m)	3.60	2.30*
Load capacity (kg)	4500	4 500
Height (m)	3.40	2.96
Boom length (m)	5.64	6.00
Turning radius (m)	5.30	6.30
Ground clearance (m)	0.60	0.48

* expandable to 3.6 m

Equipment suppliers

The Samsung excavators are manufactured in Korea and in Québec are distributed by Wajax.

Rotobec F2000 forwarders are manufactured by Rotobec Inc., 200 Industrielle, C.P. 189, Ste-Justine, Québec, G0R 1Y0 Tel.: 418-383-3002 Fax: 418-383-5334.

JM 2000 forwarders are manufactured by Porteurs Forestiers JM 2000 Inc. and distributed by North-American Forestry Distribution Inc, 194, du Carrefour, St-Antonin, Rivièrel-du-loup, Québec G0l 2J0 Tel.: 1-888-376-6233 Fax: 418-867-8654.

The approximate (1999) price of the Samsung 130 LCM excavator with Pan 828 harvesting head is \$160 000.

The approximate (1999) price of the Rotobec F2000 forwarder is \$135 000.

References

Compendium articles Operations Cut-to-Length #21 and Equipment Feller-Processor #26

Ewing R.H.; Lirete, J. 1999. *Second Thinning of Red Pine Plantations with a Small Cut-to-Length System*. FERIC, Pointe-Claire. Field Note Partial Cutting-24.

For further information, contact:

Denis Thibault, Carton St Laurent, 1053 Boulevard Ducharme, La Tuque, Québec G9X 3C3 Tel.: 819-523-4531 Fax: 819-523-9157.

Donald Fortin, St.-Edmond des Plaines, Québec Tel.: 418-274-3526.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #20

Region
New Brunswick

Author
Janet Mitchell, RPF

Date
November 1999

Source
FERIC field visit in August 1999

Contractor
Leclaire Silviculture, Miramichi, NB

Equipment

- hand falling
- manual processing
- Catu porter (Figures 1 and 2)

Location
Near Heath Steel Mine, Miramichi, NB on Crown land managed by Repap New Brunswick Inc.

Site and stand

- natural stand of fir and spruce with some hardwood, regenerated after a fire in 1944
- stand had been juvenile spaced in 1984
- slopes 0 - 30%

Prescription

- extraction trails are 20 m apart

Operating procedure

- contractor ribbons off an area 40-m wide for each cutter
- cutter then cuts two trails and thins between them within his area
- crew of 20 cutters, hand fall, process the trees into 8' logs, sort into pulp or sawlog, and stack them along the extraction trail
- Catu porter then loads and forwards the logs to the main road for hauling to the mill on short-log trucks



Figure 1. Catu porter.

- cutters are paid on a piece-rate that starts at a base rate (\$0.44/log). The rate is increased or decreased depending on 6 criteria: ground conditions, species, amount of crown, amount of branches, size of branches and tree size. Before cutting starts, the contractor and the Licensee walk each block, and the price is agreed upon.

Equipment description and specifications

See Table 1. Additionally,

- Catu porter was designed by Jan Ellingsen of Repap New Brunswick Inc.
- FERIC, Eastern Division assisted prior to the manufacturing stage by providing calculations to optimize the performance

Table 1. Catu Porter Specifications

Catu porter	
Engine power (kW)	56
Engine	Cummins
Approximate weight empty (kg)	7 500
Width (m)	2.25
Length (m)	8.00
Height (m)	3.00
Articulation	± 40°
Ground clearance (m)	0.48

- Case backhoe with Patu powered forwarding trailer and loader
- cab has bi-directional seat for forward and rearward steering
- fuel and hydraulic fluid tank were modified with assistance from FERIC, Eastern Division, to make them more streamlined and prevent "hang-ups" on ground obstacles
- trailer has a hydraulic drive sprocket between each set of rear wheels (Figure 3)
- narrow width (2.25 m)

Productivity

The forwarder can carry approximately 7 m³/load and can forward 14 loads/10-hour shift. The forwarder is being run at 2 shifts/day (Source: Jan Ellingsen, Repap, Miramichi).

Equipment Manufacturer and Distributor

The Catu porter was manufactured by Sunny Corner Manufacturing, Miramichi and is distributed in Canada by Case.

The approximate (1999) price of the Catu porter is \$125 000, depending on options.

For further information, contact:

Jan Ellingsen, Woodlands Division, Repap New Brunswick Inc., 345 Curtis Road, PO Box 5040, Miramichi, NB, E1V 3N3 Tel.: 506-627-3709 Fax: 506-622-5702.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca



Figure 3. Hydraulic drive sprocket between the rear wheels.

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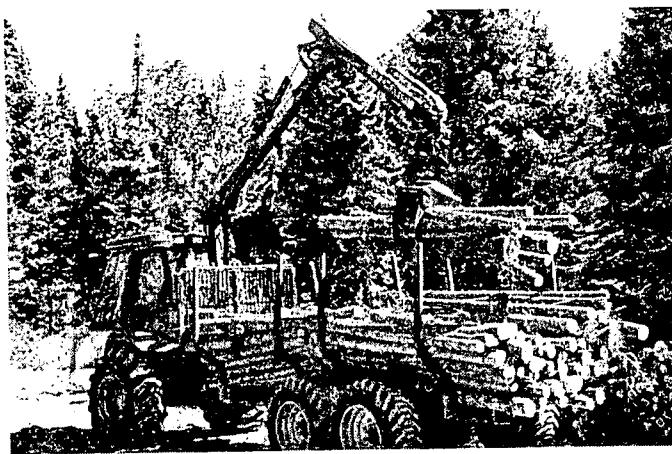


Figure 2. Catu porter unloading at the landing.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length Item: #21

Region
New Brunswick

Author
Janet Mitchell, RPF

Date
November 1999

Source
FERIC field visit in August 1999

Contractor
Les bois Franes FBM Ltd., St-Quentin, NB

Equipment
• JM 2000 444B combination harvester/forwarder
(Figures 1 and 2)

Location
Fraser Paper Inc., St Quentin Division near Plaster Rock, New Brunswick

Site and stand
• natural stand of spruce and balsam fir, some deciduous
• stand had been precommercial thinned in 1982
• preharvest - 2000 trees/ha, average dbh of 13.9 cm, average height of 8.75 m

Prescription
• 15 m between trails, no ghost trails
• 2.4 m residual tree spacing
• residual 14 - 18 m² basal area, removing approximately 30%

Operating procedure
• harvester cuts trails and thins between trails
• pulp logs are 2.4 m (8') long (conifer only)
• sawlogs are 3.6 m (12') long
• when harvesting is complete, the harvesting head is removed and replaced with the grapple
• forwarder then loads the sorted logs and carries them to the roadside
• sawlogs were hauled to Fraser's mill in Plaster Rock and the pulp logs were hauled to Fraser's mill in Edmundston.

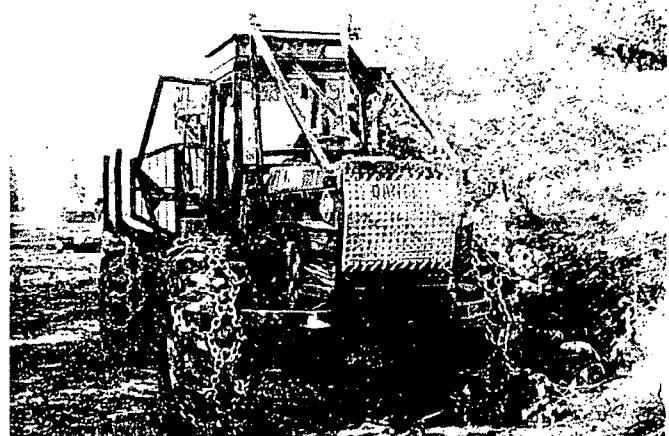


Figure 1 JM 2000 444B.

- contractor is running two shifts per day

Equipment description and specifications

See Table 1. Additionally,

- Ford Versatile 9030 tractor chassis that has been extended 3.0 m
- operator was using a Mowi grapple on a Mowi 4567 boom

Table 1. JM 2000 444B Combination Harvester/Forwarder Specifications

JM 2000 444B	
Engine power (kW)	74.6
Engine	Ford diesel 4 WD
Power transmission	hydrostatic 3 range gear box
Carrying capacity (kg)	4 500
Cutting capacity (cm) ^a	45
Approximate weight (kg)	6 530
Width (m)	2.28
Length (m)	6.88
Height (m)	2.96
Turning radius (m)	6.30
Crane reach (m)	6.00
Ground clearance (m)	0.48

^a Three heads are available from the manufacturer.

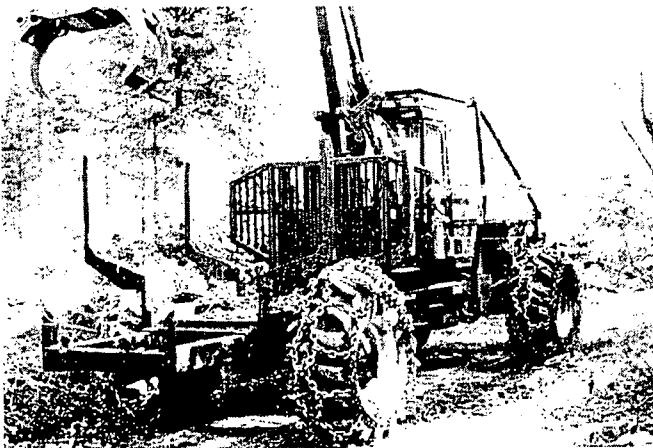


Figure 2. JM 2000 444B combination harvester/forwarder.

- forwarder converts to a harvester by switching the loading grapple with a Patu harvesting head in 45 minutes by removing pin on boom
- parallel boom configuration
- contractor modified the JM 2000 by adding 10 more lights to improve visibility at night, and added a second alternator
- contractor also added a post to rest the grapple or harvesting head, a self-cleaning device on the roller teeth and more guarding
- contractor plans to modify the grapple to eliminate the excess swing every time the operator reaches for a log to load

Equipment Manufacturer and Distributor

The JM 2000 444B is manufactured by Porteurs Forestiers JM 2000 Inc. and distributed by North-American Forestry Distribution Inc., Rivière-du-loup, Québec.

The approximate (1999) price of the JM 2000 444B is \$260 000 excluding taxes.

References:

FERIC Compendium articles Operations Cut-to-Length #19 and Equipment Feller Processor #26.

Ewing, R.H.; Lurette, J. 1998. *Commercial Thinning Using the JM 2000 Cut-to-Length System*. FERIC, Pointe-Claire. Field Note Partial Cutting-17.

For further information, contact:

Pierre Dancause, Fraser Paper Inc., 175A Canada Street, Saint-Quentin, New Brunswick E8A 1J6
Tel.: 506-235-9812 Fax: 506-235-2237.

North-American Forestry Distribution Inc., 194, du Carrefour, St-Antonin, Rivière-du-loup, Québec G01 2J0 Tel.: 1-888-376-6233 Fax: 418-867-8654

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #22

Region
Québec

Author
Janet Mitchell, RPF

Date
December 1999

Source
FERIC field visit in August 1999

Equipment

- Kubota KX 191 excavator with Patu RH 405 head (Figure 1)
- manual falling
- line skidders
- Valmet 828 forwarder

Location

Crown land managed by Coopérative Laterrière near Falardeau, Québec

Site and stand

- 65-year-old stand of black spruce and balsam fir

Prescription

- no pre-marking
- remove one in three trees, approximate 30% of the volume
- trails are 6-m wide, 50-m apart occupying 9% of the block area
- average diameter of residual trees is 5% larger than average diameter of all trees before harvest
- final cut will be in 15 years

Operating procedure

- Kubota excavator with Patu RH405 harvesting head first cuts trail and thins (approximately 6-m) on either side of the trail
- hand fallers then thin remaining area between trails
- line skidder then winches unprocessed stems to the extraction trail (Figure 2)
- Kubota returns to process the skidded stems

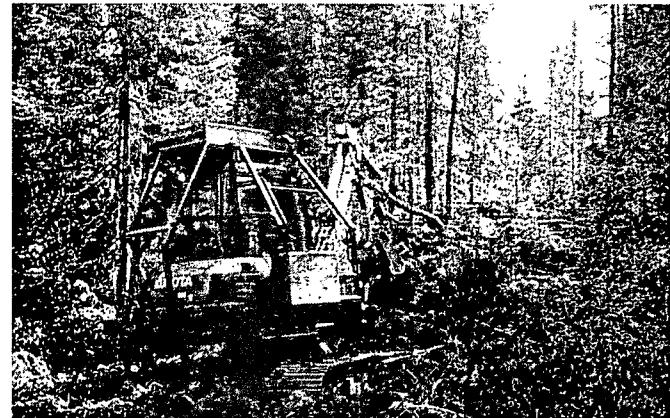


Figure 1. Kubota KX 191 mini excavator with Patu head.

- Valmet forwarder then loads and forwards the processed logs to the landing
- contractor is checked for quality by Cooperative Laterrière with 1 plot (5.64-m radius) per 5 ha

Equipment description and specifications

See Table 1. Additionally,

- original primary and secondary booms of the excavator were removed and replaced with a Patu model 915 crane with telescopic extension (1.6 m) by CamTrac, Quebec City.
- Patu 405 RH head was the new roller-feed unit

Equipment Manufacturer and Distributor

Kubota equipment is manufactured by Kubota

Table 1. Kubota KX 191 Excavator Specifications

Kubota KX 191 excavator

Engine power (kW)	44
Cutting capacity (cm)	0.45
Approximate weight (kg)	6 000
Width (m)	2.15
Length (m)	4.72
Boom reach (m)	6.00
Ground clearance (m)	0.35



Figure 2 Line skidder.

Corporation, Osaka, Japan and distributed by CamTrac, Quebec City.

Patu equipment is manufactured in Finland by Kesla Oy, Joensuu, Finland, Tel.: 358-13-682-841 Fax: 358-13-682-8300.

The approximate (1999) price of the Kubota excavator is \$250 000 including all the modifications.

For further information, contact:

Pierre Rose, Coopérative Laterrière, Chicoutimi, Québec Tel.: 418-678-2222 Fax: 418-678-9786.

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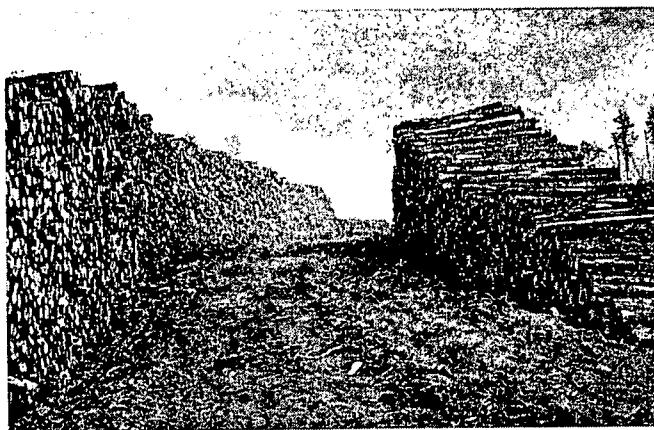


Figure 3. Short wood waiting to be hauled to the mill.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #23

Region
New Brunswick

Author
Janet Mitchell, RPF

Date
December 1999

Source
FERIC field visit August 1999

Contractor
Victoria Forest Improvements, Plaster Rock, NB

Equipment

- Rocan T harvester with Patu 915 boom and Patu harvesting head (Figure 1)
- Ford 9030 chassis with boom and Pan 828 harvesting head
- forwarder

Location
Fraser Paper, Plaster Rock Division, NB

Site and stand

- natural stand of spruce and balsam fir, some deciduous
- stand had been precommercial thinned in 1980

Prescription

- 30 m between main extraction trails
- 1-2 ghost trails
- 2.4-m residual tree spacing
- residual 14 - 18 m² basal area, removing approximately 30% by basal area

Operating procedure

- harvester cut the trails and thin as far as they reach either side of the trail
- harvester then cuts 1-2 ghost trails between the extraction trails, processing the stems and piling the logs on the main extraction trails
- forwarder loads and forwards the logs, travelling only on the main extraction trails

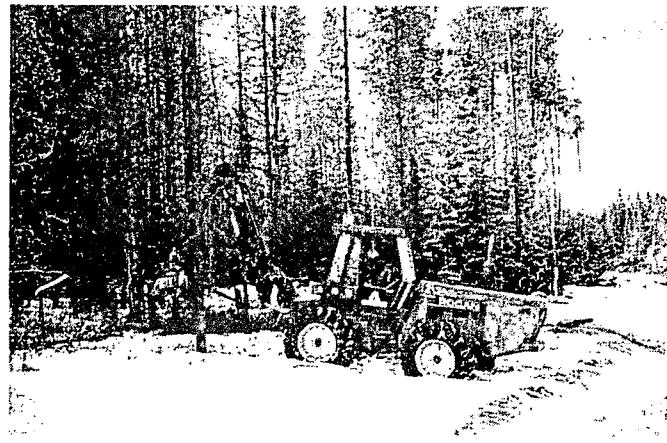


Figure 1. Rocan T harvester.

- logs are decked at the roadside

Equipment description and specifications

See Table 1. Additionally,

- Ford Versatile 9030 tractor chassis with Patu 915 boom and Patu stroke harvesting head
- Rocan T harvester: Ford Versatile 9030 tractor chassis with Pan 828 harvesting head
- parallel boom configuration
- used for ghost trails, because of narrow width

Table 1. Rocan T Harvester Specifications

Rocan T harvester	
Engine power (kW)	84
Engine	Ford diesel
Power transmission	4 WD
	hydrostatic
Head capacity (cm)	41
Approximate weight (kg)	6 400
Width (m)	2.10
Length (m)	5.10
Height (m)	3.20
Crane reach (m)	6.60
Ground clearance (m)	0.60

Productivity

Contractor used to have pre-commercial thinning and planting contracting company and has been commercial thinning for less than one year. He estimates that the harvesters are cutting 2.3 m³/hour each.

Equipment Manufacturer and Distributor

The Rocan-T thinning harvester and Rottne forwarder are available through Rocan Forestry BC Ltd., 5339A Hartway Drive, Prince George, BC V2N 4T7 Tel.: 250-962-8244 Fax: 250-962-8892.

In eastern Canada the Rocan harvester and Rottne forwarder are available through Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.

The approximate (1999) price of the Rocan T harvester is \$330 000.

For further information, contact:

Duane Godsoe or Bill Whalen, Fraser Papers Inc., 31 Renous Road, Plaster Rock, NB E7G 4B5 Tel.: 506-356-4109 Fax: 506-356-4105.

Devon McDougall, Victoria Forest Improvements, Plaster Rock, NB Tel.: 506-356-8335.

References:

FERIC Compendium articles Operations Cut-to-Length #18 and Equipment Feller-Processor #9

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region
Québec

Author
Janet Mitchell, RPF

Date
December 1999

Source
FERIC field visit in August 1999

Contractor
Reboistech, Dolbeau-Mistassini, Québec

Equipment

- Takeuchi TB 070 mini-excavator with Patu RH405 harvesting head (Figure 1)
- Tree Farmer C-5 skidder converted into a forwarder (Figure 2)

Location
Alliance Forest Products Inc., Dolbeau-Mistassini, Québec

Site and stand

- 40-45 year old jack pine
- 0 - 10% slopes

Prescription

- first thinning
- 25-27 m between main extraction trails
- removing approximately 25 - 33% of basal area of the stems, leaving non commercial species and spruce
- second thinning planned for 20 years and then final cut in another 20 years

Operating procedure

- trees were premarked
- harvester cut the trails (3.4-m wide) and thinned between trails to the maximum of 4 m on either side
- hand fallers cut any trees that the excavator was unable to reach between trails

Harvesting System: Cut-to-Length
Item: #24



Figure 1. Takeuchi mini excavator with Patu head.

- hand fallers cut, bucked (into 2.4 m lengths, 7 cm top), carried and piled the logs at the trail edges
- larger, heavier stems closer to the centre of the strip were felled (top towards the trail) partially bucked (a portion of the fibre was left intact) at the 16' mark. These were then picked up by the forwarder at the top end of the stem and then broke the log at the bucked mark and continued this until the stem was loaded.

Equipment description and specifications

See Tables 1 and 2. Additionally,

- standard boom mounted on a slewing pivot

Table 1. Takeuchi TB 070 Mini-Excavator Specifications

Takeuchi TB 070
mini-excavator

Engine power (kW)	53
Engine	Nissan 4 cylinder
Approximate weight (kg)	7 100
Width (m)	2.2
Length (m)	7.0
Height (m)	2.6
Boom reach (m)	6.0
Ground clearance (m)	0.38

Table 2 Tree Farmer Forwarder Specifications

Tree Farmer C-5 skidder converted into a forwarder	
Engine power (kW)	70
Engine	Deutz
Transmission	4 speed mechanical
Width (m)	2.5
Length of bunk (m)	3.7
Carrying capacity (m^3)	6.0

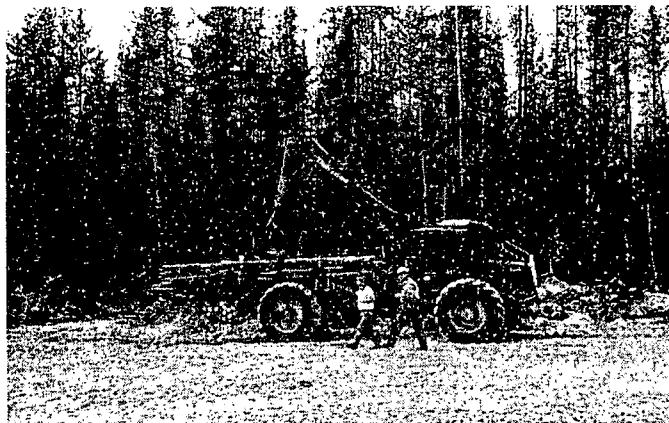


Figure 2. Tree Farmer C-5 skidder converted into a forwarder.

- positioned at the front edge of the turret platform
- Patu RH405 harvesting head has roller-feeds
 - forwarder has a Patu 625 crane

Productivity

The contractor estimates that the harvester and forwarder are producing 75 m^3 /day.

Equipment supplier

Takeuchi equipment is manufactured by Takeuchi Manufacturing Company Ltd., 205-3 Uwadaira, Hanisinagun, Nagano, Japan and distributed in Canada by Takeuchi Manufacturing Company Ltd., 206 Principal, St. Thomas D'Aquin, St.-Hyacinthe, Quebec JOH 2A0 Tel.: 514-796-3666.

The approximate (1999) prices of the Takeuchi excavator and the Tree Farmer forwarder are \$112 000 and \$60 000, respectively.

For further information, contact:

Alliance Forest Products Inc., 200 Boulevard De Quen, Dolbeau-Mistassini, Québec G8M 1M1 Tel.: 418-239-3219 Fax: 418-276-8390.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

**Equipment: Feller-Processor #26
Model: JM 2000 444B**

References

- FERIC Compendium articles Operations Cut-to-Length #19 and #21
- FERIC Field Note Partial Cutting-17

Illustrations

- JM 2000 Grizz 444B combination harvester/forwarder (Figures 1 and 2)

Location

On Crown land managed by Fraser Paper Inc.'s St-Quentin Division, New Brunswick and private land owned and managed by Carton St Laurent near St-Félicien, Québec.

Equipment specifications

See Table 1. Additionally,

- Ford Versatile 9030 tractor chassis that has been extended 3.0 m
- Timberjack axles
- contractor modified the JM 2000 by adding 10 more lights to improve visibility at night, and added a second alternator

Table 1. JM 2000 Grizz 444B Combination Harvester/Forwarder Specifications

JM 2000 Grizz 444B

Engine power (kW)	74.6
Engine	Ford diesel 4 cylinders hydrostatic 3-range gear box
Power transmission	
Carrying capacity (kg)	4500
Cutting capacity (cm) ^a	45
Width (m)	2.28
Length (m)	4.0 - 5.0
Height (m)	2.96
Weight (kg)	6 530
Turning radius (m)	6.30
Crane reach (m)	6.00
Ground clearance (m)	0.48

* Three heads are available from the manufacturer.

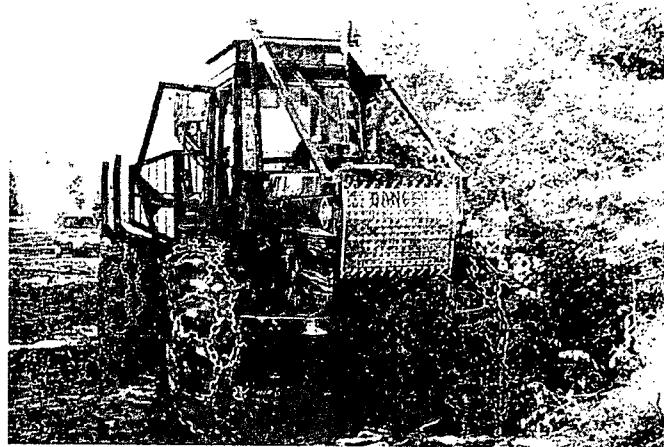


Figure 1. JM 2000 Grizz 444B combination harvester/forwarder.

- contractor also added a post to rest the grapple or harvesting head, a self-cleaning device on the roller teeth and more guarding
- Operator was using a Mowi 4567 crane and grapple with 6-m reach and parallel boom configuration
- contractor plans to modify the grapple to eliminate the excess swing every time the operator reaches for a log
- converts to a harvester by switching the loading grapple with a Patu harvesting head in 45 minutes by removing pin on boom

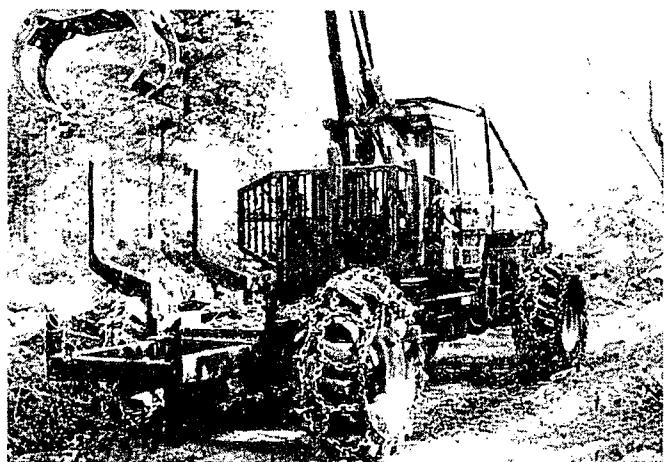


Figure 2 JM 2000 Grizz 444B combination harvester/forwarder.

Manufacturer and distributor

The JM 2000 Grizz 444B combination harvester/forwarder is manufactured by Porteurs Forestiers JM 2000 Inc. and distributed by North-American Forestry Distribution Inc., Rivière-du-loup, Québec.

Approximate (1999) price of the JM 2000 Grizz 444B is \$260 000, excluding taxes.

For further information, contact:

Pierre Dancause, Fraser Paper Inc., 175 A Canada Street, Saint-Quentin, New Brunswick E8A 1J6 Tel.: 506-235-9812 Fax: 506-235-2237.

North-American Forestry Distribution Inc., 194, du Carrefour, St-Antonin, Rivière-du-loup, Québec G0l 2J0 Tel.: 1-888-376-6233 Fax: 418-867-8654
E-mail: nafd@icrdl.net

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Skidder #6

Model: LKT-50

Reference

- Compendium article Operations Cut-and-Skid #7

Illustration

- LKT 50 line skidder with double drum winch (Figure 1)

Location

The skidder was timed during an equipment demonstration on Kevco Timber Ltd.'s Woodlot 085 near Union Bay, BC.

Contractor

Salix Trading Inc., North Vancouver, BC

Equipment specifications

See Table 1. Additionally,

- 4-wheel drive with differential lock
- remote control operated the skidder RPM and the speed and direction of the double drum winch
- three chokers, with offset bell and 11-mm cable, on each winch
- PTOs located at front and rear of machine for mounting attachments for use in silviculture, harvesting, road maintenance and agriculture

Table 1. LKT 50 Line Skidder Specifications

	LKT 50 line skidder
Engine power (kW)	47
Engine - Perkins 704-30	diesel
Power transmission	4 stroke
Maximum speed (kph)	20
Approximate weight (kg)	4 560
Width (m)	1.95
Length (m)	4.98
Height (m)	2.92
Turning radius (m)	3.68
Winch line pull (kg)	3600 each
Line speed (m/min)	60
Ground clearance - with standard tires (m)	0.40

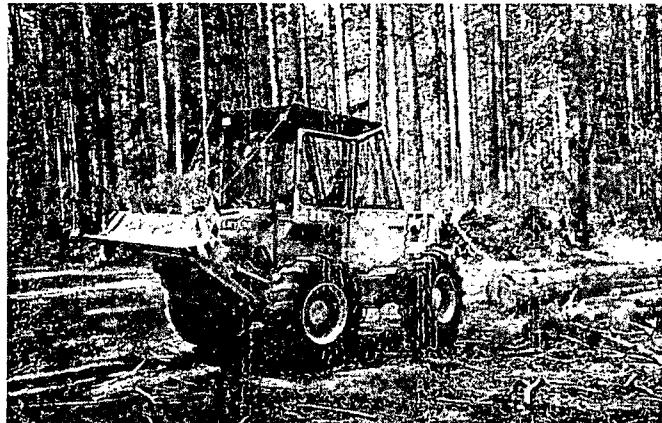


Figure 1. LKT 50 line skidder with double drum winch.

Equipment manufacturer and distributor

LKT skidders are manufactured by ZTS TEES Lesné traktry Ltd., in the Slovak Republic and are distributed in Canada by Salix Trading Inc., North Vancouver, BC.

The approximate (1999) price of the LKT 50 line skidder is \$99,000 complete with guarding necessary for forestry.

For further information, contact:

Dr. Vlado Butora, Salix Trading Inc., 800 Hendry Avenue, North Vancouver, BC V7L 4C9 Tel.: 604-980-1182 Fax: 604-980-1142.
E-mail: latcan@istar.ca

Craig Evans, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: craig-e@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder # 18 Model: Hi-Skid Log Forwarder

References

- Compendium article Operations Cut-and-Skid #8
- FERIC Field Note General-73

Illustrations

- Hi-Skid log forwarder (Figure 1)
- chain slings used to realign or dump the load (Figure 2)
- load being dumped at the sortyard (Figure 3)
- breakaway block (Figure 4)

Location

The equipment was viewed by FERIC during a demonstration on the British Columbia Institute of Technology Forest Society's Woodlot 007, near Maple Ridge, BC.

Contractor

Alfa Fab Ventures, 100 Mile House, BC

Equipment specifications

See Table 1. Additionally,

- mounted on a truck rated to 15 250 kg gross vehicle weight (Figure 1)
- hydraulically-driven winch with 100 m of 13-mm diameter cable and three chokers
- hand-held remote control operated yarding and loading functions
- trolley-mounted fairlead is suspended from a track assembly extending out over the back of the truck

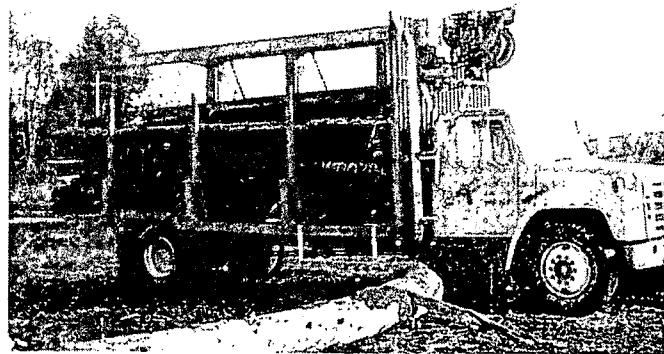


Figure 1. Hi-Skid log forwarder.

- when turn reached the truck, the fairlead moved forward along the track pulling the turn onto the truck bed
- dumping was accomplished with three hydraulic cylinders vertically mounted on the driver's side of the truck
- cylinders tension three open-link-chain slings extend under the load to pivoting stakes on the opposite side (Figures 2 and 3)
- partially activated, the slings are used to realign the load
- breakaway block designed by the contractor was used to deflect logs around obstacles and to increase lift (Figure 4)



Figure 2. Chain slings being used to realign or dump the load.



Figure 3. Load being dumped at the sortyard.

Manufacturer and distributor

The Hi-Skid log forwarder was designed and built by John Schulte, Alfa Fab Ventures, 100 Mile House with technical assistance from FERIC and financial assistance from Forest Renewal BC's Forest Innovation Development Program delivered by BC Advanced Systems Insatiate.

Approximate (1999) price of the Hi-Skid log forwarder, depending on the options is between \$50 000 and \$60 000.

For further information, contact:

John Schulte, Alfa Fab Ventures, C-70 Young Road RR#1, 100 Mile House, BC V0K 2E0 Tel.: 250-395-4249 Fax: 250-395-1872.
E-mail: schulte@bcinternet.net

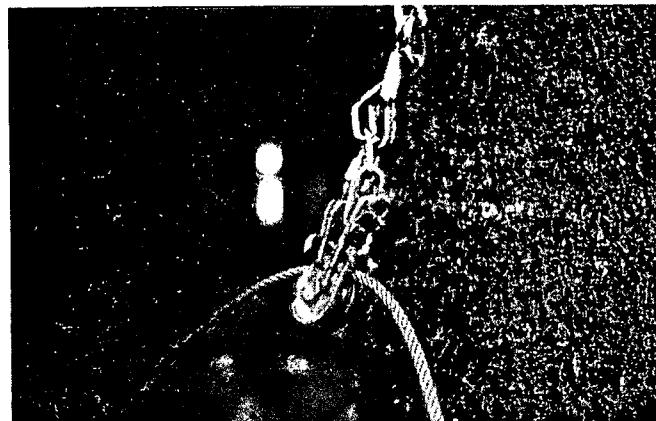


Figure 4. Breakaway block.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder # 19 Model: Catu Porter

Reference

- Compendium article Operations Cut-to-Length #20

Illustrations

- Catu porter (Figures 1 and 2)
- hydraulic drive sprocket between rear wheels (Figure 3)

Location

The Catu porter has worked in commercial thinning for Repap New Brunswick Inc. for the 1999 season near Heath Steel Mine, Miramichi, NB on Crown land managed by Repap New Brunswick Inc.

Contractor

Edgar Morris, Miramichi, NB

Equipment specifications

See Table 1. Additionally,

- Catu porter was designed by Jan Ellingsen of Repap New Brunswick Inc.
- FERIC, Eastern Division assisted prior to the manufacturing stage by providing calculations to optimize performance
- Case backhoe with Patu powered forwarding trailer and loader

Table 1. Catu Porter Specifications

Catu porter	
Engine power (kW)	56
Engine	Cummins
Carrying capacity (m ³)	7.0
Approximate weight empty (kg)	7 500
Width (m)	2.25
Length (m)	8.00
Height (m)	3.00
Articulation	± 40 °
Ground clearance (m)	0.48

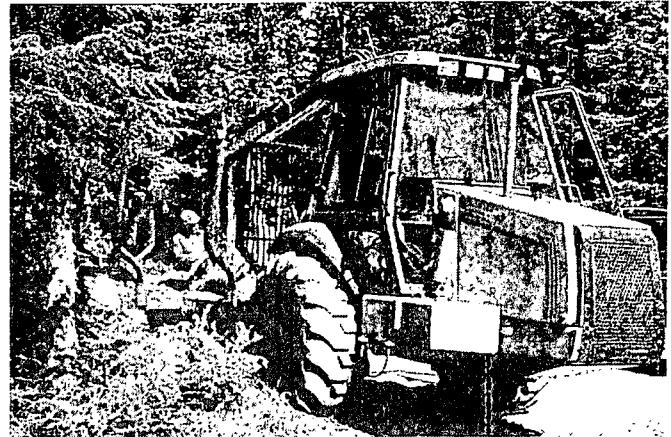


Figure 1. Catu porter.

- cab has bi-directional seat for forward and rearward steering
- fuel and hydraulic fluid tank were modified with assistance from FERIC, Eastern Division, to make them more streamlined and prevent "hang-ups" on ground obstacles
- trailer has a hydraulic drive sprocket between each set of rear wheels (Figure 3)
- narrow width (2.25 m)

Manufacturer and distributor

The Catu porter was manufactured by Sunny Corner Manufacturing, Miramichi and is distributed in Canada by Case.



Figure 2. Catu porter unloading at the landing.

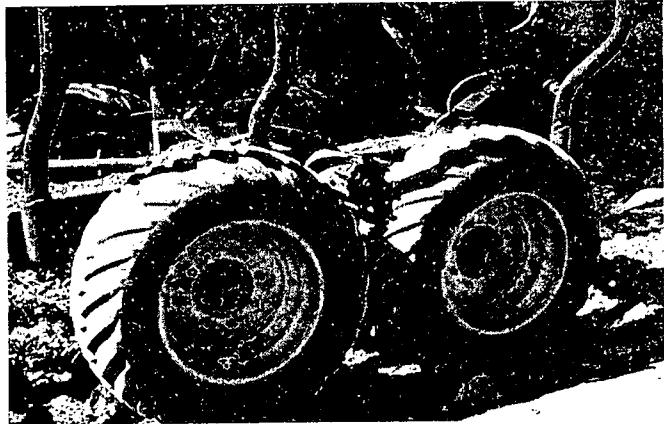


Figure 3 Hydraulic drive sprocket between the rear wheels.

The approximate (1999) price of the Catu porter is \$125 000, depending on options.

For further information, contact:

Jan Ellingsen, Woodlands Division, Repap New Brunswick Inc., 345 Curtis Road, PO Box 5040, Miramichi, NB, E1V 3N3 Tel.: 506-627-3709 Fax: 506-622-5702.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Equipment

Equipment: Yarder #11 Model: Owren 400

Reference

- Compendium article Operations Cable #19

Illustrations

- Owren 400 yarder (Figure 1)
- Koller SKA 2.5 carriage (Figure 2)

Location

New Hazelton, BC

Contractor

Corduroy Creek Contracting Ltd., New Hazelton, BC

Equipment specifications

See Table 1. Additionally,

- Owren 400 yarder is a separate cable crane unit mounted on a Kockum 850 forwarder carrier
- hydrostatic drive system contains no mechanical components; each drum is powered by its own hydraulic motor
- Owren 400 yarder can be used in clearcutting, partial cutting and thinning applications; it can yard uphill, downhill or on flat terrain using running skyline, standing skyline, and gravity configurations
- all configurations can employ intermediate supports to improve deflection
- Owren 400 yarder can work with an original (Owren) mechanical slackpulling carriage or other compatible type of carriage (e.g., Koller SKA 2.5)
- Owren 400 yarder mounted on a Kockum 850 forwarder carrier can work off-road, e.g., on skid trails
- Owren 250 model also available

Manufacturer

Owren yarders are manufactured by Trygve Owren A/S, N-2607 Vingrom, Lillehammer, Norway
Tel.: 47-61-26-2200 Fax: 47-61-26-2358.

Equipment distributors

In Canada, Owren yarders are available through Owren Yarding System Ltd., PO Box 255, Prince George, BC V2L 4S1 Tel.: 250-562-6191 Fax: 250-962-0458.

Table 1. Owren 400 Yarder Specifications

Owren 400 yarder	
Engine	Deutz, turbodiesel water cooled
Engine power (kW)	134
Line capacity	
Skyline	400 m - 19 mm (3/4")
Mainline	400 m - 12 mm (1/2" swedge)
Haulback	800 m - 12 mm (1/2" swedge)
Slackpulling	400 m - 12 mm (1/2" swedge)
4 Guylines	50 m - 19 mm (3/4")
Maximum line speed (m/s)	variable 0-8
Maximum line pull (kg)	6000
Overall tower height (m)	12.8
Weight with Kockum 850 forwarder carrier (kg)	24 000



Figure 1. Owren 400 yarder.

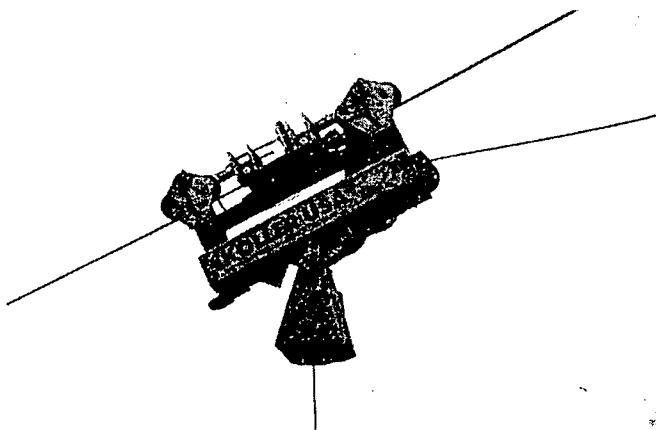


Figure 2. Koller SKA 2.5 carriage.

For further information, contact:

Haakon Obel, Owren Yarding System Ltd., Prince George, BC Tel.: 250-562-6191 Fax: 250-962-0458.

George Burns, Corduroy Creek Contracting Ltd., PO Box 586, New Hazelton, BC V0J 2J0 Tel.: 250-842-6842.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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FOREST ENGINEERING
RESEARCH INSTITUTE
OF CANADA
Western Division



INSTITUT CANADIEN
DE RECHERCHES
EN GÉNIE FORESTIER
Division de l'ouest

SR108-9

March, 2000

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108) - Issue Nine

The Compendium of Commercial Thinning Operations and Equipment in Western Canada has received funding for 1999/2000 from Forest Renewal BC.

The enclosed material comprises the ninth issue of fourteen, 1-page descriptions of commercial thinning operations and equipment. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you have not received the first eight issues, please complete the form below and send it to the address provided.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink, appearing to read "J. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

**ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING
OPERATIONS AND EQUIPMENT — (SR-108)**

Please return completed form to:

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2601 East Mall
Vancouver, BC V6T 1Z4
Fax: 604-228-0999

E-mail: janet-m@vcr.feric.ca

<input type="checkbox"/> issues 1-8	PLEASE SEND COMPENDIUM (SR-108) TO:	
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-and-Skid
Item: #10

Region

Oregon

Author

Janet Mitchell, RPF

Date

March 2000

Source

FERIC field visit in February 2000

Contractor

John and Lynne Breese, Prineville, OR

Equipment

- hand felling
- Farmi 9000-kg powered forwarding trailer with Farmi HK 4366 loader and a 1995 Valtra/Valmet 8400 tractor (Figures 1 and 2)
- Niab 5-15B tractor-mounted processor (Figure 3)

Location

Private land, near Prineville, Oregon

Site and stand

- open woodland of juniper, ponderosa pine and Douglas-fir
- juniper is approximately 90 years old
- pine and Douglas-fir are between 80-140 years old
- gentle to rolling slopes

Prescription

- remove all juniper within the pine stands
- residual inter-tree distance is approximately "diameter + 10", i.e., 15 inch tree +10 equals 25 feet between residual trees
- select to retain the best form class

Operating procedure

- hand fell trees
- Niab operator winched stems to the trail, processed them and piled the logs at the edge of the trail
- some stems had to be cut manually
- the tractor with Farmi forwarding trailer and loader, loaded the stems into the bunks and



Figure 1. Farmi 9000-kg forwarding trailer.

forwarded them to the roadside or landing

- produced approximately 25% sawlog and 75% pulpwood
- self-loading logging truck transported the logs to the mill

Equipment description and specifications

See Tables 1 and 2. Additionally,

- Niab 5-15B attaches to the tractor by the three-point hitch
- hydraulic pump is attached to the tractor power take off (PTO)
- winch controlled either remotely or by means of a

Table 1. Valtra/Valmet 8400 Tractor and Farmi 9000-kg Forwarding Trailer Specifications

	Valtra/ Valmet tractor	Farmi forwarding trailer
Engine power (kW)	103	52 required
Power transmission	36 speed	n.a.
Approximate weight (kg))	5 160	2 690
Width (m)	2.18	2.32
Length (m)	4.75	6.03
Height (m)	2.87	2.17
Turning radius (m)	5.1	n.a.
Crane reach (m)	n.a.	6.6
Carrying capacity (kg)	n.a.	9 000
Ground clearance (m)	0.53	0.59

Table 2. Niab 5-15B Tractor-Mounted Processor Specifications

Niab 5-15B processor	
Power required (kW)	30
Hydraulic flow rate (l/min)	90
Maximum stem diameter (cm)	50.0
Length of winch rope (m)	40.0
Winch effort (tonnes)	2.50
Width (m)	2.45
Height (m)	2.30
Length (m)	2.00
Weight (kg)	1 030

- button on the control panel
- equipped with a length meter, and lengths are shown on the control panel display
- limbing knife pressure can be modified
- control panel height is adjustable
- Valtra/Valmet 8400 tractor has a Valmet 620 DW engine
- tire chains for the tractor are available

Equipment supplier

The Niab 5-15B tractor-mounted processor is manufactured by Niab, Box 153, S-830 47 Trangsviken, Sweden Tel.: 46-640-402-10 Fax: 46-640-403-70 and is available through Silvana Import Trading Inc., Montreal, Quebec.

The Farmi 9000 kg forwarding trailer is manufactured by Normet Corporation, FIN-74510, Peltosalmi, Finland Tel.: 358-77-152-41 Fax: 358-77-236-06 and is available through Global Forest Equipment, Courtenay, BC.

Valtra/Valmet tractors are manufactured by Valtra Inc., FIN-44200 Suolahti, Finland Tel.: 358-14-549-111 Fax: 358-14-549-1386. In BC, they are available through Global Forest Equipment, Courtenay, BC.

The approximate (2000) price of the Niab is \$45 000 and the Farmi forwarding trailer and loader are \$32 500 and \$27 000, respectively. The Valtra/Valmet 8400 tractor is approximately \$110 000.

References:

FERIC Compendium articles Operations Cable #12, #13 and #14, Cut-and-Skid #11, Equipment Forwarder #6 and Other #5.



Figure 2. Valtra/Valmet 8400 tractor (Photo courtesy of Global Forest Equipment Ltd.).

For further information, contact:

John and Lynne Breese, 3315 SE Paulina Hwy., Prineville, OR 97754 USA Tel.: 541-447-6762.

Richard DeLuca, Global Forest Equipment Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-334-9694 Fax: 250-334-9338.

Dick Johnsson, Silvana Import Trading Inc. Suite 304, 4269 West Ste-Catherine Street, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3523 Fax: 514-939-3863.

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Figure 3. Niab 5-15B tractor-mounted processor (Photo courtesy of Roderick Ewing, FERIC, Eastern Division).



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region
Quebec

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in August 1999

Contractor
Leo Prevost, Quebec

Equipment

- hand falling
- Valtra/Valmet 665 tractor with a Niab 5-15B tractor-mounted processor (Figure 1)
- Majaco R-Flex 410 forwarding trailer with Majaco M120 loader (Figure 2)

Location
Normandin Demonstration Forest, near St.-Félicien,
Quebec

Site and stand

- 55-year-old jack pine stand
- flat to gentle slopes

Prescription

- second thinning
- remove approximately 40% basal area
- 25 m between forwarding trails

Operating procedure

- faller pre-felled an area
- Niab operator winched stems to trail edge, processed them into 3.6- and 2.4-m lengths, and decked the logs on the other side of the trail for the forwarder
- in the afternoon, the processor was detached from the tractor and replaced with the forwarding trailer
- Valtra/Valmet tractor, with Majaco forwarding trailer and loader, loaded the logs into the bunks

Harvesting System: Cut-and-Skid
Item: #11

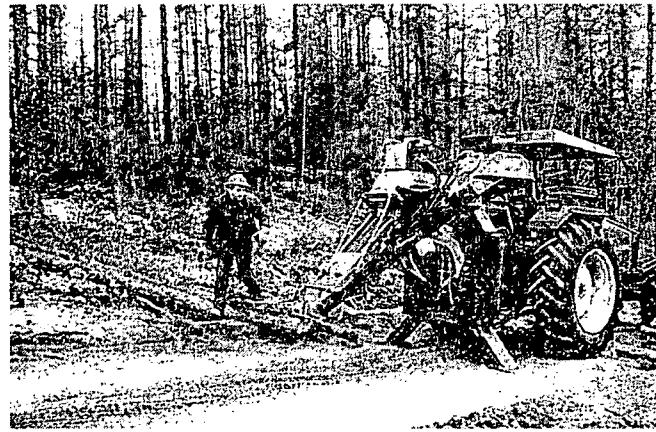


Figure 1. Valmet 665 tractor with Niab 5-15B tractor-mounted processor (Photo courtesy of Roderick Ewing, FERIC, Eastern Division).

- and forwarded them to the roadside for transport to the local mill
- faller also helped the Niab operator by setting the chokers for the processor

Equipment description and specifications

See Table 1. Additionally,

Niab:

- attaches to the tractor by the three-point hitch
- hydraulic pump is attached to the tractor power take off (PTO)

Table 1. Valtra/Valmet 665 Tractor and Niab 5-15B Tractor-Mounted Processor Specifications

	Valtra/ Valmet 665 tractor	Niab 5-15B processor
Engine power (kW)	60	30 required
Hydraulic flow rate (l/min)	40	60 required
Approximate weight (kg)	3 010	1 030
Width (m)	2.03	2.45
Length (m)	3.75	2.00
Height (m)	2.61	2.30
Winch effort (tonnes)	n.a.	2.50
Length of winch rope (m)	n.a.	40.0
Maximum stem diameter (cm)	n.a.	50.0

- winch controlled either remotely or by means of a button on the control panel
- telescopic boom is suspended below the frame
- combination delimiting head and grapple is at the infeed end
- boom can be lowered to increase stability during winching
- head grapple and a second grapple on the frame suspend stems as they are fed through the delimiting, length-measurement and bucking mechanisms
- lengths are shown on the control panel display
- limbing knife pressure can be modified
- control panel height is adjustable

Valtra/Valmet tractor:

- has a Valmet 320D engine
- 0.40-m ground clearance

Majaco forwarding trailer:

- 1.2 m maximum grapple diameter
- 0.1 m minimum grapple diameter

Equipment supplier

Niab 5-15B tractor-mounted processors are manufactured by Niab, Box 153, S-830 47 Trangsviken, Sweden Tel.: 46-640-402-10 Fax: 46-640-403-70. They are available through Silvana Import Trading Inc., Montreal, Quebec.

Valtra/Valmet tractors are manufactured by Valtra Inc., FIN-44200 Suolahti, Finland Tel.: 358-14-549-111 Fax: 358-14-549-1386. In BC, they are available through Global Forest Equipment, Courtenay, BC.

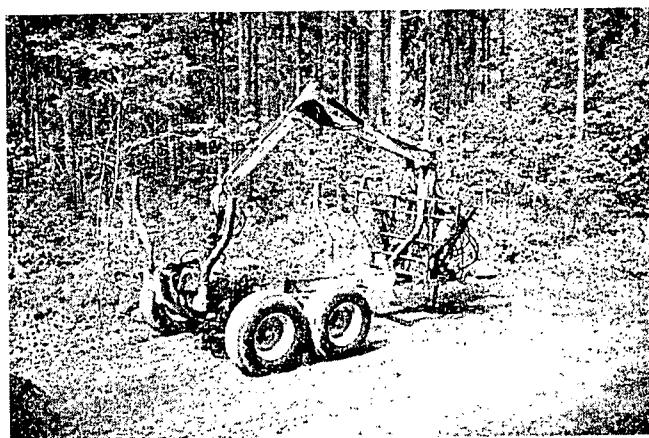


Figure 2. Majaco R-Flex 410 forwarding trailer with Majaco M120 loader (Photo courtesy of Roderick Ewing, FERIC, Eastern Division).

Table 2. Majaco R-Flex 410 Forwarding Trailer and M120 Loader Specifications

Majaco forwarding trailer and loader	
Approximate weight (kg)	863
Width (m)	1.80
Bunk length (m)	2.90
Total length (m)	4.80
Crane reach (m)	3.90
Carrying capacity (m ³)	2.97
Ground clearance (m)	0.48

Majaco forwarding trailers are manufactured and distributed by Atelier Majaco Inc., Chesterville, Quebec.

The approximate (2000) price of the Niab is \$45 000. The Valtra/Valmet tractor is approximately \$110 000. The Majaco forwarding trailer with loader and grapple is \$12 000.

References:

FERIC Compendium articles Operations Cut-and-Skid #10 and Equipment Other #5.

FERIC Field Note Partial Cutting-12.

For further information, contact:

Leo Prevost, Quebec, Tel.: 418-274-3241.

Dick Johnsson, Silvana Import Trading Inc. Suite 304, 4269 West Ste-Catherine Street, Montreal, Quebec H3Z 1P7 Tel.: 514-939-3523 Fax: 514-939-3863.

Richard DeLuca, Global Forest Equipment Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-334-9694 Fax: 250-334-9338.

Atelier Majaco Inc., 5127, de la Plaisance, Chesterville, Quebec G0P 1J0 Tel.: 819-382-9977 Fax: 819-382-9970.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Region

Alberta

Author

Kris Kosicki, Ph.D.

Date

March 2000

Source

FERIC short-term study

Contractors

Greg King, Bridge Lake Holdings Inc., Hinton, AB
Nick Larouche, Larouche Logging Ltd., Edson, AB

Equipment

- Tigercat 845 feller-buncher with Koehring 50-cm disc saw (Figure 1)
- John Deere 748E grapple skidder (Figure 2)
- Lim-mit LM2000 log processor on John Deere D-LC carrier

Location

Weldwood of Canada Limited, Hinton Division's Forest Management Area east of Hinton, AB

Site and stand

- inactive, braided flood plain of the McLeod River
- Lower Foothills (LF) natural subregion, ecosites: LF-e low-bush cranberry; LF-i horsetail; and LF-d Labrador tea-mesic
- mixed stands of white spruce (43%), aspen (35%), lodgepole pine (19%), and black spruce (3%)
- preharvest volume 405 m³/ha
- even terrain, 0-3% with few short pitches to 30%
- moderately fine to fine-textured soils
- medium hazard of soil compaction and rutting
- little understory vegetation or slash

Prescription

- modified two-pass shelterwood system
- provide favourable conditions for natural regeneration of white spruce and pine
- select and retain white spruce seed trees in 35- to 50-cm DBH classes (2 to 3 trees/ha)

**Harvesting System: Mechanical
Item: #3**

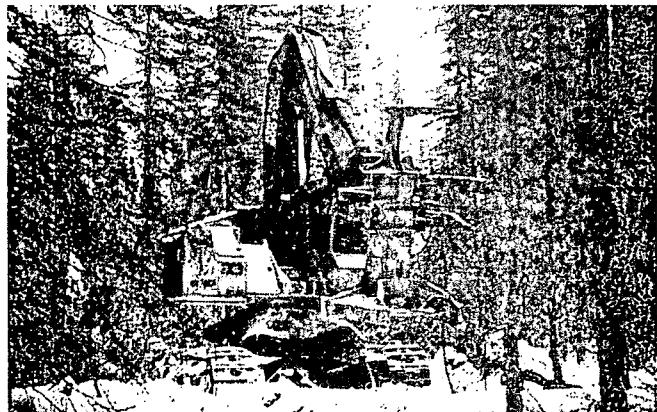


Figure 1. Tigercat 845 feller-buncher.

- remove 50% of the stand basal area
- harvest small patches of pure lodgepole pine
- second entry in 5 to 10 years

Operating procedure

- white spruce seed tree and pure lodgepole pine patches selected and marked
- skid trail centrelines located and marked at 24-m spacing
- 50° angles between haul roads and skid trails
- to reduce wind damage and improve visual quality of the residual stand, skid trails longer than 100 m were dog-legged
- the feller-buncher removed 8-m-wide skid trails and 50% of the basal area in 4-m-wide strips on each side of the trails
- 8-m-wide strips were left untreated on each side of the harvested strip
- rub-trees were left to protect the residual trees against damage by the skidded loads
- felled trees were skidded along trails and decked at roadside and in ditchline for delimiting
- all harvest operations were performed in winter
- daytime temperatures were below -10°C
- soil was frozen

Equipment description and specifications

See Tables 1 and 2. Additionally,

- Tigercat 845 is a zero-tail-swing feller-buncher with Koehring 50-cm disc saw

Table 1. Tigercat 845 Feller-Buncher and John Deere 748E Grapple Skidder Specifications

	Tigercat 845	John Deere 748E
Engine power (kW)	153	123
Width (m)	3.05	3.11
Length (m)	4.39	7.77
Operating weight (kg)	21 300	15 650
Maximum boom reach (m)	7.8	n/a
Minimum boom reach (m)	3.8	n/a

Study results

The productivities observed during the FERIC study in 1999 are summarized in Table 2. As well, the costs of harvesting phases, based on FERIC's costing formula, are presented.

The 8-m-wide trails permitted unobstructed travel by the zero-tail-swing feller-buncher and grapple skidder. The zero-tail-swing and the ability of the feller-buncher to control the falling direction and location of felled stems helped reduce damage to the residual stand and enhanced skidding productivity.

Equipment supplier

The Tigercat 845 feller-buncher is manufactured by Tigercat Industries Inc., 40 Consolidated Dr., PO Box 544, Paris, ON N3L 3T6 Tel.: 519-442-1000 Fax: 519-442-1855. www.tigercat.com

The equipment is distributed through the John Deere dealer network. The approximate (2000) price for the Tigercat feller-buncher is \$440 000.

Reference

Kosicki, K.T. 2000. *Trials of Alternative Silvicultural Systems in a Western Alberta Riparian Zone:*

Table 2. Productivities and Costs by Phase

Harvesting phase	Productivity (m ³ / PMH)	Cost (\$/m ³)
Planning and layout	n/a	1.98
Falling	72	2.06
Skidding	46	2.34
Processing	36	3.82
Total	n/a	10.20

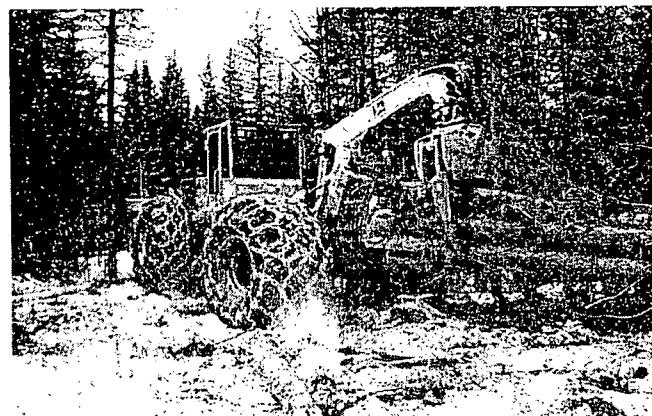


Figure 2. John Deere 748E grapple skidder.

Productivities and Costs of Harvesting Operations.
ERIC, Vancouver. Advantage Report - in progress.

For further information, contact:

Stan Navratil, Silfor Consulting, 165 Seabolt Cr., Hinton, AB T7V 1K4 Tel./Fax: 780-865-6106.
E-mail: navratil@telusplanet.net

Thomas Braun, Planning Forester, Weldwood of Canada Limited, Hinton, AB T7V 1V7 Tel.: 780-817-7708 Fax.: 780-865-8164.
E-mail: thomas_braun@weldwood.com

Greg King, Bridge Lake Holdings Inc., Box 6245, Hinton, AB T7V 1X6 Tel.: 780-865-3635 Fax: 780-865-3565.

Nick Larouche, Larouche Logging Ltd., 59 Poplar Place Trailer Court, Edson, AB T7E 1N5 Tel.: 780-723-5204.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #25

Region
Washington

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in February 2000

Contractor
Jim Oldis, Kelso, WA

Equipment

- Komatsu PC 128UU (ultra urban) tracked thinning harvester with a Logmax 540 single-grip harvesting head (Figure 1)
- Timberjack 1010 forwarder (Figure 2)

Location
Weyerhaeuser's private land in the St. Helen's Tree Farm near Longview, WA

Site and stand

- 30-year-old plantation of Douglas-fir and western hemlock
- precommercial thinned and pruned in 1990
- 346 trees/ha had been pruned

Prescription

- thinning from below
- want to retain 494 trees/ha, with preference for the pruned trees

Operating procedure

- harvester cut trails and thinned between the trails, and sorted the logs at the trail edge
- forwarder made two passes, collecting the pulpwood and sawlogs in different trips
- forwarder decked the wood at the roadside
- loader, operated by the harvester operator, loaded the logging trucks for transport to the mill

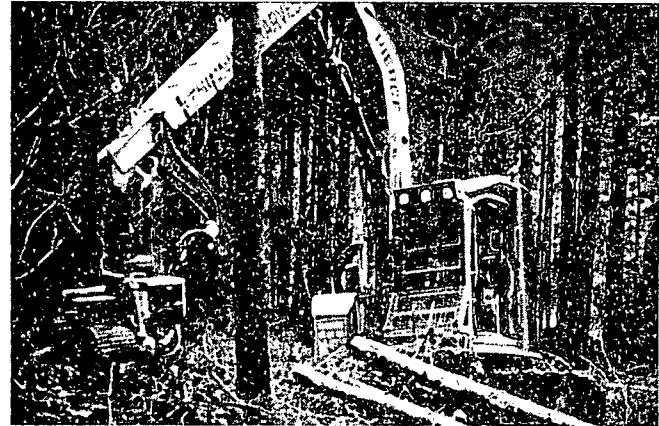


Figure 1. Komatsu PC 128UU harvester with Logmax 540 single-grip harvesting head.

Equipment description and specifications

See Tables 1 and 2. Additionally,

- harvester is a Japanese excavator with a Pierce boom and Logmax harvesting head
- harvester carrier is 2.4 m wide and can turn within its width - no tail swing
- harvesting head has an auto-measuring system to measure length and diameter
- uses commonly available components
- boom has a reach of 7.2 m
- original Komatsu was modified to increase cab space
- larger harvesting head, required larger counter weight

Table 1. Komatsu PC 128UU Harvester with Logmax 540 single-grip harvesting head Specifications

Komatsu PC 128UU harvester	
Engine power (kW)	63
Power transmission	hydrostatic
Head capacity (cm)	0.54
Approximate weight (kg)	11 800
Width (m)	2.44
Boom reach (m)	7.2
Ground clearance (m)	0.40

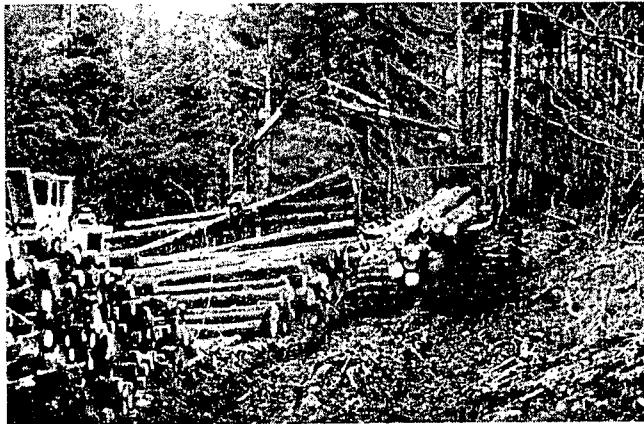


Figure 2. Timberjack 1010 forwarder.

Productivity

The contractor estimates his productivity at 50t/day.

Equipment supplier

Komatsu and Timberjack equipment are available through Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.: 604-532-8324 Fax: 604-532-8354.

Logmax equipment is manufactured and distributed by Pierce Pacific Inc., 930 Laval Cres., Kamloops, BC V2C 5P5 Tel.: 250-372-9986 Fax: 250-372-9975 Toll free: 1-800-666-4474.

In Washington, Komatsu and Timberjack equipment are available through Pacific North Equipment Co., PO Box 88000, Seattle, WA 98138 USA Tel.: 206-872-3500 Fax: 206-872-3519 Toll free: 1-800-669-2425.

Table 2. Timberjack 1010 Forwarder Specifications

Timberjack 1010 forwarder	
Engine power (kW)	82
Engine	GM-Perkins 1004 turbo, 4 cylinder
Power transmission	6-wheel drive power shift
Approximate weight (kg)	13 330
Width (m)	2.85
Length (m)	8.63
Height (m)	3.55
Carrying capacity (t)	10
Crane reach (m)	7.0
Ground clearance (m)	0.60



Figure 3. Log loader.

The approximate (2000) price of the Komatsu PC 128UU tracked thinning harvester with a Logmax 540 harvesting head is \$300 000. The Timberjack 1010 forwarder is approximately \$385 000.

References:

FERIC Compendium articles Operations Cut-to-Length #1, #2, #6, #8, and #17, Equipment Feller-Processor #8 and Forwarder #1.

For further information, contact:

Jim Oldis, J.L.&O. Enterprises, Inc., Kelso, WA Tel.: 360-636-5427.

Sam Ceballos, Weyerhaeuser, PO Box 188, Longview, WA 98632 USA Tel.: 360-578-4505 Fax: 360-636-6333.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #26

Region
Washington

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in March 2000

Contractor
Jake Pleines, Forks, WA

Equipment

- Timberjack 1270B harvester with Timberjack 762C single-grip harvesting head (Figure 1)
- Timberjack 1210 forwarder (Figure 2)
- loader (Figure 3)

Location
Rayonier's private land near Forks, WA

Site and stand

- Douglas-fir plantation with western hemlock natural regeneration
- irregular spacing, pre-thinning
- some wind throw
- flat to gentle slope

Prescription

- thin from below
- 346-420 residual trees/ha
- minimize damage

Operating procedure

- trees were selected by the harvester operator
- forwarder sorted on the landing
- forwarder operator also operated the loader

Equipment description and specifications

See Tables 1 and 2. Additionally,

- harvester is articulated with a tandem-axle bogie on the front section



Figure 1. Timberjack 1270B harvester.

- bogies can be fitted with a flexible steel track to aid traction and reduce ground pressure
- high visibility cab
- seat in forwarder swivels 180° for forward and rearward steering
- parallel motion knuckleboom crane has 236° operating radius
- log specifications can be programmed into the on-board computer
- minimum log lengths and top diameters for pulp and sawlogs can be identified, however, the operator can override the computer

Table 1. Timberjack 1270B Harvester Specifications

Timberjack 1270B harvester	
Engine power (kW)	152
Power transmission	6-wheel drive hydrostatic
Engine	Perkins Turbo intercooled diesel
Head capacity (cm)	60-cm diameter
Approximate weight (kg)	15 950
Width (m)	2.86
Length (m)	7.07
Height (m)	3.64
Crane reach (m)	8.6
Ground clearance (m)	0.59

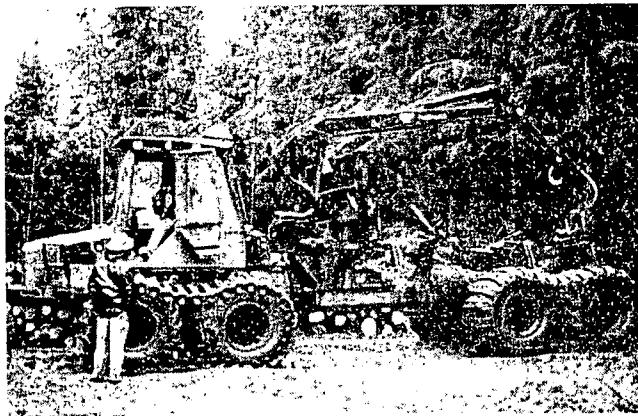


Figure 2. Timberjack 1210 forwarder.

- loader on forwarder has telescoping extension
- grapple has continuous rotation
- four pairs of stakes with extensions
- Timberjack 1210 forwarder has been replaced by the 1410 forwarder

Equipment supplier

Timberjack equipment is manufactured by Timberjack Inc., Woodstock, ON.

In Canada, Timberjack equipment is available through Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.: 604-532-8324 Fax: 604-532-8354.

Table 2 Timberjack 1210 and 1410 Forwarders Specifications

	Timberjack 1210 forwarder	Timberjack 1410 forwarder
Engine power (kW)	128	124
Power transmission	8-wheel drive hydrostatic	8-wheel drive hydrostatic
Engine	Perkins 1004 Turbo	Perkins 1006 Turbo
Approx. weight (kg)	15 155	17 000
Width (m)	2.85	2.93
Length (m)	9.93	9.20-10.40
Height (m)	3.58	3.70
Crane reach (m)	7.2	7.2-8.3
Carrying capacity (t)	12 - t	14 - t
Ground clearance (m)	0.60	0.60

In Washington and Oregon, Timberjack equipment is distributed by Pacific North Equipment Co., 22431 83rd Avenue S, Kent, WA 98032 USA Tel.: 206-872-3500.

The approximate (2000) prices of the Timberjack 1270B harvester and 1410 forwarder are \$631 000, and \$540 000 respectively.

References

FERIC Compendium articles Operations Cut-to-Length #1, #2, #6, #16, #17, #27, Equipment Feller-Processor #1 and Forwarder #1.

FERIC Technical Note TN-235.

FERIC Field Note Processing-40.

For further information, contact:

Jake Pleines, Brothers Cutting Inc. PO Box 427, Forks, WA 98331 USA Tel.: 360-374-6373 Fax: 360-374-6088.

Tim White, Timberjack Inc., PO Box 160, 925 Devonshire Ave., Woodstock, ON, N4S 7X1 Tel.: 519-537-6271 Fax: 519-537-8395.

E-mail: tim.white@ca.timberjack.com

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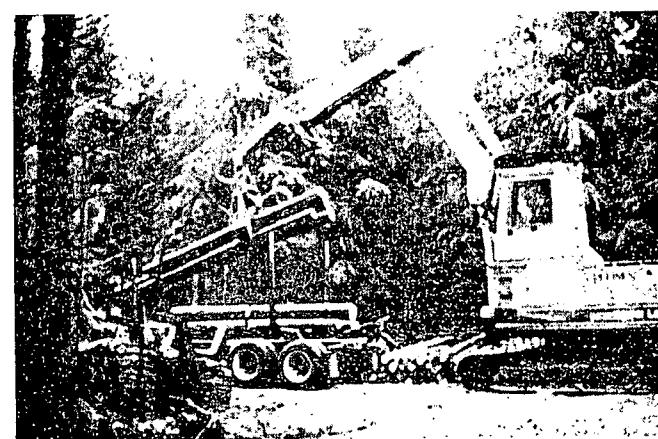


Figure 3. Log loader.



Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #27

Region
Washington

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in March 2000

Contractor
Fred Pleines, Forks, WA

Equipment

- Timberjack 1270 harvester with TJ 762B harvesting head (Figure 1)
- Timberjack 1210 forwarder and log loader (Figures 2 and 3) will be used; they are currently on another sale (see Cut-to-Length 26)



Figure 1. Timberjack 1270 harvester.

- bogies were fitted with a flexible steel track to aid traction and reduce ground pressure
- high visibility cab
- seat in forwarder swivels 180° for forward and rearward steering
- parallel motion knuckleboom crane has 236° operating radius
- log specifications can be programmed into the on-board computer
- minimum log lengths and top diameters for pulp and sawlogs can be identified, however, the operator can override the computer

Location
US Forest Service land near Forks, WA

Site and stand

- 50-year-old Douglas-fir, spruce and western hemlock plantation, established after a fire
- gentle to rolling slopes

Prescription

- thinning from below
- remove marked trees
- residual spacing at 346 trees/ha

Operating procedure

- trees were pre-marked by US Forest Service staff
- harvester felled and processed the trees at the stump, and sorted the sawlog and pulplogs
- forwarder travels on the harvester trails, loads the logs into the bunks, and forwards the wood to the roadside where it is decked for the logging truck

Equipment description and specifications

See Tables 1 and 2. Additionally,

- harvester is articulated with a tandem-axle bogie on the front section

Table 1. Timberjack 1270 Harvester Specifications

	Timberjack 1270 harvester
Engine power (kW)	114
Power transmission	6-wheel drive hydrostatic
Engine	Perkins turbo intercooled diesel
Head capacity (cm)	60-cm diameter
Approximate weight (kg)	16 410
Width (m)	2.68
Length (m)	7.01
Height (m)	3.63
Boom reach (m)	8.3
Ground clearance (m)	0.59

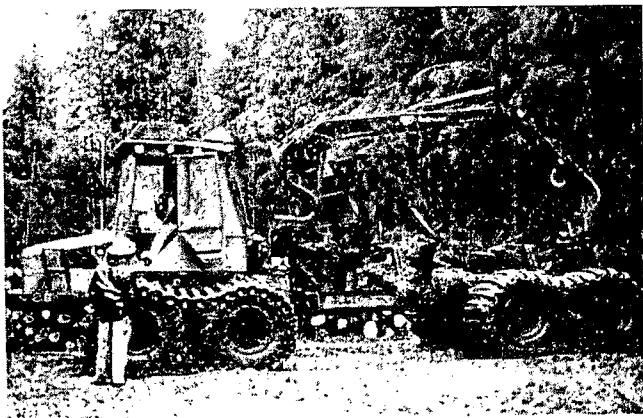


Figure 2. Timberjack 1210 forwarder.

- loader on forwarder has telescoping extension
- grapple has continuous rotation
- four pairs of stakes with extensions
- Timberjack 1270 harvester has been replaced by the 1270B harvester
- Timberjack 1210 forwarder has been replaced by the 1410 forwarder

Equipment supplier

Timberjack equipment is manufactured by Timberjack Inc., Woodstock, ON.

In Canada, Timberjack equipment is available through Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.: 604-532-8324 Fax: 604-532-8354.

Table 2. Timberjack 1210 and 1410 Forwarders Specifications

	Timberjack 1210 forwarder	Timberjack 1410 forwarder
Engine power (kW)	128	124
Power transmission	8-wheel drive hydrostatic	8-wheel drive hydrostatic
Engine	Perkins 1004 Turbo	Perkins 1006 Turbo
Approx. weight (kg)	15 155	17 000
Width (m)	2.85	2.93
Length (m)	9.93	9.20-10.40
Height (m)	3.58	3.70
Crane reach (m)	7.2	7.2-8.3
Carrying capacity (t)	12 - t	14 - t
Ground clearance (m)	0.60	0.60

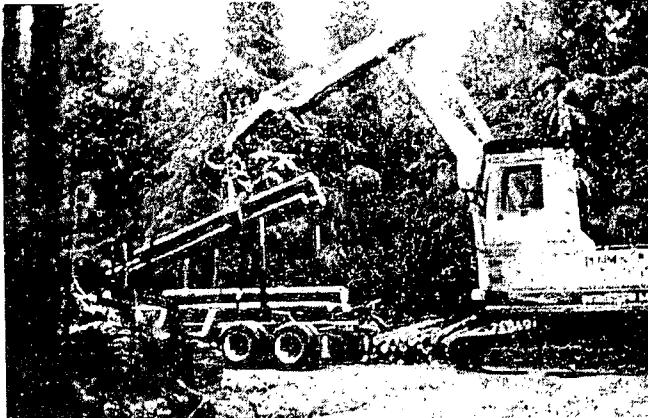


Figure 3. Log loader.

In Washington and Oregon, Timberjack equipment is distributed by Pacific North Equipment Co., 22431 83rd Ave. S, Kent, WA 98032 USA Tel.: 206-872-3500.

The approximate (2000) prices of the Timberjack 1270 harvester and 1410 forwarder are \$631 000 and \$540 000 respectively.

References

FERIC Compendium articles Operations Cut-to-Length #1, #2, #6, #16, #17, #26, Equipment Feller-Processor #1 and Forwarder #1.

FERIC Technical Note TN-235.

FERIC Field Note Processing-40.

For further information, contact:

Fred Pleines, Pleines Logging Company, 1755 Bogachiel Way, Forks, WA 98331 USA Tel.: 360-374-6373 Fax: 360-374-6088.

Tim White, Timberjack Inc., PO Box 160, 925 Devonshire Ave., Woodstock, ON, N4S 7X1 Tel.: 519-537-6271 Fax: 519-537-8395.
E-mail: tim.white@ca.timberjack.com

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**Forest Engineering Research Institute of Canada, Western Division
Compendium of Commercial Thinning — Operations**

Region Oregon

Author

Janet Mitchell, RPF

Date
March 2000

Source

Contractor
Tim Card, Eugene, OR

Equipment

- hand falling
 - Koller K301 yarder with Acme carriage and 4 Johnson electronic chokers (Figures 1 and 2)
 - Kobelco Mark 4 SK 200 LC log loader (Figure 3)

Location

US Department of Interior, Bureau of Land Management
land near Cottage Grove, OR

Site and stand

- Douglas-fir plantation
 - pre-commercially thinned at age 12

Prescription

- thin from below
 - minimize damage

Operating procedure

- hand falling, limbing and processing at the stump
 - crew was short handed, yarder operator also operated the loader
 - when 2 chokesetters were present, 4 chokers were used; when 1 chokesetter ran the yarder, only 2 chokers were used
 - yarding to the landing, electronic chokers self-release at the landing by remote control on yarder
 - logs are stamped with the timber mark and painted
 - loader then sorts the logs and decks them at the roadside until they are loaded onto logging trucks

Harvesting System: Cable
Item: #21

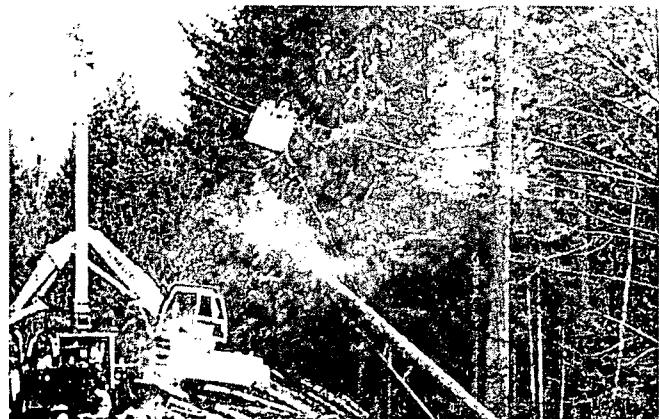


Figure 1. Koller K301 yarder with Acme carriage.

Equipment description and specifications

See Table 1. Additionally,

- yarder mounted on Ford F600 truck

Production

The crew produced approximately 6 truck loads/day.

Table 1. Koller K301 Yarding Specifications

Equipment suppliers

Koller is manufactured by Koller, Kufstein, Austria and distributed by Northwest Harvesters Incorporated, Portland, OR.

Kobelco log loaders are sold and serviced by Feenaughty Machinery Co., Portland, OR.

In BC, Kobelco log loaders are available from Trican Machinery Ltd., Surrey, BC.

The electronic chokers are manufactured and distributed by Johnson Industries Ltd., Richmond, BC.

The approximate (2000) price of the Koller K301 is US\$48 000.

References:

FERIC Compendium articles Operations Cable #8, #22 and Equipment Yarder #2.

For further information, contact:

Tim Card, 28507 Kokkeler Rd., Eugene, OR 97402 USA Tel.: 541-689-8817 Cel: 541-954-1126.

Des Trent, Northwest Harvesters Incorporated, 8828 NE Killingsworth Street, Portland, OR 97220 USA Tel.: 503-257-7696 Fax: 503-257-2704.

Norm Johnson, Johnson Industries Ltd., 8500 River Road, Richmond, BC V6X 1Y4 Tel.: 604-273-3737 Fax: 604-273-9654.

Trican Machinery Ltd., 19066 95A Ave., Surrey, BC V4N 4P2 Tel.: 604-513-3100 Fax: 604-513-3101.

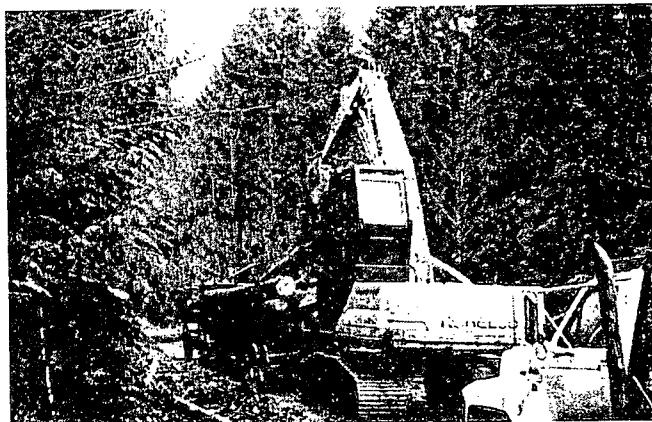


Figure 3. Kobelco SK 200 LC log loader.

Feenaughty Machinery Co., PO Box 13279, Portland, Oregon 97213 USA Tel.: 503-282-2566 Fax: 503-282-1755 Toll free: 1-800-875-2566.

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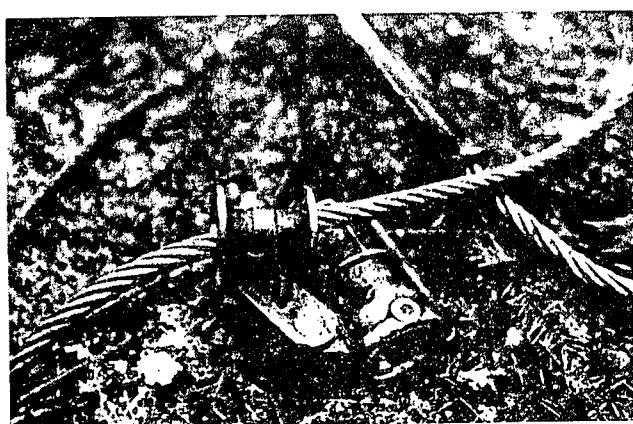


Figure 2. Johnson electronic chokers.



Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #22

Region
Oregon

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in March 2000

Contractor
Tim Card, Eugene, OR

Equipment

- hand falling
- Skylead C-40 yarder with Eaglet carriage and electronic chokers (Figures 1 and 2)
- Kobelco Mark 4 SK 200 LC log loader (Figure 3)

Location
Private land near Timber, OR

Site and stand

- Douglas-fir plantation
- pre-commercially thinned at age 12

Prescription

- thin from below
- minimize damage

Operating procedure

- hand falling, limbing and processing at the stump
- yarding to the landing, electronic chokers self-release at the landing by remote control on yarder
- logs are stamped with the timber mark and painted
- loader then sorts the logs and decks them at the roadside until they are loaded onto logging trucks

Equipment description and specifications

See Table 1. Additionally,

- 12.2 m lightweight latticed tower
- 4 drum guyline system
- can use intermediate supports to reduce road construction, overcome physical obstacles, access

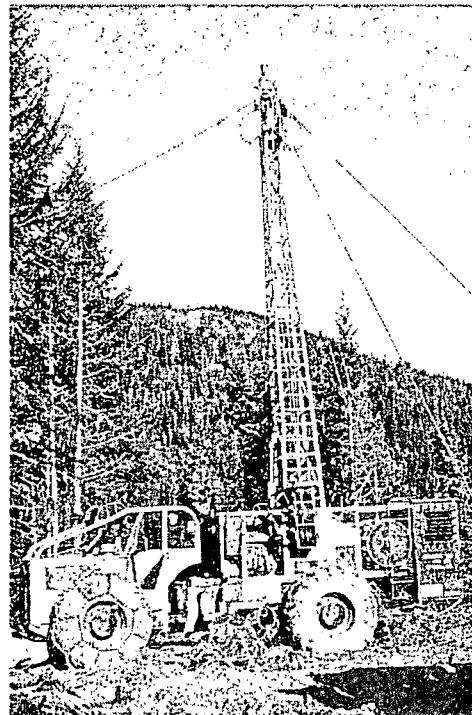


Figure 1. Skylead C-40 yarder.

- more ground per setting, and reduce yarding and rigging time where ground clearance is a problem
- rigging intermediate supports require 1.5-2.0 hours labour
- can be trailer-, truck- or skidder-mounted
- tightening side on guyline drums reduces cable wear and hang-ups
- can be used for both uphill and downhill yarding

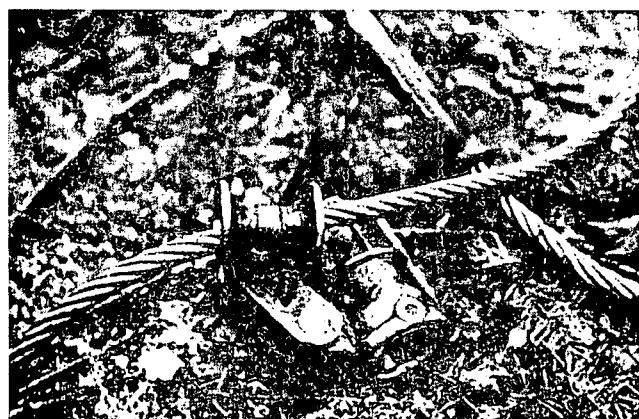


Figure 2. Johnson electronic chokers.

Table 1. Skylead C-40 Yarding Specifications

Skylead C-40 yarder	
Engine	Cummins diesel, 6 cylinder
Engine power (kW)	174
Power transmission (Allison, automatic)	4 speed forward 1 speed reverse
Winch drive	mechanical
Line capacity	
Skyline	610 m - 19 mm
Mainline	610 m - 12 mm
Haulback	1280 m - 12 mm
Guyline	60 m - 19 mm
Maximum line speeds (m/min)	
Mainline	714
Haulback	714
Maximum line pulls (kg)	
Skyline	20 530
Mainline	15 950
Overall tower height (m)	12.2

- radio controlled carriage (Maki II or Eaglet) can be moved up or down the skyline to adjust for hang-ups when lateral yarding

Equipment suppliers

The Skylead yarder is manufactured and distributed by Skylead Logging Equip. Corp., Enderby, BC.

Kobelco log loaders are sold and serviced by Feenoughty Machinery Co., Portland, OR. In BC, they are available through Trican Machinery Ltd., Surrey, BC.

The electronic chokers are manufactured and distributed by Johnson Industries Ltd., Richmond BC.

The approximate (2000) price for the Skylead yarding system is \$430 000 including cable, rigging, radios, and a carriage.

References:

FERIC Compendium articles Operations Cable #16, #17, Cable #21 and Equipment Yarding #10.

For further information, contact:

Tim Card, 28507 Kokkeler Road, Eugene, OR 97402
USA Tel.: 541-689-8817 Cel.: 541-954-1126.



Figure 3. Kobelco log loader.

Bill Varner, Skylead Logging Equip. Corp., Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

Norm Johnson, Johnson Industries Ltd., 8500 River Road, Richmond, BC V6X 1Y4 Tel.: 604-273-3737 Fax: 604-273-9654.

Trican Machinery Ltd., 19066 95A Ave., Surrey, BC V4N 4P2 Tel.: 604-513-3100 Fax: 604-513-3101

Feenoughty Machinery Co., PO Box 13279, Portland, Oregon 97213 USA Tel.: 503-282-2566 Fax: 503-282-1755 Toll free: 1-800-875-2566

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #23

Region
Washington

Author
Janet Mitchell, RPF

Date
March 2000

Source
FERIC field visit in February 2000

Contractor
Ramco Mechanical Cutting Ltd., La Center, WA

Equipment

- Timberjack 2618 feller buncher
- Thunderbird TSY 6140 SLR swing yarder with Eaglet carriage and Johnson electronic chokers (Figure 1)
- Keto 500 processing head on Komatsu excavator (Figure 2)
- Link Belt 2800 log loader (Figure 3)
- Komatsu D21 crawler tractor for clearing the landings

Location
Weyerhaeuser's private land on St. Helen's Tree Farm near Kelso, WA

Site and stand

- 32-year-old Douglas-fir plantation
- precommercially thinned at age 12
- 840 trees/ha

Prescription

- corridors are 36 m apart and approximately 300 m in length
- thinning from below
- remove approximately 370 trees/ha

Operating procedure

- mechanical falling with the feller-buncher
- stems yarded to the landing
- electronic chokers self-released at the landing

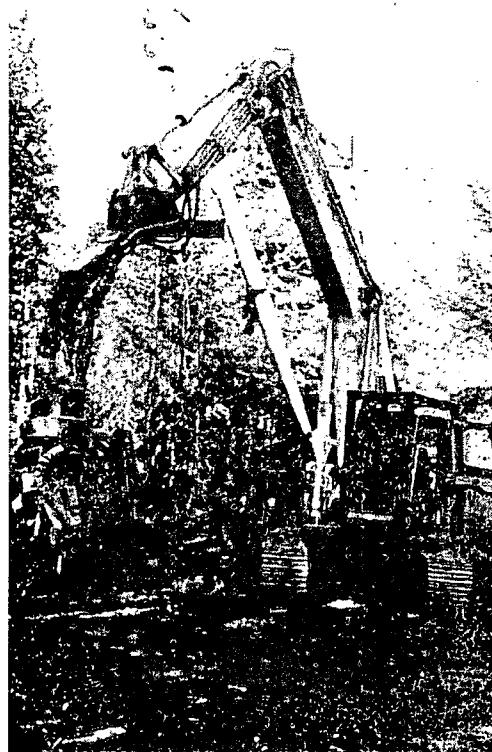


Figure 1. Komatsu excavator with Thunderbird yarder in background.

- stems processed at the landing with the Keto 500 processing head
- logs were decked and loaded by the Link Belt log loader
- Komatsu D21 crawler tractor cleared the landings

Production

Contractor estimates the production at 4-5 50-t loads/day for 250 t/day.

Equipment description and specifications

See Table 1. Additionally,

- Thunderbird yarder has Caterpillar 3126 Dita engine and Allison MT643 4F-1R transmission

Equipment suppliers

Thunderbird yarders are manufactured by Ross Corporation, Eugene, OR and are available through Fanning, 555 Great Northern Way, Vancouver, BC V5T 1E2 Tel.: 604-872-4444 Fax: 604-872-2994.

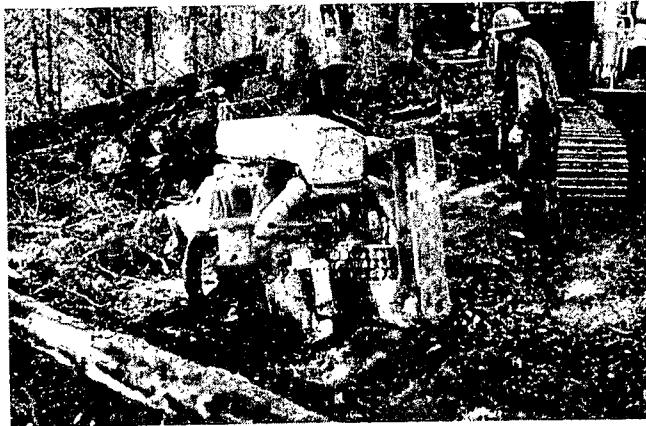


Figure 2. Keto 500 processing head.

Komatsu excavators are available through Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.: 604-532-8324 Fax: 604-532-8354.

Johnson electronic chokers are available through Johnson Industries Ltd., 8500 River Road, Richmond, BC V6X 1Y4 Tel.: 604-273-3737 Fax: 604-273-9654.

Keto processing heads are available through Forest Harvesting Equipment Ltd., 4666 Fisher St., New Westminster, BC V3L 3H9 Tel./Fax: 604-524-6469.

The approximate (2000) prices for the equipment are as follows:

Thunderbird TSY 6140 SLR yarder: US\$400 000

Eaglet carriage US\$35 000

Keto 500 processor US\$250 000

Table 1. Thunderbird TSY 6140 SLR Swing Yarding Specifications

	Thunderbird TSY 6140 SLR swing yarder
Engine power (kW)	172
Line capacity	
Mainline	600 m - 16 mm
Haulback	1200 m - 16 mm
Strawline	1200 m - 6 mm
Maximum line speed (m/min)	399
Maximum line pull (kg)	19 000
Approximate weight (kg)	28 600
Operating tower height (m)	12.2



Figure 3. Link Belt 2800 log loader.

Link Belt 2800 loader US\$229 000
Timberjack 2618 feller-buncher US\$350 000
Komatsu D21 crawler tractor US\$30 000.

For further information, contact:

Sam Ceballos, Weyerhaeuser Longview, PO Box 188, Longview, WA USA 98632, Tel.: 360-578-4505 Fax: 360-636-6333
E-mail: Sam.Ceballos@Weyerhaeuser.com

Wendy or Marc Chord, Ramco Mechanical Cutting Ltd., 5616 NE 399th Street, La Center, WA USA 98629 Tel.: 360-263-1967 Fax: 360-263-5707.

Ross Corporation, PO Box 2577, 460 N Danebo, Eugene, OR USA 97402 Tel.: 541-689-5031 Toll free: 1-800-777-9555 Fax: 541-689-0420.
E-mail: ross@thunderbird.net

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #27

Model: Samsung 130 LCM with PAN 828 harvesting head

Reference

- FERIC Compendium article Operations Cut-to-Length #19

Illustration

- Samsung 130 LCM with DT teleboom and PAN 828 harvesting head (Figure 1)

Location

On private land owned and managed by Carton St Laurent between St-Félicien and Chibougamau, Quebec.

Contractor

Donald Fortin, St-Edmond des Plaines, Quebec

Equipment specifications

See Table 1.

Production

Contractor estimated the harvester was able to cut 110 stems or 7-9m³/8-hour shift.

Manufacturer and distributor

The Samsung excavators are manufactured in Korea and are distributed by Wajax, 9087E - 198 Street,

Table 1. Samsung 130 LCM Excavator Specifications

	Samsung 130 LCM Excavator
Engine power (kW)	74
Engine - Cummins	4 cylinder water cooled
Power transmission	hydrostatic 2 speed
Approximate weight (kg)	15 000
Cutting capacity (m)	0.40
Width (m)	2.74
Length (m)	4.30
Height (m)	3.02
Tail swing radius (m)	2.26
Boom reach (m)	10.0
Ground clearance (m)	0.65

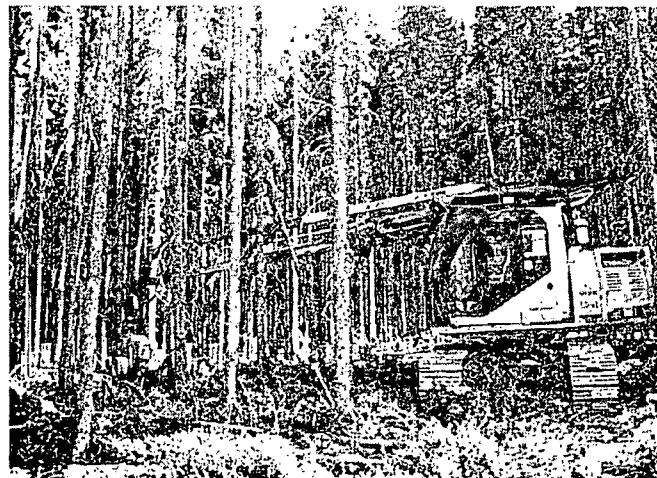


Figure 1. Samsung 130 LCM with PAN 828 harvesting head (Photo courtesy of J-F. Gingras, FERIC, Eastern Division).

Langley, BC V1M 3B1 Tel.: 604-513-2216 Toll free: 1-800-668-4884.

The approximate (1999) price of the Samsung 130 LCM excavator with Pan 828 harvesting head is \$160 000.

For further information, contact:

Denis Thibault, Carton St Laurent, 1053 Boulevard Ducharme, La Tuque, Quebec G9X 3C3 Tel.: 819-523-4531 Fax: 819-523-9157.

Donald Fortin, St-Edmond des Plaines, Quebec Tel.: 418-274-3526.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #28

Model: Kubota KX 191 excavator with Patu RH 405 head

Reference

- FERIC Compendium article Operations Cut-to-Length #22

Illustration

- Kubota KX 191 excavator with Patu RH 405 head (Figure 1)

Location

Crown land managed by Coopérative Laterrière near Falardeau, Quebec.

Equipment specifications

See Table 1.

- original primary and secondary booms of the excavator were removed and replaced with a Patu model 915 crane with telescopic extension (1.6 m) by CamTrac, Quebec City
- Patu 405 RH head was the new roller-feed unit

Equipment Manufacturer and Distributor

Kubota equipment is manufactured by Kubota Corporation, Osaka, Japan and distributed by CamTrac, Quebec City.

Patu equipment is manufactured in Finland by Kesla Oy, Joensuu, Finland, Tel.: 358-13-682-841 Fax: 358-13-682-8300.

Table 1. Kubota KX 191 excavator with Patu RH 405 head Specifications

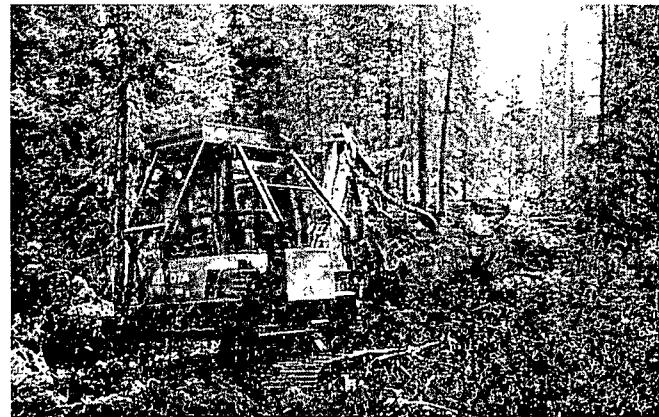


Figure 1. Kubota KX 191 excavator with Patu RH 405 head.

The approximate (1999) price of the Kubota excavator is \$250 000 including all the modifications.

For further information, contact:

Pierre Rose, Coopérative Laterrière, 4910 boul. Talbot, Chicoutimi, Québec G0V 1K0 Tel.: 418-678-2222 Fax: 418-678-9786.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Kubota KX 191 excavator with Patu RH 405 head	
Engine power (kW)	44
Cutting capacity (m)	0.45
Approximate weight (kg)	6 000
Width (m)	2.15
Length (m)	4.72
Height (m)	3.02
Boom reach (m)	6.0
Ground clearance (m)	0.35



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #6

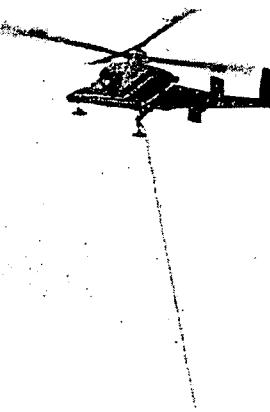
Model: Kaman K-1200 K-Max "Aerial Truck" Helicopter

Illustrations

- Kaman K-1200 K-Max light-lift helicopter (Figures 1 and 2)

Location

The helicopter was observed by FERIC working on Crown land managed by Ainsworth Lumber Company Limited, about 30 km northwest of Gold Bridge, BC in the Lillooet Forest District. Although the helicopter was working in a clearcut, it is suitable for commercial thinning.



Contractor

Airlift Helilog Incorporated, Pitt Meadows, BC

Note: The K-Max helicopter is owned by MidWest Helicopters Ltd., Winnipeg, MB

Aircraft specifications

See Table 1. Additionally,

- two-bladed counter-rotating intermeshing configuration enables the helicopter to operate without a tail rotor resulting in more power

Table 1. Kaman K-1200 K-Max Helicopter Specifications

	Kaman K-1200 K-Max helicopter
Maximum gross weight (kg)	5 862
Max. rated payload capacity (kg)	2 722
Fuel capacity (kg)	672
Vne (km/h) *	100
Economy cruise (km/h)	80
Service ceiling (m)	4 573
Main rotor blades (no.)	4
Main rotor diameter (m)	14.7
Overall aircraft height (m) **	4.2
Overall aircraft length (m) ***	12.7

* Vne is velocity never exceeded.

** Overall aircraft height is measured to the top of the rear rotor hub.

*** Overall aircraft length is the length of the fuselage.

Figure 1. Kaman K-1200 K-Max Helicopter.

- available for lifting
- rated useful load, with full fuel, is 2 722 kg (6 000 lbs.)
- one 1 342 kW Textron Lycoming T5317A-1 gas turbine engine, de-rated to 1 119 kW, equipped with a particle separator
- strong airframe constructed of heavy-gauge materials
- TBOs (Time-before-overhaul) of all components are designed for a minimum of 2 500 flight hours
- designed and built for repetitive external load cycle
- accommodation for one pilot, no passengers
- equipped for helicopter yarding with a multiple hook system or grapple attached to a 45- or 60-m dropline
- initially developed in 1990
- Federal Aviation Administration (FAA) Certification in August 1994

Manufacturer and distributor

The Kaman K-1200 K-Max helicopter is

manufactured and distributed by the Kaman Aerospace Corporation of Bloomfield, Connecticut, USA. Parts support is provided by Kaman Industrial Technologies.

The approximate (2000) factory list price of the base model Kaman K-1200 K-Max helicopter is US\$3 500 000.

For further information, contact:

Commercial Aviation Operations, Kaman Aerospace Corporation, PO Box 2, Bloomfield, CT 08002 USA
Tel.: 203-242-4461.

MidWest Helicopters Ltd., Logging Division Headquarters, 9226 James Street, Chilliwack, BC V2P 6G9 Tel.: 604-792-6539 or West Hanger Road, Winnipeg International Airport, Winnipeg, Manitoba V2P 6G9 Tel.: 204-885-6212 Fax: 204-831-0879.

Brian Bergstrom, Logging Operations Manager, Airlift Helilog Incorporated, 4-11465 North Baynes Road, Pitt Meadows, BC V3Y 2B3 Tel.: 604-465-8981.

Dave Rennie, Divisional Operations Superintendent, Ainsworth Lumber Co., Ltd., 530 Main Street, PO Box 880, Lillooet, BC V0K 1V0 Tel.: 250-258-5200 Fax: 250-258-5250.

Michelle Dunham FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: michel-b@vcr.feric.ca or admin@vcr.feric.ca

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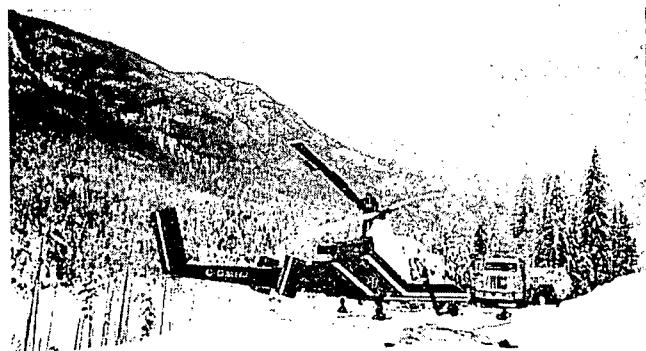


Figure 2. Kaman K-1200 K-Max at service landing.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #7

Model: Eurocopter SA-315B Lama Helicopter

Illustrations

- Eurocopter SA-315B Lama helicopter (Figure 1)

Location

The helicopter was observed by FERIC working on Crown land managed by Ainsworth Lumber Company Limited, about 50 km northwest of Lillooet, BC in the Lillooet Forest District. Although the helicopter was working in a clearcut, it is suitable for commercial thinning.

Contractor

Airlift Helilog Incorporated, Pitt Meadows, BC

Aircraft specifications

See Table 1. Additionally,

- single rotor with tail rotor configuration
- full bubble-type cabin enclosure
- high altitude performance capabilities (Eurocopter SA-315B Lama set the helicopter absolute altitude record of 12 442 m in 1972)
- only helicopter commercially produced that can lift its own weight

Table 1. Eurocopter SA-315B Lama Helicopter Specifications

	Eurocopter SA-315B Lama helicopter
Maximum gross weight (kg)	1 950
Max. rated payload capacity (kg)	1 134
Fuel capacity (kg)	997
Vne (km/h) *	209
Economy cruise (km/h)	192
Service ceiling (m)	5 400
Main rotor blades (no.)	3
Tail rotor blades (no.)	3
Overall aircraft height (m) **	3.09
Overall aircraft length (m) ***	10.24

* Vne is velocity never exceeded

** Overall aircraft height is measured to the top of the rear rotor hub.

*** Overall aircraft length is the length of the fuselage.



Figure 1. Eurocopter 315B Lama Helicopter.

- rated useful load, with full fuel, 464 kg (1020 lbs.)
- helicopter logging is generally not performed with full fuel load, therefore actual useful load was significantly greater (900 to 1000 kg)
- one Turbomeca Artouste IIIBI, 640 kW turbine engine, de-rated to 515 kW
- accommodation for one pilot and four passengers
- equipped for helicopter yarding with either a 14-kg hook or a 114-kg grapple attached to a 30-, 45- or 60-m dropline
- initially developed in 1968
- Federal Aviation Administration (FAA) Certification, VFR (visual flight rules) in February 1972

Manufacturer and distributor

The Eurocopter SA-315B Lama has not been manufactured since 1988. Used and/or refurbished Lama helicopters are fairly common but may not be retro-fitted for helicopter logging.

The approximate (1988) factory list price of an equipped Eurocopter SA-315B Lama helicopter was US\$770 000. Equipped price includes VHF, ADF or transponder, dual controls, heater, high skid gear and cargo hook.

The approximate re-sale value of a 1988 equipped low time/high value Eurocopter SA-315B Lama helicopter

is in the range of US\$600 000 to US\$700 000. Low time denotes components which have been operated for a small portion of their service life limit since new or since last overhauled in accordance with the manufacturer's recommendations.

For further information, contact:

Brian Bergstrom, Logging Operations Manager,
Airlift Helilog Incorporated, 4-11465 North Baynes
Road, Pitt Meadows, BC V3Y 2B3 Tel.: 604-465-
8981.

Dave Rennie, Divisional Operations Superintendent,
Ainsworth Lumber Co., Ltd., 530 Main Street, PO
Box 880, Lillooet, BC V0K 1V0 Tel.: 250-258-5200
Fax: 250-258-5250.

Michelle Dunham FERIC, 2601 East Mall,
Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: michel-b@vcr.feric.ca or admin@vcr.feric.ca

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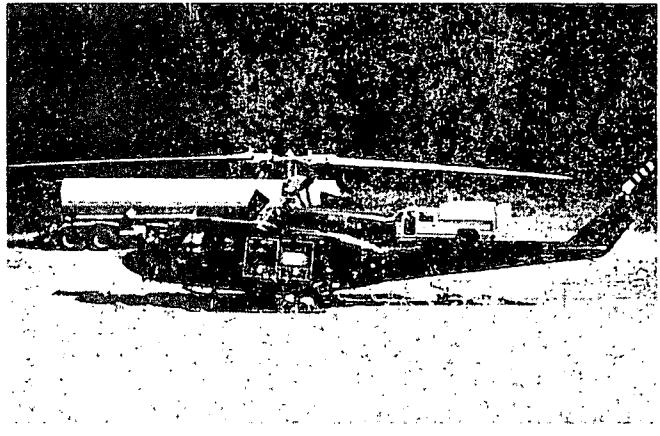


Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #8
Model: Bell 214B "Big lifter" Helicopter

Illustration

- Bell 214B helicopter (Figure 1)



Location

The helicopter was observed by FERIC working on Crown land managed by Ainsworth Lumber Company Limited, about 30 km northwest of Gold Bridge, BC in the Lillooet Forest District. Although the helicopter was working in a clearcut, it is suitable for commercial thinning.

Contractor

TransWest Timber Incorporated, Chilliwack, BC

Aircraft specifications

See Table 1. Additionally,

- single rotor with tail rotor configuration.
- one 2 185-kW Allied Signal (Lycoming) turbine engine, de-rated to 1 678 kW
- rated useful load, with full fuel, is 2 090 kg (4 604 lbs.)
- Bell 214B helicopter generally did not yard with full fuel (fuel was at 70 to 75% of maximum at the start of each yarding cycle)

Table 1. Bell 214B Helicopter Specifications

	Bell 214B helicopter
Maximum gross weight (kg)	6 260
Max. rated payload capacity (kg)	3 629
Fuel capacity, standard tank (kg)	1 367
Vne (km/h) *	259
Economy cruise (km/h)	246
Service ceiling (m)	6 090
Main rotor blades (no.)	2
Tail rotor blades (no.)	2
Overall aircraft height (m) **	4.22
Overall aircraft length (m) ***	13.77

* Vne is velocity never exceeded.

** Overall aircraft height is measured to the top of the rear rotor hub.

*** Overall aircraft length is the length of the fuselage.

Figure 1. Bell 214B helicopter at service landing.

- accommodation for one pilot, one co-pilot and fourteen passengers
- Bell 214B was stripped-down for logging (i.e. passenger equipment removed) to reduce aircraft gross weight
- equipped for helicopter yarding with a hook system or a grapple attached to a 45- or 60-m dropline
- initially developed in 1973
- Federal Aviation Administration (FAA) certification, VFR (visual flight rules) in January 1976
- first model equipped with US-manufactured fiberglass rotor blade to achieve FAA certification (July 1978)

Manufacturer and distributor

The Bell 214B helicopter has not been manufactured since 1981.

The approximate (1981) factory list price of an equipped Bell 214B helicopter is US\$1 857 000. Equipped price includes VHF, ADF, high skid gear, cargo hook, dual instruments and rotor brake.

The approximate resale value of a 1981 equipped low time/high value Bell 214B helicopter is currently in the range of US\$1 670 000 to US \$1 761 000. Low time denotes components which have been operated for a small portion of their service life limit since new

or since last overhauled in accordance with the manufacturer's recommendations.

For further information, contact:

Tim McEvoy, President, TransWest Timber Incorporated, PO Box 87, 46185 Olds Drive, Chilliwack, BC V2P 6H7 Tel.: 604-795-6200.

Dave Rennie, Divisional Operations Superintendent, Ainsworth Lumber Co., Ltd., 530 Main Street, PO Box 880, Lillooet, BC V0K 1V0 Tel.: 250-258-5200 Fax: 250-258-5250.

Michelle Dunham FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: michel-b@vcr.feric.ca or admin@vcr.feric.ca

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Western Division



INSTITUT CANADIEN
DE RECHERCHES
EN GENIE FORESTIER
Division de l'ouest

December, 2000

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108) - Issue Ten

The Compendium of Commercial Thinning Operations and Equipment in Western Canada has received funding for 2000/2001 from Forest Renewal BC.

The enclosed material comprises the tenth issue of ten, 1-page descriptions of commercial thinning operations and equipment. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). If you have not received the first nine issues, please complete the form below and send it to the address provided.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

A handwritten signature in black ink, appearing to read "Janet L. Mitchell".

Janet L. Mitchell, R.P.F.
Researcher, Silvicultural Operations Group

**ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING
OPERATIONS AND EQUIPMENT — (SR-108)**

Please return completed form to:

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #28

Region

Interior British Columbia

Author

Janet Mitchell, RPF

Date

December 2000

Source

FERIC field visit in October 2000

Contractor

John Avoine, Beaverdell, BC

Equipment

- hand falling
- JMS 900 forwarding trailer (Figures 1 and 2)
- JMS 900 R loader
- Polaris 6WD ATV

Location

Crown land managed by Pope and Talbot Ltd. south of Beaverdell, BC

Site and stand

- Montane Spruce (MSdm1-05) ecosystem with site index of 16
- 80-year-old lodgepole pine, larch (Figure 3)
- stand density of total stand is 2400 trees/ha
- stand density of trees >1.3 m in height is 1656 trees/ha



Figure 1. JMS 900 forwarding trailer.

- stand density of Layer 2 (material suitable for posts) is 400 trees/ha
- average dbh of 19 cm
- average merchantable height of 16 m
- average slope of 18%

Prescription

- pre-cut to remove small stems (Layer 2, <12.5 cm) that would be unmerchantable in a conventional clearcut operation, cut to 6.4 cm-top
- final cut will be with a feller-buncher in one year

Operating procedure

- 3 hand fallers
- process at the stump, cut into 3.0-m lengths, 2.4 m also acceptable



Figure 2. JMS forwarding trailer with loader.

Table 1. JMS Loaders Specifications

	JMS loaders	
	900 R	106
Lifting capacity at max. reach (kg)	227	409
Lifting capacity at 1.2 m (kg)	409	682
Min. grapple opening (cm)	2.5	2.5
Max. grapple opening (cm)	63.0	81.0
Loader reach (m)	2.7	3.15
Weight (kg)	205	364
Boom rotation (°)	270	360

Table 2. JMS Forwarding Trailers Specifications

JMS forwarding trailers		
	900 SR	126
Width (m)	1.37	1.47
Length (m)	3.61	3.91
Capacity (kg)	1591	2273
Weight (kg)	182	432

- processed logs are stacked at the edge of the forwarding trail, sorted by diameter
- loader on trailer then loads the logs into the bunks
- approximately 50 pieces per load
- logs forwarded to the landing
- processed logs were unloaded from the trailer directly onto a truck for transport to the post mill in Beaverdell, BC

Production

Contractor estimates the production at 2 loads per day. There were approximately 200 pieces per truck load. A second trailer can take approximately 30% more.

Equipment description and specifications

See Table 1. Additionally,

- Polaris ATV is 6 wheel drive, but 4 wheel drive ATV would also be suitable
- canopy for the ATV was designed and manufactured by the operator to provide protection from the elements
- ATV tire chains were modified by doubling the cross pieces to increase traction
- Honda engine 6.7 kW (9 hp) and hydraulic system were mounted on the back of the ATV to provide a power source for the loader
- smaller Honda engine 4.1 kW (5.5 hp) could also be used
- JMS trailer was modified by adding an hydraulic cylinder to move the axle to balance the weight during travelling empty
- trailer brakes would be recommended for travelling on steep slopes
- JMS trailer has an optional dump box for transporting firewood, gravel or etc.
- ATV can be loaded into the dump box and towed by another vehicle for long moves
- many accessories available
- loader has continuous grapple rotation
- more equipment details can be found in Dunnigan (1990)



Figure 3. Stand conditions, pre-treatment.

Equipment suppliers

JMS forwarding trailers and loaders are manufactured by Yvon Caron, JMS Inc., Quebec and distributed by John ATV Accessories, Beaverdell, BC.

References

FERIC Compendium article Equipment Forwarder #20

Dunnigan, J. 1990. Evaluation of the JMS self-loading trailer for all-terrain vehicles (ATV's). FERIC, Pointe Claire. Field Note No. Skidding/Forwarding - 14. 2pp.

Dunnigan, J., Beaulieu, L., and Folkema, M.P. 1987. All-terrain vehicles (ATV's) for forestry work. FERIC, Pointe Claire. Technical Note No. TN-109. 16pp

For further information, contact:

John Avoine, John ATV Accessories, Box 96, Beaverdell, BC V0H 1A0 Tel./Fax: 250-484-5684 Cel 250-470-2684.

E-mail: johnatv@telus.net
www.johnatv.com

Yvon Caron, JMS Inc., 240, route 285, L'Islet S, Quebec G0R 2C0 Tel.: 418-247-5510.

George Delisle, Pope and Talbot Ltd., Boundary Timber Division, Box 70, Midway, BC V0H 1M0 Tel.: 250-449-2500 Fax: 250-449-2388.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cut-to-Length
Item: #29

Region

Alberta

Author

Janet Mitchell, RPF

Date

December 2000

Source

FERIC field visit in November 2000

Contractor

Chlorophylle Contracting Ltd., Whitecourt, AB

Equipment

- Neuson 11002 HV harvester with a Logmax 3000 harvesting head (Figure 1)
- Rottne 6WD Rapid forwarder
- Rocan-T thinning-harvester with Pan 828 head (Figure 2)

Location

Millar Western Forest Products Ltd., near Whitecourt, AB

Site and stand

- study block was in the Labrador tea ecosite of the Upper Foothills ecoregion (UF d1.2)
- 54-year-old pine stand established after a fire

Table 1. Neuson 11002 HV Harvester Specifications

	Neuson 11002 HV harvester
Engine power (kW)	75
Engine	Deutz BF 4M 4 cylinder turbo diesel
Cutting capacity (m)	0.50
Approximate weight (kg)	11 600
Width (m)	2.40
Length (m)	7.40
Height (m)	3.30
Boom reach (m)	9.1
Track width (m)	0.50
Ground clearance (m)	0.52

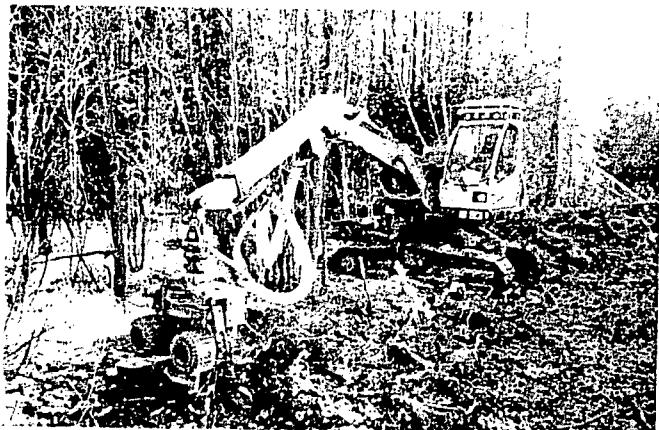


Figure 1. Neuson 11002 HV harvester with a Logmax 3000 harvesting head.

- pre-treatment stand density of 2860 trees/ha
- diameter average dbh of 16 cm
- average height of 16 m
- flat and broken topography
- no obstacles
- approximately 5 cm snow

Prescription

- in the study strata, reduce density to 1626 stems per ha between trails (Figure 3)
- thinning from below
- remove approximately 1233 trees/ha, 13.8 m²/ha basal area
- maximum stump height of 30 cm

Operating procedure

- trees to be removed were selected by the harvester operator
- main trails were selected and marked by a subcontractor
- Neuson harvester cut the main trails with an inter-distance of 25 m
- Rocan-T cut the ghost trails between the main trails, placing the processed logs at the edge of the main trail
- stems were processed on the trail in front of the machine to provide a debris mat for machine travel
- forwarder traveled only on the main harvesting trails cut by the Neuson

Production

Productivity is dependent on stand density and tree size. The contractor estimates the production at 680 trees per shift.

Equipment description and specifications

See Table 1. Additionally,

Neuson:

- suited for thinning or final harvest
- smaller models available
- steel or rubber tracked harvester (the one FERIC observed had steel tracks)
- high visibility cab
- Logmax 3000 harvesting head
- cab tilts 25° for working on slopes up to 47%
- lateral tilt of 15°
- Neuson 9002 does not tilt
- contractor added a xenon light to increase visibility at night

Rocan-T Thinning Harvester:

- Ford Versatile 9030 tractor chassis with a Pan 828 harvesting head
- parallel boom configuration
- because of its narrow width, can be used for ghost trails
- being replaced by the Enviro Thinning Harvester

Equipment suppliers

The Neuson harvester is manufactured in Austria by Neuson. Rocan equipment is manufactured by Rocan Forestry Service, Dieppe, NB.

All the equipment is distributed by The Rocan Group.

The approximate (2000) price of the Neuson harvester is \$400 000. The Rocan-T thinning harvester has been replaced by the Enviro Thinning harvester and is approximately \$375 000. The Rottne Rapid forwarder is approximately \$350 000.

References

Compendium articles Operations Cut-to-Length #18 and Equipment Feller-Processors #21 and #29.

For further information, contact:

Jean François Tremblay or Tom Strapps, Chlorophylle Contracting Ltd., Whitecourt, AB Tel.: 780-778-6114 Fax: 780-706-1010 Cell.: 604-612-2407.

Kevin Westerhaug, Millar Western Forest Products Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 780-706-0483 Fax: 780-778-4631.

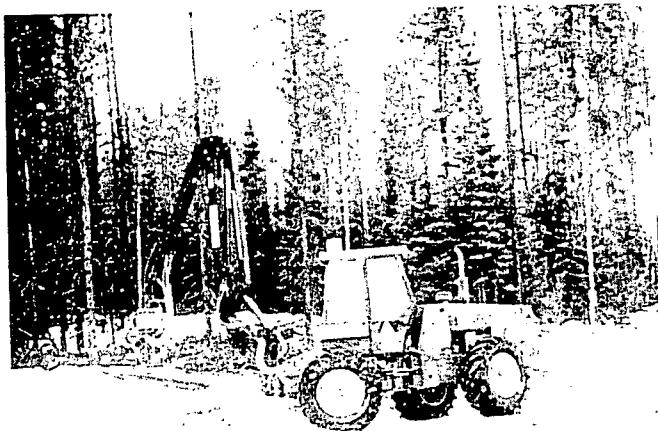


Figure 2. Rocan-T thinning harvester.

Brent MacLeod, Rocan Forestry BC Limited, 5339A Hartway Drive, Prince George, BC V2K 5B6 Tel.: 250-962-8244 Fax: 250-962-8892.
E-mail: rocanbc@telus.net
www.rocan.com

Alan Anderson, Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.
E-mail: info@rocan.com

Neuson, Gaisbergerstrabe 52, A-4030 Linz, Austria, Tel.: 0-732-66-73-31 Fax: 0-732-66-01-25.

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Figure 3. Stand conditions post-treatment.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

**Harvesting System: Cut-to-Length
Item: #30**

Region

Alberta

Author

Janet Mitchell, RPF

Date

December 2000

Source

FERIC field visit in November 2000

Contractor

Zell Oilfield Services Ltd., Spruce Grove, AB

Equipment

- Timberjack 1270 harvester with feller-processing head (Figure 1)
- Timberjack 1210B forwarder (Figure 2)
- chainsaw

Location

Vanderwell Contractors (1971) Ltd., north of Athabasca, AB

Site and stand

- 66-year-old white spruce stand with some deciduous
- site index of 22 m (height at 50 years of age)

Table 1. Timberjack 1270 Harvester Specifications

Timberjack 1270 harvester	
Engine	Perkins turbo intercooled diesel
Engine power (kW)	114
Power transmission	6 wheel drive hydrostatic
Head capacity	60 cm
Approx. weight (kg)	16 410
Width (m)	2.68
Length (m)	7.01
Height (m)	3.63
Boom reach (m)	8.3
Ground clearance (m)	0.59

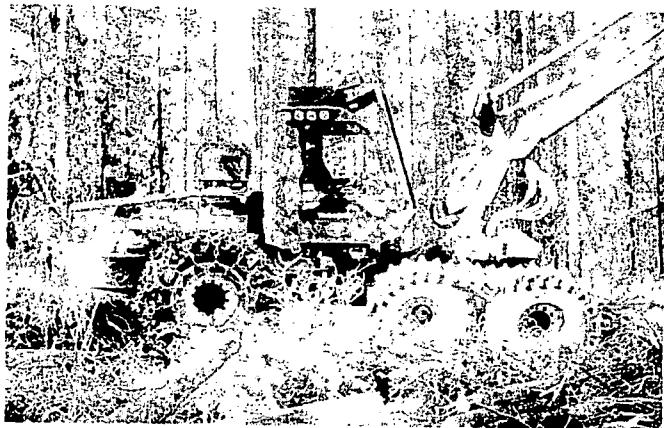


Figure 1. Timberjack 1270 harvester.

- stand density (>5cm) of 1200 trees/ha
- stand density (>12.5 cm) of 1000 trees/ha
- average piece size of 0.34 m³/tree
- average stand volume of 340 m³/ha
- average dbh of 27.3 cm
- average height 23 m
- imperfectly drained sandy clay loam
- average rooting depth approximately 58 cm

Prescription

- improve the stand health and reduce fuel loading
- enhance crop tree quality
- use trees that would be lost to mortality
- thinning from below
- remove approximately 20-30% of the merchantable stems based on spacing factor and risk of windthrow

Operating procedure

- trails were marked by Vanderwell at 20 m spacing
- trees to be removed were selected by the harvester operator
- unmerchantable stems were removed by a manual faller with a chainsaw before the harvester entered the stand
- stems were processed at the stump, sorted into pulp and sawlog, and piled at the trail edge
- logs were forwarded to the landing and decked at roadside until they are hauled to the mill

Production

Productivity is dependent on stand density, species and tree size. Contractor estimates the production at 10-15 m³/productive machine hour.

Equipment description and specifications

See Tables 1 and 2. Additionally,

- harvester is articulated with a tandem-axle bogie on the front section
- bogies can be fitted with a flexible steel track to aid traction and reduce ground pressure
- high visibility cab
- seat in forwarder swivels 180° for forward and rearward steering
- parallel motion knuckleboom crane has 236° operating radius
- log specifications can be programmed into the on-board computer
- minimum log lengths and top diameters for pulp and sawlogs can be identified, however, the operator can override the computer
- loader on forwarder has telescoping extension
- grapple has continuous rotation
- four pairs of stakes with extensions
- Timberjack 1210B forwarder has been replaced by the 1410 forwarder
- Timberjack 1270 harvester has been replaced by the 1270B with 8.6 m reach, 152 kW

Equipment suppliers

Timberjack equipment is manufactured by Timberjack Inc., Woodstock, ON.

Timberjack equipment is available through Terratech dealers, for example, Terratech Equipment Ltd., 20645 Langley By-Pass, Langley, BC V3A 5E8 Tel.:

Table 2. Timberjack Forwarders Specifications

	Timberjack 1210 forwarder	Timberjack 1410 forwarder
Engine power (kW)	128	124
Power transmission	8-wheel drive hydrostatic	
Engine	Perkins 1004 turbo	
Approx. weight (kg)	15 155	17 000
Width (m)	2.85	2.93
Length (m)	9.93	9.2-10.40
Height (m)	3.58	3.70
Crane reach (m)	7.2	7.2-8.3
Carrying capacity (t)	12 t	14 t
Ground clearance (m)	0.60	0.60

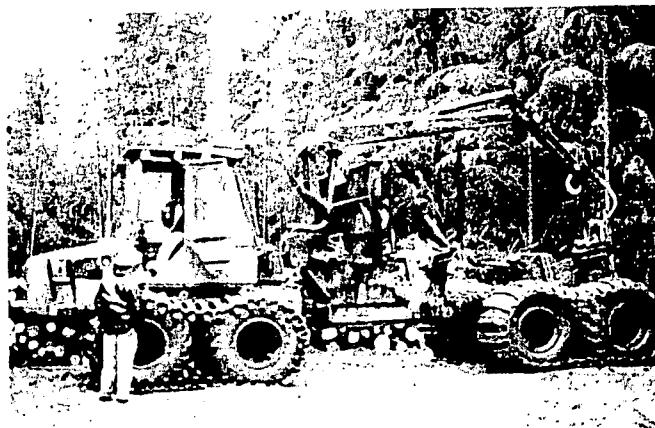


Figure 2. Timberjack 1210 forwarder.

604-532-8324 Fax: 604-532-8354.

In Alberta, Timberjack is distributed through Coneco Equipment Inc., 16116 - 111 Avenue, Edmonton, AB T5M 2S1 Tel.: 780-451-2630 Fax: 780-451-2646.

The approximate (2000) prices of the Timberjack 1270B harvester and 1410 forwarder are \$631 000, and \$540 000 respectively.

References

FERIC Compendium articles Operations Cut-to-Length #1, #2, #6, #16, #17, #26, #27, Equipment Feller-Processor #1 and Forwarder #1.

FERIC Technical Note TN-235 and Field Note Processing-40.

For further information, contact:

Lorne Carson, Vanderwell Contractors (1971) Ltd. PO Box 415, Slave Lake, AB T0G 2A0 Tel.: 780-849-3824 Fax: 780-849-2530.

E-mail: lcanson@vanderwell.com

Les Zeller, Zell Oilfield Services Ltd., Spruce Grove, AB. Tel.: 780-962-8753 Fax: 780-962-6612.

Tim White, Timberjack Inc., PO Box 160, 925 Devonshire Ave., Woodstock, ON, N4S 7X1 Tel.: 519-537-6271 Fax: 519-537-8395.

E-mail: tim.white@ca.timberjack.com

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #24

Region

Coastal British Columbia

Author

Janet Mitchell, RPF

Date

December 2000

Source

FERIC field visit in September 2000

Contractor

C&L Logging Co. Ltd., Maple Ridge, BC

Equipment

- hand falling
- Skylead C-40 16000 yarder (Figure 1)
- Eaglet radio-controlled carriage
- Hitachi UH07 loader

Location

Private land in the University of British Columbia/Malcolm Knapp Research Forest, Maple Ridge, BC

Site and stand

- Coastal Western Hemlock (CWHdm) ecosystem
- 60-year-old stand of western hemlock and western red cedar, naturally regenerated after logging and a slash fire in 1931
- stand density of 1100 trees/ha with average dbh of 26 cm

Prescription

- corridors are approximately 80-120 m in length (Figure 2)
- thinning from below
- leave approximately 350 trees/ha with average dbh of 34 cm

Operating procedure

- corridors and trees to be removed were pre-marked by the research forest staff
- corridors were approximately 30-35 m apart
- contractor selected the backspur trees

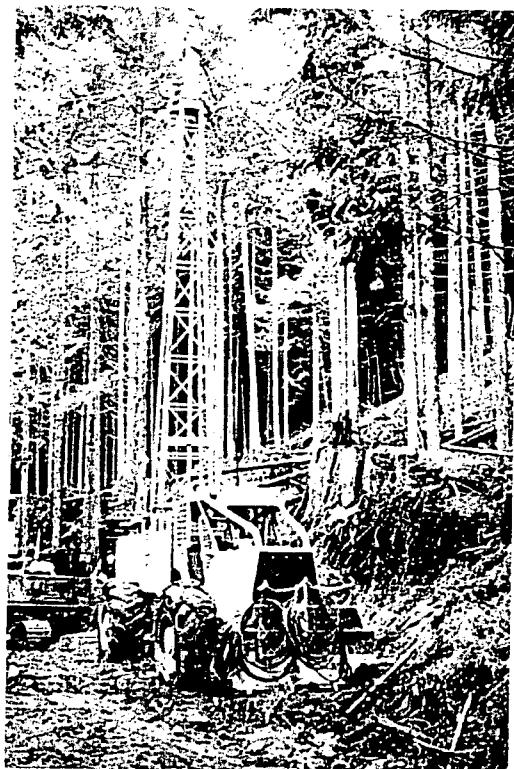


Figure 1. Skylead C-40 16000 yarder with Eaglet carriage.

- intermediate supports were used on long corridors, but not during FERIC's visit
- hand falling and processing at the stump
- logs yarded to the landing
- logs were decked and sorted by the log loader
- logs were loaded and hauled by self-loading log trucks to the mill

Production

Contractor estimates the production at 2 loads per day.

Equipment description and specifications

See Table 1. Additionally,

- 3 drum guyline system
- can use intermediate supports to reduce road construction, overcome physical obstacles, access more ground per setting, and reduce yarding and rigging time where ground clearance is a problem
- rigging intermediate supports require 1.5-2.0 hours labour

Table 1. Skylead C-40 16000 Yarder Specifications

	Skylead C-40 16000 yarder
Engine	Cummins diesel, 4-cylinder
Engine power (kW)	174
Power transmission (Allison, automatic)	4 speed forward 1 speed reverse mechanical
Winch drive	
Line capacity	
Skyline	610 m - 19 mm
Mainline	610 m - 12 mm
Haulback	1280 m - 12 mm
Guyline	60 m - 19 mm
Maximum line speed (m/min)	
Mainline	714
Haulback	714
Maximum line pull (kg)	
Skyline	20 530
Mainline	15 950
Overall tower height (m)	12.2

- Skylead yarder can be mounted on a trailer, truck or skidder
- can be used for both uphill and downhill yarding
- radio-controlled carriage can be moved up or down the skyline to adjust for hang-ups when lateral yarding

Equipment suppliers

The Skylead yarder is manufactured and distributed by Skylead Logging Equipment Corp., Enderby, BC.

References

FERIC Compendium articles Operations Cable #16, #17, #22, and Equipment Yarder #10

For further information, contact:

Bill Varner, Skylead Logging Equipment Corp. Box 880, Enderby, BC V0E 1V0 Tel.: 250-838-6845 Fax: 250-838-7877.

Dan Carlson, C&L Logging Co. Ltd., 11790 - 246th St., Maple Ridge, BC V2X 6X6 Tel.: 604-463-9616 Fax: 604-463-9616-1.



Figure 2. Yarding corridor.

Paul Lawson, Manager, Malcolm Knapp Research Forest, 14500 Silver Valley Road, Maple Ridge, BC V4R 2R3 Tel.: 604-463-8148 Fax: 604-463-2712.
E-mail: plawson@interchg.ubc.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #29 Model: Neuson 11002 Harvester

References

- FERIC Compendium articles Operations Cut-to-Length #29 and Equipment Feller-Processor #15.

Illustration

- Neuson 11002 HV harvester with Logmax 3000 harvesting head (Figures 1 and 2)

Location

DEMO 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000. The harvester also worked in commercial thinning near Whitecourt, AB. In this instance, the harvester worked in conjunction with a Rocan-T thinning harvester and Rottne Rapid forwarder.

Equipment specifications

See Table 1.

- suited for thinning or final harvest
- smaller models available
- steel or rubber tracked harvester
- high visibility cab
- Logmax 3000 harvesting head
- boom has a 9.1 m reach
- cab tilts 25° for working on slopes up to 47%
- lateral tilt of 15°
- Neuson 9002 does not tilt

Table 1. Neuson 11002 HV Harvester Specifications

	Neuson 11002 HV Harvester
Engine power (kW)	75
Engine	Deutz BF 4M 4 cylinder turbo diesel
Cutting capacity (m)	0.49
Approximate weight (kg)	11 600
Width (m)	2.40
Length (m)	7.40
Height (m)	3.30
Boom reach (m)	9.1
Track width (m)	0.50
Ground clearance (m)	0.52

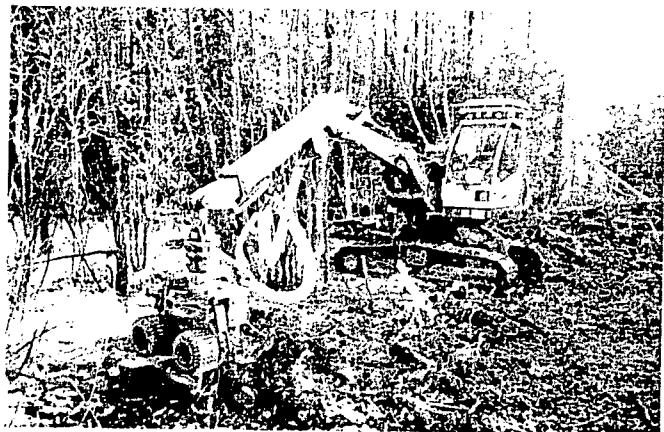


Figure 1. Neuson 11002 HV harvester with Logmax 3000 harvesting head.

- contractor added a xenon light to increase visibility at night

Equipment Manufacturer and Distributor

Neuson harvesters are manufactured in Austria by Neuson and distributed in North America by The Rocan Group.

The approximate (2000) price of the Neuson 11002 HV harvester with the Logmax 3000 harvesting head is \$400 000.

For further information, contact:

Jean François Tremblay or Tom Strapps, Chlorophylle Contracting Ltd., Whitecourt, AB Tel.: 780-778-6114 Fax: 780-706-1010 Cel.: 604-612-2407.

Brent MacLeod, Rocan Forestry BC Limited, 5339A Hartway Drive, Prince George, BC V2K 5B6 Tel.: 250-962-8244 Fax: 250-962-8892.

E-mail: rocanbc@telus.net

Alan Anderson, Rocan Forestry Service Ltd., 703 Blvd. Malenfant, Dieppe, NB E1A 5T8 Tel.: 506-859-9906 Fax: 506-857-8018.

E-mail: info@rocan.com

www.rocan.com

Kevin Westerhaug, Millar Western Forest Products Ltd., 5004 - 52 Street, Whitecourt, AB T7S 1N2 Tel.: 780-778-2221 Fax: 780-778-4631.

Neuson Gaisbergerstrabe 52, A-4030 Linz, Austria, Tel.: 0-732-66-73-31 Fax: 0-732-66-01-25.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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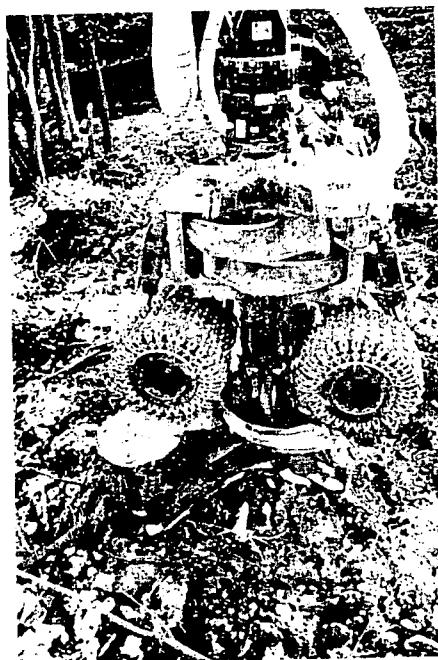


Figure 2. Logmax 3000 harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #7 Model: Thomas T-245 HDK

Reference:

- FERIC Advantage Report Vol. 1, No. 24, August 2000

Illustrations

- Thomas T-245 HDK skid-steer loader with grapple and chokers (Figures 1 and 2)

Location

The Thomas T-245 HDK was observed by FERIC working on the University of British Columbia / Alex Fraser Research Forest, about 75 km northeast of Williams Lake, BC in the Cariboo Forest Region. Although the skidder was being used for clean up following a partial cut harvested the previous year, it may be suitable for commercial thinning and single tree harvesting.

Contractor

Doug Pilkington Contracting, Big Lake, BC

Equipment specifications

See Table 1. Additionally,

- skid steer loader
- log grapple on front
- hook welded on back to hold chokers
- 2 chokers
- high-floatation tires with tracks to increase traction and minimize ground disturbance



Figure 1. Thomas T-245 HDK skid-steer loader with grapple and chokers, notice the hook on front under grapple.

- hydraulic controls remain locked until operator is in the seat with the seat belt fastened and the seat bar lowered
- steering controls lock in neutral and the parking brake automatically engages when the operator exits the cab
- universal attachment mounting fits a variety of attachments
- contractor would like to upgrade the hydraulics to add a feller buncher head
- contractor is also considering adding a winch assembly to aid in the skidding operation

Table 1. Thomas T-245 HDK Loader Specifications

	Thomas T-245 HDK loader
Engine power (kW)	64.7
Power transmission	hydrostatic
Approximate weight (kg)	3 629
Lifting capacity (kg)	1091
Width (m)	1.8
Length (m)	3.0
Height (m)	2.1
Maximum speed (km/h)	10.0
Track width (m)	0.27
Ground clearance (m)	0.23



Figure 2. Thomas T-245 HDK loader.

Equipment manufacturer and distributor

Thomas skid steer loaders are manufactured by Thomas Equipment in New Brunswick and distributed by L.E.J. International Trucks Ltd. in Prince George, BC.

The approximate (2000) price of the Thomas T-245 HDK loader with tracks is \$55 000, not including the modifications completed by the owner.

For further information, contact:

Don Skea, Forest Operations Supervision, UBC/Alex Fraser Research Forest, 72 S 7th Ave, Williams Lake, BC V2G 4N5 Tel.: 250-392-2207 Fax: 250-398-5708.

E-mail: skea@interchange.ubc.ca.

Doug Pilkington Contracting, Box 176, Big Lake, BC V0L 1L0 Tel.: 250-243-0025.

L.E.J. International Trucks Ltd., 1951 - 1st Ave, Prince George, BC V2L 2Y8 Tel.: 250-563-0476 Fax: 250-563-0297.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC, V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #20 Model: JMS

References

- Compendium article Operations Cut-to Length #28
- FERIC Field Note Skidding/Forwarding - 14
- FERIC Technical Note No. TN-109

Illustrations

- JMS forwarding trailers with hydraulic grapple loaders (Figures 1 and 2)
- Polaris 6WD ATV (Figure 3)

Location

DEMO 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000. The JMS forwarding trailer was also observed completing a pre-cut for Pope and Talbot Ltd. south of Beaverdell, BC

Contractor

John Avoine, Beaverdell, BC

Equipment specifications

See Table 1. Additionally,

- Polaris ATV is 6 wheel drive, but 4 wheel drive ATV would also be suitable
- canopy for the ATV was designed and manufactured by the operator to provide protection from the elements
- ATV tire chains were modified by doubling the cross pieces to increase traction
- Honda engine 6.7 kW (9 Hp) and hydraulic system were mounted on the back of the ATV to provide a power source for the loader

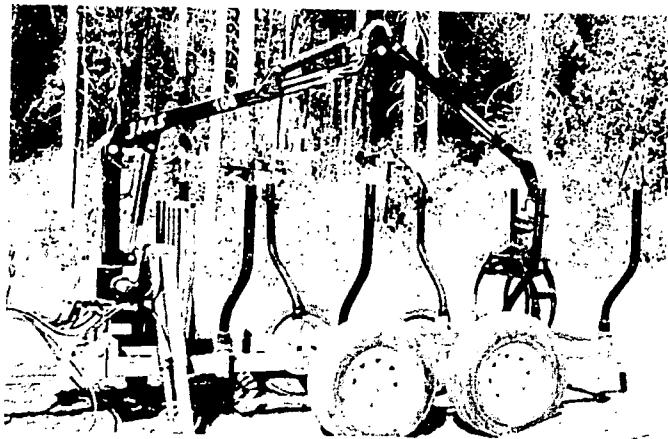


Figure 1. JMS 126 forwarding trailer with JMS 106 loader.

- smaller Honda engine 4.1 kW (5.5 hp) could be used
- JMS trailer was modified by adding an hydraulic cylinder to move the axle to balance the weight during travelling empty
- trailer brakes would be recommended for travelling on steep slopes
- JMS trailer has an optional dump box for transporting firewood, gravel or etc.
- ATV can be loaded into the dump box and towed by another vehicle for long moves
- many accessories available
- loader has continuous grapple rotation
- more equipment details can be found in FERIC Field Note No. Skidding/Forwarding - 14.

Table 1. JMS Loaders Specifications

	JMS loaders	
	900 R	106
Lifting capacity at max. reach (kg)	227	409
Lifting capacity at 1.2 m (kg)	409	682
Minimum grapple opening (cm)	2.5	2.5
Maximum grapple opening (cm)	63.0	81.0
Loader reach (m)	2.7	3.15
Weight of loader (kg)	205	364
Boom rotation (°)	270	360

Table 2. JMS Forwarding Trailers Specifications

	JMS forwarding trailers	
	900 SR	126
Width (m)	1.37	1.47
Length (m)	3.61	3.91
Capacity (kg)	1591	2273
Weight (kg)	182	432

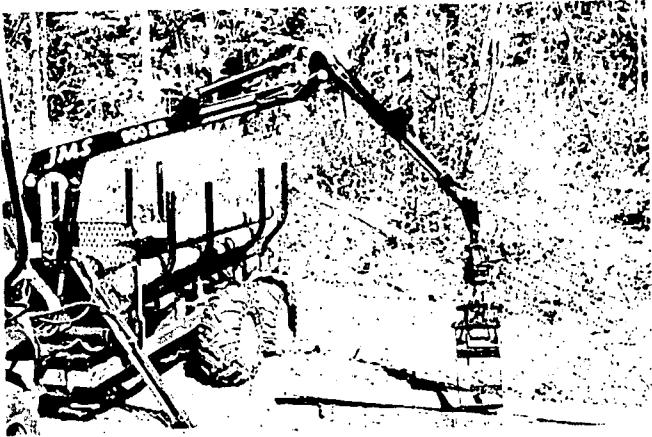


Figure 2. JMS 900SR forwarding trailer with JMS 900R loader.

Equipment manufacturer and distributor

The JMS forwarding trailers are manufactured by Yvon Caron, JMS Inc., Quebec and distributed in BC by John ATV Accessories, Beaverdell, BC.

The approximate (2000) price of the JMS forwarding trailer and loader is \$9 700 (not including freight or taxes).

For further information, contact:

John Avoine, John ATV Accessories, Box 96
Beaverdell, BC V0H 1A0 Tel./Fax: 250-484-5684
Cell 250-470-2684.
E-mail: johnatv@telus.net.
www.johnatv.com

Yvon Caron, JMS Inc., 240, route 285, L'Islet S,
Quebec G0R 2C0 Tel.: 418-247-5510.



Figure 3. Polaris ATV with soft-top canopy.

George Delisle, Pope and Talbot Ltd., Boundary Timber Division, Box 70, Midway, BC V0H 1M0
Tel.: 250-449-2212 Fax: 250-449-2388.

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC, V6T 1Z4 Tel.: 604-228-1555 Fax: 604-228-0999. E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #9 Model: Woodbug 20" Small Log Sawmill

Illustrations

- Woodbug 20" Small Log Sawmill (Figures 1 and 2)

Location

The sawmill was observed by FERIC at an equipment demonstration for the Woodlot Association of Alberta, AGM near Devon, AB October 1999.

Equipment specifications

See Table 1. Additionally,

- mill comes in two sizes
- mill is constructed in modular sections 3.0 m long that bolt end-to-end up to the desired length
- the position of the log is manually adjusted using "dimension stops" teeth on the frame as a guide for accurate width-cutting in half-inch increments
- "log dog" secures and locks the log in position during sawing
- saw moves along the frame and the bar nose is secured in a track to provide a consistent board-width
- cutting diameter is limited by the height of the frame, see Table 1
- Husqvarna 394XP chain saw on gliders
- Woodbug requires a 90 cc saw or larger
- Babybug requires a 50 cc or larger saw
- chain is sharpened with a modified filing guide

Manufacturer and distributor

The Woodbug saw is manufactured and distributed by Woodbug Small Log Sawmills Ltd., Heriot Bay, BC.

Table 1. Sawmill Specifications

	Woodbug 20"	Babybug 11"
Frame height (m)	0.60	0.38
Frame width (m)	0.60	0.36
Weight (kg)		
sawmill	63.6	40.4
hardware	9.1	4.5
Max. cutting diameter (cm)	51.0	28.0



Figure 1. Woodbug 20" sawmill.

The approximate (2000) price of the Woodbug small log sawmill (excluding the saw) is \$1 100, depending on the options. The Babybug is approximately \$800 (excluding the saw).

For further information, contact:

Woodbug Small Log Sawmills Ltd., PO Box 138, Heriot Bay, BC V0P 1H0 Tel.: 250-285-3270 Toll free: 1-877-966-3284 Fax: 250-285-2539. E-mail: woodbug@paconline.net

Janet Mitchell FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

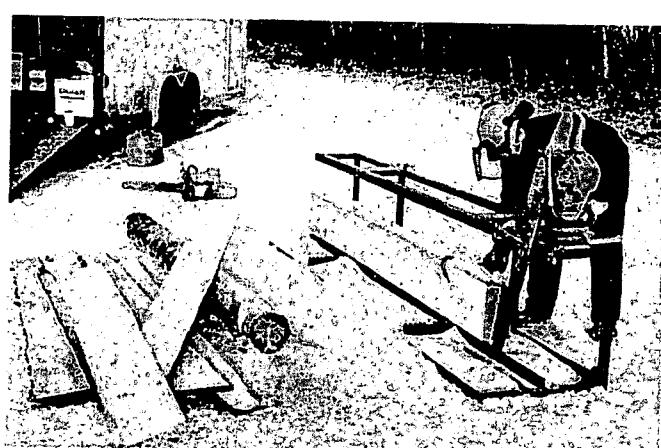


Figure 2. Woodbug 20" sawmill.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #10 Model: Mobile Dimension Saw

Illustrations

- 128 Mobile Dimension Saw (Figure 1)

Location

The sawmill was observed by FERIC at an equipment demonstration for the Woodlot Association of Alberta, AGM near Devon, AB, October 1999.

Equipment specifications

See Table 1. Additionally,

- gasoline-powered Volkswagen engine
- air-cooled, 4 cylinder, 4 cycle
- available in either 43 or 50 kW
- carriage weight is 114 kg
- feed control is hydrostatic
- 6 inserted teeth per blade
- 3 sawblades work together
- 2 horizontal blades edge the log, while the vertical blade is the main sawblade
- log does not move or have to be turned, as the sawblades move across the log
- can be operated as a double or single edger
- production depends on the diameter, length and species

Manufacturer and distributor

The Mobile dimension saw is manufactured by Mobile Manufacturing Company, Troutdale, Oregon.

Table 1. Mobile Dimension Saw Specifications

	Mobile Dimension Saw
Engine with electric start	
power (kW)	50
Maximum cut (mm)	107.9 x 311
Minimum cut (mm)	6.35 x 44.6
Main saw blade	
diameter (mm)	762
6 tooth, kerf (mm)	7.94 (5/16")
Edger saw blades (2)	
diameter (mm)	495
6 tooth, kerf (mm)	7.94 (5/16")

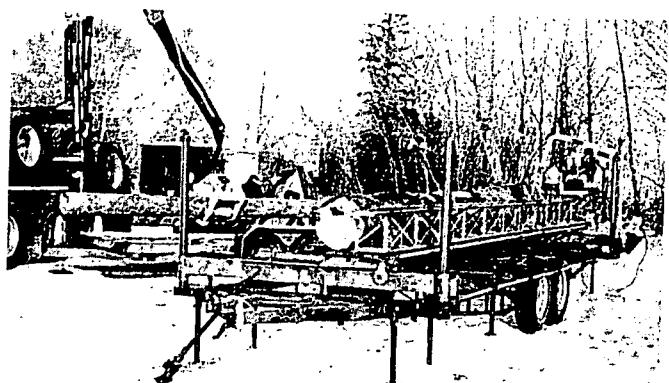


Figure 1. Mobile Dimension Saw.

In Alberta, this equipment is available through Brian Lee, Buck Lake Alberta.

Approximate (1999) price of the Model 128 Mobile Dimension Saw with tandem-axle trailer is \$40 470 (fob, Buck Lake, AB).

For further information, contact:

Brian Lee, Box 5, Buck Lake AB T0C 0T0 Tel.: 780-388-2215.

Mobile Manufacturing Company, PO Box 250, Troutdale, OR 97060 USA Tel.: 503-666-5593
Fax: 503-661-7548 www.mobilemfg.com
E-mail: info@mobilemfg.com

Janet Mitchell FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #11 Model: Bear Cat Wood Chipper

Illustrations

- Bear Cat wood chipper (Figure 1)

Location

The Bear Cat wood chipper was observed by FERIC at an equipment demonstration for the Woodlot Association of Alberta, AGM near Devon, AB, October 1999.

Equipment specifications

- highway towable, with adjustable jack with wheel for easy movement
- 15-kW (20-hp) Kohler engine with electric start and manual clutch
- maximum chipping diameter of 15 cm
- chipper weight is 657 kg
- disc weight is 125 kg
- 4 chipper steel blades mounted in a staggered position on a 76-cm diameter cutting disc
- self feeding operation through hopper (76 x 76 cm)
- 360° rotating bed and 360° rotating discharge chute with deflector
- split-hinged chipper housing allows quick access to blades
- blades can be sharpened with a grinder
- takes 30 minutes to replace blades
- many other models available

The chipper can be used to chip logging slash (tops and branches) from commercial thinning operations where the trees are processed at the road edge. The chipper distributes the material back into the stand to reduce the fire hazard and to minimize the slash accumulations at the trail edge. The chipped material can also be collected into a trailer, moved off-site and used for gardening mulch.

Manufacturer and distributor

Bear Cat wood chippers are manufactured by Bear Cat, a Division of TerraMarc Industries, North Dakota.

Approximate (2000) price of Bear Cat wood chipper is \$7 000.

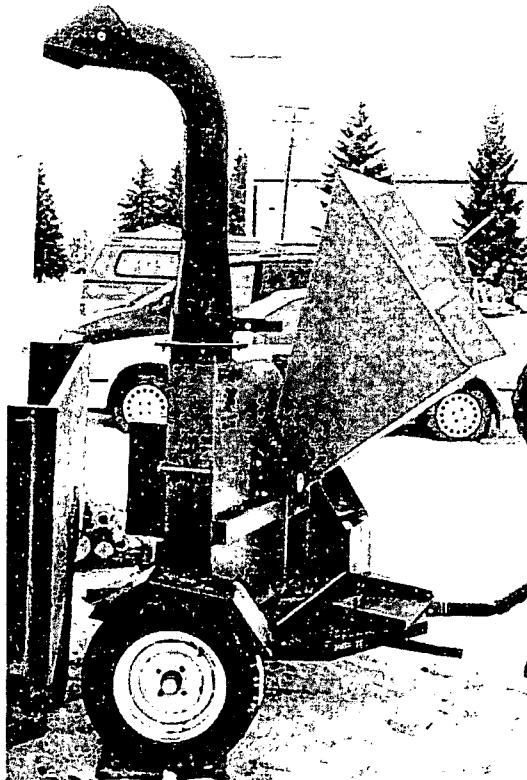


Figure 1. Bear Cat wood chipper.

For further information, contact:

Bear Cat, a Division of TerraMarc Industries, PO Box 849, West Fargo, ND 58078-0849 Tel.: 701-282-5520
Fax: 701-282-9522 Toll free: 1-800-247-7335.
www.terramarc.com

Janet Mitchell FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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March, 2001

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RESEARCH INSTITUTE
OF CANADA**
Western Division



**INSTITUT CANADIEN
DE RECHERCHES
EN GÉNIE FORESTIER**
Division de l'ouest

FERIC Members, Partners and Other Readers

Re: Compendium of Commercial Thinning Operations and Equipment (SR-108) - Issue Eleven

The funding from Forest Renewal BC for the Compendium of Commercial Thinning Operations and Equipment in Western Canada has ended.

The enclosed material comprises the eleventh and final issue of twenty-four, 1-page descriptions of commercial thinning operations and equipment. Please insert the articles in the appropriate sections following the tabs, enclosed with the first issue (December 1995). A final index has been enclosed to replace the index provided with Issue 7. If you have not received the first ten issues, please complete the form below and send it to the address provided. The Compendium of Commercial Thinning will be available as long as supplies last.

Thank you for all your support over the past 6 years.

Yours truly

FOREST ENGINEERING RESEARCH INSTITUTE OF CANADA

Janet L. Mitchell, R.P.F.
Senior Researcher, Silvicultural Operations Group

**ORDER FORM: COMPENDIUM OF COMMERCIAL THINNING
OPERATIONS AND EQUIPMENT — (SR-108)**

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Index

Commercial Thinning - Operations Index

(March 2001)

Harvesting System	Article	Location	Equipment
I-A Cut-and-Skid	1	Southern Coastal BC	Hand falling and Iron Horse mini-skidder
	2	Southern Coastal BC	Hand falling, ASV Posi-Track mini-skidder with Farmi JL 501 winch
	3	Southern Interior BC	Hand falling, Tree Farmer C-7 line-skidder and John Deere 544 rubber-tired loader
	4	Southern Interior BC	Hand falling, John Deere 540 rubber-tired skidder, Nokka 400 processor and Hitachi EX 60 excavator
	5	Alberta	Hand falling, Farmi JL 501 winch, Farmi forwarding trailer and Valmet tractor
	6	Southern Coastal BC	Hand falling and horse skidding
	7	Southern Coastal BC	Hand falling and LKT 50 line skidder
	8	Southern Coastal BC	Hand falling and Hi-Skid log forwarder
	9	Quebec	Hand falling and Turboforest T-42C line-skidder
	10	Oregon, USA	Hand falling, Niab tractor-mounted processor, Farmi forwarding trailer, and Valmet tractor
	11	Quebec	Hand falling, Niab tractor-mounted processor, Majaco forwarding trailer, and Valmet tractor
I-B Mechanical	1	Southern Interior BC	Morbark Wolverine feller-buncher, Caterpillar 518 rubber-tired grapple-skidder and Steyr processor
	2	Southern Interior BC	Timbco T445 excavator with Quadco harvesting head and Caterpillar D4H custom tracked skidder with Hydrawrap grapple
	3	Alberta	Tigercat 845 feller-buncher, John Deere 748E grapple-skidder, and Lim-mit LM2000 log processor on John Deere D-LC carrier
I-C Cut-to-Length	1	Southern Coastal BC	Timberjack 1270 harvester and Timberjack 910 forwarder
	2	Southern Interior BC	Timberjack 1270 harvester and Timberjack 1010 forwarder
	3	Southern Coastal BC	Timbco T445 excavator with Keto 500 harvesting head and Caterpillar D4H tracked skidder with ESCO 210 grapple
	4	Southern Coastal BC	Norcar 490 harvester and Norcar 600H forwarder
	5	Alberta	Timberjack 608 feller-buncher with 762B harvesting head, Rottne single-grip harvester and Rottne forwarder
	6	Washington, USA	Timberjack 1270 harvester and Timberjack 1210B forwarder

Harvesting System	Article	Location	Equipment
I-C Cut-to-Length Cont.			
	7	Washington, USA	Bell TH 120 tracked harvester and Bell T12B forwarder
	8	Washington, USA	Komatsu PC 128UU tracked thinning harvester and Timberjack 230A forwarder
	9	Washington, USA	Valmet 500T harvester and Valmet 546 forwarder
	10	Northern Interior BC	Valmet 546H harvester with Valmet 948 head
	11	Northern Interior BC	John Deere 290D excavator with HTH 14 Pan harvesting head and Kubota M8580 tractor with an Enviroquip B-Line 9000 forwarding trailer
	12	Northern Coastal BC	Valmet 546H harvester and Valmet 546H forwarder
	13	Alberta	Bell TH 120 tracked harvester and Bell T12B forwarder
	14	Alberta	Valmet 901C harvester with Valmet 942 head
	15	Southern Interior BC	Komatsu PC 90 excavator with Hahn HSG 140 harvesting head and F4-Dion forwarder
	16	Alberta	Timberjack 1270 harvester, Rottne harvester and Rottne forwarder
	17	Alberta	Timberjack 608 feller-buncher with 762B harvesting head and Timberjack 1210 forwarder
	18	Alberta	Rocan T thinning harvester with a Pan 828 harvesting head and Rottne forwarder
	19	Quebec	Samsung 130 LCM excavator with DT telebooms and Pan 828 harvesting head and 3 forwarders (Rotobec F2000, JM 2000 and a converted International S8 skidder)
	20	New Brunswick	Hand falling and Catu porter
	21	New Brunswick	JM 2000 444B combination harvester / forwarder
	22	Quebec	Kubota excavator with harvesting head, hand falling, line skidding, mechanical processing with Kubota excavator and Valmet 828 forwarder.
	23	New Brunswick	Rocan T harvester with Patu 915 boom, Patu harvesting head and forwarder
	24	Quebec	Takeuchi TB 070 mini-excavator with Patu RH405 harvesting head
	25	Washington, USA	Komatsu PC 128 UU tracked thinning harvester with Logmax 540 single-grip harvesting head, and Timberjack 1010 forwarder
	26	Washington, USA	Timberjack 1270B harvester, Timberjack 1210 forwarder and loader



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Index

Commercial Thinning - Operations Index Cont.

(March 2001)

Harvesting System	Article	Location	Equipment
I-C Cut-to-Length Cont.	27	Washington, USA	Timberjack 1270 harvester, Timberjack 1210 forwarder and loader
	28	Southern Interior BC	Hand falling, JMS forwarding trailer with loader
	29	Alberta	Neuson 11002 harvester with Logmax harvesting head, Rocan-T thinning harvester, and Rottne 6WD Rapid forwarder
	30	Alberta	Timberjack 1270 harvester and Timberjack 1210B forwarder
I-D Cable	1	Southern Coastal BC	Hand falling, Kubota KH191 excavator, Nokka forwarding trailer and loader and free-standing bunks
	2	Southern Coastal BC	Hand falling and Washington 78-40 swing yarder
	3	Southern Coastal BC	Hand falling and Igland Jones Trailer Alp yarder
	4	Chile	Hand falling and Urus I-Uni yarder with Stuefer HSK 2000 carriage
	5	Washington, USA	Hand falling and Diamond D210 swing yarder
	6	Lower Mainland of BC	Hand falling, 1980 Washington 78SL swing yarder, Maki Mini-Mak II carriage and Kobelco 200LC loader
	7	Washington, USA	Dahlvester harvester, ThinLine monocable system and John Deere 70D hydraulic loader
	8	Washington, USA	Hand falling, trailer mounted Koller K-300 yarder with Koller SKA-1 carriage, Caterpillar 235 and Linkbelt LS2800 hydraulic loader
	9	Lower Mainland of BC	Hand falling and Timbermaster 4-drum yarder
	10	Washington, USA	Hand falling, Howe-Line yarder, Maki carriage and Hitachi EX200 hydraulic loader
	11	Southern Coastal BC	Hand falling and Urus I Uni 300 yarder with Stuefer HSK 2000 carriage
	12	Southern Coastal BC	Hand falling, Kubota excavator, Farmi 9000 kg forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks
	13	Southern Coastal BC	Hand falling, Farmi JL2/601 winch, Farmi forwarding trailer with Farmi HK 4166 loader, Kubota M9580 tractor and free-standing bunks
	14	Southern Coastal BC	Hand falling, Caterpillar excavator, Farmi tractor and Nokka forwarding trailer

Harvesting System	Item	Location	Equipment
I-D Cable Cont.	15	Southern Coastal BC	Hand falling, Kubota excavator, Case crawler tractor, and Farmi forwarding trailer
	16	Northern Interior BC	Hand falling, Skylead C-40 16000 skyline yarder and Maki II carriage
	17	Southern Coastal BC	Hand falling, Skylead C-40 16000 skyline yarder and Eaglet carriage
	18	Lower Mainland of BC	Hand falling, Washington 078 yarder, with Hitachi UH18 mobile back spar
	19	Northern Interior BC	Hand falling, Owren 400 yarder, Koller SKA 2.5 carriage, and Cat LL 229 loader
	20	Southern Coastal BC	Hand falling and Timbco 415 excavator with Pierce single-grip harvesting head, Diamond D210 swing yarder with Maki II carriage, Link-Belt hydraulic log loader and Ranger 667 grapple skidder
	21	Oregon, USA	Hand falling, Koller K301 yarder with Acme carriage, Johnson electronic chokers, and Kobelco log loader
	22	Oregon, USA	Hand falling, Skylead C-40 16000 yarder with Eaglet carriage, Johnson electronic chokers and Kobelco log loader
	23	Washington, USA	Timberjack 2618 feller-buncher, Thunderbird TSY 6140 SLR swing yarder with Eaglet carriage, Johnson electronic chokers, Keto 500 processing head on Komatsu excavator, Link Belt 2800 log loader and Komatsu D21 crawler tractor
	24	Southern Coastal BC	Hand falling, Skylead C-40 16000 yarder with Eaglet carriage and Hitachi UH07 loader
	25	Northern Interior BC	Hand falling, Skylead C-40 16000 yarder with Mini-Mak II carriage and intermediate support
	26	Northern Interior BC	Hand falling, Owren 400 yarder with Koller SKA 2.5 carriage and intermediate support
	27	Southern Coastal BC	Hand falling, Washington SLH 78 mobile swing yarder with Mini-Mak II carriage and intermediate support
I-E Other	1	Quebec	A Summary of a report: P. Meek. 2000. Guide for managers of commercial thinning projects (based on Quebec's Crown Land experience). FERIC, Pointe Claire, QC. Advantage 1(31).



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Index

Commercial Thinning - Equipment Index

(March 2001)

Equipment	Article	Model
II-A Feller-Bunchers	1	Morbark Wolverine 6300 feller-buncher
	2	John Deere 653 feller-buncher
	3	Hydro-Ax tri-wheel feller-buncher
	4	Tigercat 845 feller-buncher
II-B Feller-Processors	1	Timberjack 1270 harvester with 762B harvesting head
	2	Timberjack 608 feller-buncher with 762B harvesting head
	3	Valmet 546H harvester with 948 harvesting head
	4	Valmet 500T harvester with 960 harvesting head
	5	Timbco T445 excavator with Keto 500 harvesting head
	6	Norcar 490 harvester
	7	Bell TH 120 tracked harvester with SP 550 harvesting head
	8	Komatsu PC 128UU tracked harvester with HTH 14 Pan harvesting head
	9	Rocan T thinning harvester with Pan 828 harvesting head
	10	Valmet 901C with 942 harvesting head
	11	Komatsu PC 90 with Hahn HSG 140 harvesting head
	12	CombiCat 4.3s with Pan 828 harvesting head
	13	Steber 865 / 875 harvester with Steber 250 harvesting head
	14	Rottne 2002 harvester with GM 828 harvesting head
	15	Neuson 5001 / 8002 RD harvester with Pan 828 harvesting head
	16	Logman 801 harvester with Keto harvesting head
	17	Silvatec 856 TH harvester with Silvatec harvesting head
	18	Logset 506H harvester with Logset 5-55 harvesting head
	19	Ponsse Cobra / Ergo harvesters with Ponsse harvesting heads
	20	Skogsjan 695 harvester with Skogsjan harvesting head
	21	Rocan Enviro-Can harvester with a Logmax GM 828 harvesting head
	22	Prosilva 605 harvester with a Keto harvesting head
	23	Hemek 880 harvester with Woodking harvesting head
	24	Sifor 616 harvester with Sifor 500 harvesting head
	25	Pendo Eva / Master harvesters
	26	JM 2000 Grizz 444B combination harvester / forwarder
	27	Samsung 130 LCM with Pan 828 harvesting head
	28	Kubota KX191 excavator with Patu RH 405 harvesting head
	29	Neuson 11002 HV harvester with Logmax 3000 harvesting head
	30	Valmet harvester simulator

Equipment	Article	Model
II-B Feller-Processors cont.	31	Timberjack harvester simulator
	32	Valmet 911 harvester
	33	Fabtek FT663 harvester with Fabtek FT180 harvesting head
	34	Fabtek FT153 harvester with Fabtek FT180 harvesting head
II-C Skidders	1	Iron Horse mini-skidder
	2	ASV Posi Track mini-skidder with Farmi JL501 winch
	3	John Deere 440C with modified grapple
	4	Caterpillar D4H / 527 tracked skidder
	5	Turboforest mini-skidder
	6	LKT 50 line skidder
	7	Thomas T-245 HDK loader
	8	Tuff Tug winch
	9	Future Forestry Products Inc. skidding arches
	10	Forcat 2000 mini-skidder
II-D Forwarders	1	Timberjack 910/1010/1210B forwarders
	2	Valmet 546 forwarder
	3	Norcar 600H forwarder
	4	Rottne forwarder
	5	Bell T12B forwarder
	6	Farmi 9000kg forwarding trailer
	7	Enviroquip B-Line 9000 forwarding trailer
	8	Nokka 36 forwarding trailer
	9	Timbco TF815 forwarder
	10	F4-Dion forwarder
	11	Terri ATD / 2000 forwarder
	12	Scorpion 903 forwarder
	13	Trans-Gesco TG-206 / TG-88 forwarder
	14	Hemek 700 / 750 / 800 forwarder
	15	Logset 504F 6F forwarder
	16	Turboforest mini-forwarder TF-605
	17	Ponsse Buffalo, Caribou, Ergo forwarders
	18	Hi-Skid Log forwarder
	19	Catu porter



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Index

Commercial Thinning - Equipment Index Cont.

(March 2001)

Equipment	Article	Model
II-D Forwarders cont.	20	JMS forwarding trailer
	21	Novajack forwarding trailer
	22	Fabtek 546 forwarder
	23	Fortrans MT-408 forwarder
	24	Rotobec F2000B forwarder
	25	Métal Marquis forwarder
	26	Valmet 890 forwarder
	27	Valmet 860 forwarder
II-E Yarders	1	Kubota KH 191 excavator with tower
	2	Koller K300 yarder with a Koller SKA-1 carriage
	3	Timbermaster yarder
	4	Urus I-Uni yarder with a Stuefer HSK 2000 carriage
	5	Howe-Line yarder with a Maki II carriage
	6	Washington 78-40/78SL swing yarders with a Maki II carriage
	7	Farmi JL2/601 winch with extension
	8	Igland Jones Trailer Alp yarder
	9	Komatsu excavator with tower with a Christy carriage
	10	Skylead C-40 16000 yarder with an Eaglet and a Maki II carriage
	11	Owren 400 yarder with a Koller SKA 2.5 carriage
II-F Other	1	Free-standing bunks
	2	Wood-Mizer portable sawmill
	3	Micromill SLP 1500 small log processor
	4	Nokka 400 tractor-mounted processor
	5	Niab 5-15B tractor-mounted processor
	6	Kaman K-1200 K-Max "Aerial Truck" Helicopter
	7	Eurocopter SA-315B Lama Helicopter
	8	Bell 214B "Big lifter" Helicopter
	9	Woodbug small log portable sawmill
	10	Mobile dimension portable sawmill
	11	Bear Cat wood chipper
	12	Blockbuster firewood processor
	13	Koller log carriage

Equipment	Article	Model
II-F Other cont.	14	Mini-Mak log carriage
	15	Valtra tractors
	16	Inchworm processor



Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: Cable
Item: #25

Region

Northern Interior British Columbia

Author

Michelle Dunham

Date

March 2001

Source

FERIC field visit in September 1998. The yarding phase of this operation was reported in Compendium article Operations Cable #16. This article details the use of the intermediate supports. Although standing single tree intermediate supports were observed during a partial cutting operation, they are also suitable for commercial thinning operations.

Contractor

Hobenshield Brothers Logging Ltd., Kitwanga, BC

Equipment

- skyline tree jack (Figure 1)
- 102-mm wide double-ply nylon straps with self tensioning clamps
- 20-cm diameter tree block
- jackline and tree strap
- grip puller (line tensioner)
- personal tree climbing equipment including belt, spurs, rope, axe and chainsaw
- Mini-Mak II intermediate support-capable log carriage
- Skylead C-40 16000 skidder-mounted yarder

Location

Crown land managed by Kitwanga Lumber Co. Ltd., 22 km west of Kitwanga, BC

Site and stand

- Interior Cedar Hemlock (ICHmc1) ecosystem
- 130-year-old western hemlock, hybrid spruce, western red cedar and subalpine fir stand
- stand density of 808 trees/ha
- slopes ranged from 10-60% and averaged 32%
- topography was relatively steep and broken, with frequent benches throughout the area

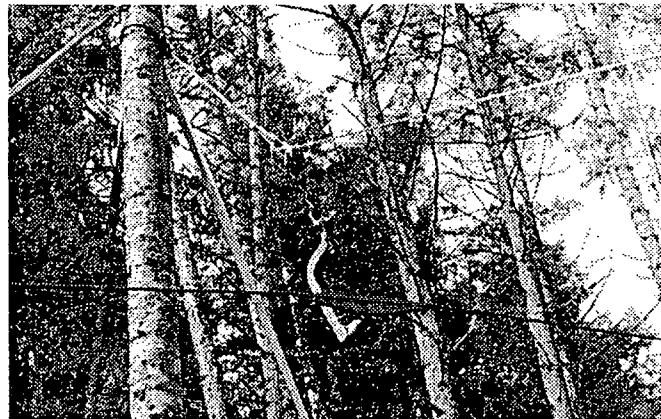
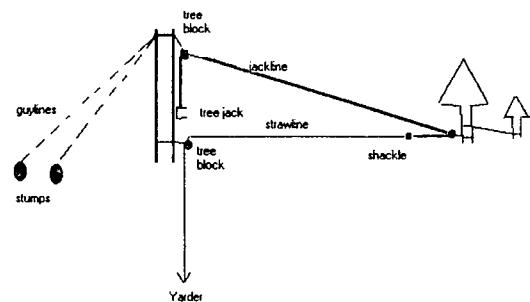


Figure 1. Single standing intermediate support tree.

Prescription

- group selection system
- remove 40% basal area
- yarding corridors spaced approximately 50 m apart and oriented perpendicular to the contours
- 10-m wide yarding corridors were clearfelled
- with single or small groups of trees outside the corridors selected randomly along the length of the corridor
- intermediate support trees were rigged when yarding distance exceeded 300 m or steep, uneven topography caused deflection problems
- intermediate support trees ranged in diameter at breast height (dbh) from 30-40 cm



- Figure 2. Single standing tree intermediate support rigging configuration.

Rigging procedures

- intermediate support trees were rigged by a crew of 3-4 people: one high rigger and 2-3 ground crew
- support trees were delimbed but not topped
- two nylon guylines were secured 0.5-1.5 m above rigging height on the support tree and secured to stumps or trees near the edge of the yarding corridor
- a tree block was hung with a tree strap on the support tree at rigging height (rigging height depended on deflection requirements)
- a jackline was passed through the tree block, then back to a tailhold tree perpendicular to the yarding corridor and opposite the guylines (Figure 2)
- the skyline was then attached to the tree jack and the jackline was tensioned with a grip puller to raise the skyline jack to its working position
- under tension the skyline and jack hung about 1 m away from the support tree, allowing adequate room for a turn of logs to pass by the base of the support tree during inhaul (Figure 3)

Production

Each intermediate support tree required approximately 1 hour to rig, if no pre-rigging was carried out.

Multi-span yarding productivity was dependent on slope yarding distance and lateral yarding distance.

Equipment manufacturers and distributors

The Mini-Mak II carriage is manufactured by Maki Manufacturing Inc., Pierce, ID. The Skylead yarder is manufactured by Skylead Logging Equipment



Figure 3. Mini-Mak II carriage passing over the tree jack.

Corporation of Enderby, BC. They are both distributed by Skylead Logging Equipment Corporation.

References

Compendium articles Operations Cable #6, #10, #16, #17, #22, #24, Equipment Yarder #5, #6, and #10. FERIC Technical Note TN-125.

For further information, contact:

Maki Manufacturing Inc., HC 64, Box 60, Pierce ID 83546 USA Tel./Fax: 208-464-2120.

Bill Varner, Skylead Logging Equipment Corporation, PO Box 880, Enderby, BC V0E 1V0 Tel: 250-838-6845 Fax: 250-838-7877.

Philip Carruthers, Kitwanga Lumber Co., (Skeena Cellulose Inc., Carnaby Operations), 10 North Boundary Road, South Hazelton, BC V0J 2R0 Tel.: 250-842-5399 Fax: 250-842-5123.

DISCLAIMER: This report is based on limited field data and is published only for the information of FERIC's members and partners. It does not constitute an endorsement by FERIC of a product or service to the exclusion of others that might be suitable.

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Forest Engineering Research Institute of Canada, Western Division

Compendium of Commercial Thinning — Operations

Harvesting System: **Cable**
Item: #26

Region

Northern Interior British Columbia

Author

Michelle Dunham

Date

March 2001

Source

FERIC field visit in October 1998. The yarding phase of this operation was reported in Compendium article Operations Cable #19. This article details the use of the intermediate supports. Although leaning single tree intermediate supports were observed during a clearcut operation, they are also suitable for commercial thinning operations.

Contractor

Corduroy Logging Ltd., New Hazelton, BC

Equipment

- Koller skyline tree jack
- 102-mm wide double ply nylon straps with self tensioning clamps
- 20-cm diameter tree block
- tree strap
- personal tree climbing equipment including belt, spurs, axe and chainsaw
- Koller SKA 2.5 log carriage
- Owren 400 mobile hydrostatic driven cable crane yarder

Location

Crown land managed by Kitwanga Lumber Co. Ltd., approximately 60 km south of New Hazelton, BC

Site and stand

- Interior Cedar Hemlock (ICHmc2) ecosystem
- 170-year-old western hemlock, hybrid spruce, western red cedar and subalpine fir
- stand density of 634 trees/ha
- broken topography with ground slopes up to 60%

- silt-clay loam and clay-loam soils with 20-40% coarse fragment content

Prescription

- clearcut with reserves
- intermediate support trees rigged at yarding distances exceeding 150 m
- intermediate support trees ranged in diameter at breast height (dbh) from 40-60 cm

Rigging procedures

- intermediate support trees were rigged by a crew of three people: a high rigger and two ground crew
- prior to rigging, the support trees were delimbed and topped
- a block was rigged near the top of the support tree to assist with pulling rigging up the tree
- two cable guylines, two nylon straps and a bypass tree jack were attached just below the top of the support tree
- an undercut was made in the tree base in the desired direction of the lean and the support guylines were anchored to stumps but not fully tensioned
- two sidecuts and a backcut were made to provide the desired lean but the tree remained attached to the stump with some holding wood left in the centre (Figure 1)
- the two guylines were tightened and the two nylon straps were anchored to large stumps
- upon completion, the skyline and jack hung about 2 m away from the intermediate support tree providing adequate space for logs to pass (Figure 2)
- each intermediate support tree required approximately 6 hours to rig.

Production

Yarding productivity during this operation was estimated at about 130-150 m³ /8-hour yarding shift for multi-span yarding occurring at 200-350 m yarding distance.



Figure 1. Partially severed base of leaning single tree intermediate support.

Equipment manufacturer and distributor

The Koller skyline tree jack and carriage are manufactured by Koller Kufstein, Austria and distributed by Northwest Harvesters Incorporated, Portland, OR.

The Owren 400 mobile yarder is manufactured in Norway by Trygve Owren AS and distributed by Owren Yarding Systems in Prince George, BC

References

Compendium articles Operations Cable #8, #19, #21
Equipment Yarder #2, and #11.
FERIC Advantage Report Vol. 1 No. 35

For further information, contact:

Haakon Obel, Owren Yarding Systems Ltd., Prince George, BC Tel: 250-563-1529

Des Trent, Northwest Harvesters Incorporated, 8828 NE Killingsworth St., Portland, OR 97220-4664
USA Tel.: 503-257-7696 Toll free: 1-800-821-1475
Fax: 503-257-2704. E-mail: kollerus@hevanet.com

George Burns, Corduroy Creek Contracting Ltd., PO Box 586, New Hazelton, BC V0J 2J0 Tel.: 250-842-6842.

Kris Kosicki, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel: 604- 228-1555
E-mail: kris-k@vcr.feric.ca or admin@vcr.feric.ca

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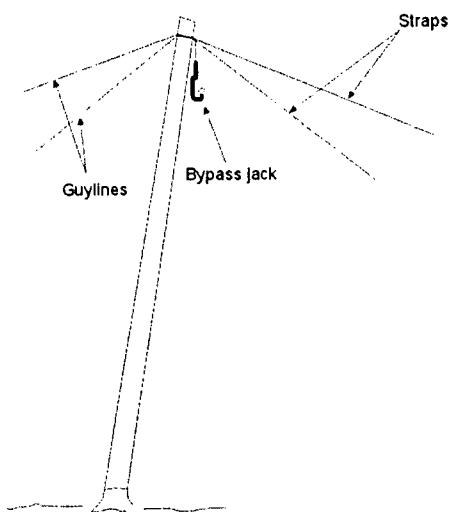


Figure 2. Rigging configuration for a single leaning tree intermediate support.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: **Cable**
Item: #27

Region

Southern Coastal British Columbia

Author

Michelle Dunham

Date

March 2001

Source

FERIC field visit in September 1997

Company

Canadian Forest Products Ltd., Coastal Operations –
Harrison, Agassiz, BC

Equipment

- custom skyline tree jack
- 22-mm cable guylines and cable clips
- three tree blocks (varying sizes)
- jackline and tree strap
- come-along (line tensioner)
- personal tree climbing equipment including belt, spurs, rope, axe and chainsaw (Figure 1)
- Washington SLH 78 mobile swing yarder
- Mini-Mak II carriage (Figure 2)

Location

Crown land managed by Canadian Forest Products Ltd., near Harrison Mills, BC.

Site and stand

- Coastal Western Hemlock (CWHdm1) ecosystem
- 70-year-old western hemlock, western red cedar and coastal Douglas-fir
- stand density of 843 trees/ha
- broken topography, convex profile, with ground slopes averaging 45%

Management objectives

- to enhance habitat for a variety of animals and birds, and
- to improve the growth and quality of the existing stand



Figure 1. Personal tree climbing equipment.

Prescription

- intermediate cut (commercial thin) with clearcut at time of final harvest
- 4-m wide yarding corridors were clearfelled
- 6-7 m residual tree spacing, removing diseased or damaged trees or those less than 29 cm diameter at breast height (dbh)



Figure 2. Mini-Mak carriage and custom tree jack.

- rig one or two intermediate support trees on most yarding corridors to improve deflection and minimize residual tree damage and ground disturbance
- intermediate support trees ranged from 50-65 cm dbh

Rigging procedures

- intermediate support trees were pre-rigged, generally by one person
- support trees were delimbed and topped
- a tree block was rigged near the top of the support tree to assist with pulling rigging up the tree
- two cable guylines were fastened to the support tree just above rigging height
- a tree block was fastened to the support tree at rigging height
- the rigger descended the tree and fastened the other end of the guylines to stumps located outside the yarding corridor
- the yarder was moved into position, the support tree was re-climbed, and strawline was threaded through the tree block
- the skyline and jackline were fastened to the jack
- a tree block was installed at the base of the support tree
- the yarder was used to pull the jack and skyline to rigging height (Figure 3)
- the jackline was secured to a stump and tensioned with a come-along
- guylines were re-tensioned (Figure 4)
- upon completion the jack hung about 2 m away from the support tree providing adequate space for logs to pass
- each intermediate support tree required approximately 3 hours to rig, including pre-rigging

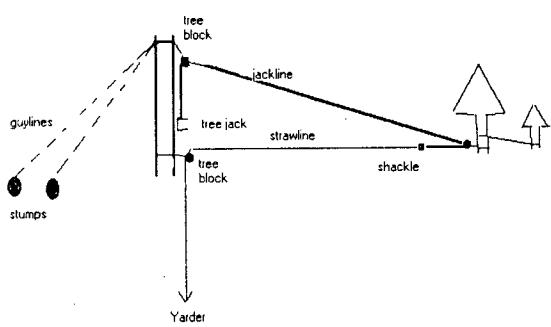


Figure 3. Rigging configuration used to pull tree jack to rigging height.

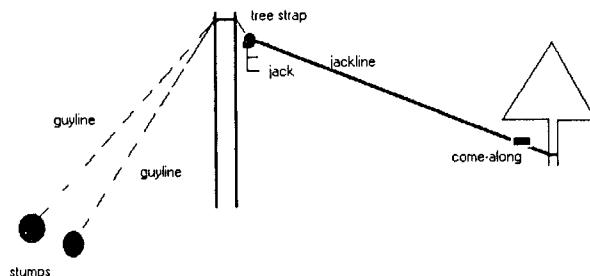


Figure 4. Single standing tree intermediate support rigging configuration.

Equipment suppliers

The Mini-Mak II carriage is manufactured by Maki Manufacturing Inc., Pierce, ID and distributed by Skylead Logging Equipment Corporation, Enderby, BC. Washington yarders have not been manufactured since 1985, but they are still well supported with parts and service through Trican Machinery Ltd., New Westminster, BC

References

FRBC Project Report 96/97-578: Alternate Harvesting for Visually Sensitive Viewscapes.

For further information, contact:

Canadian Forest Products Ltd., Coastal Operations – Harrison, 14250 Morris Valley Road, Agassiz, BC V0M 1A1 Tel: 604-796-2757

Maki Manufacturing Inc., HC 64, Box 60, Pierce, ID 83546 USA Tel./Fax: 208-464-2120.

Bill Varner, Skylead Logging Equipment Corporation, Box 880, Enderby, BC V0E 1V0 Tel: 250-838-6845 Fax: 250-838-7877. E-mail: skylead@junction.net

Trican Machinery Ltd., 455 Brunette St., New Westminster, BC V3L 3G1 Tel.: 604-540-0826.

Eric Phillips, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel: 604-228-1555
E-mail: eric-p@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Operations

Harvesting System: Other
Item: #1

Source

Meek, P. 2000. Guide for managers of commercial thinning projects (based on Quebec's Crown land experience). FERIC, Pointe Claire, QC. Advantage 1(31). 22 p.

Abstract

This report covers the many considerations required to develop the expertise to manage commercial thinning operations, and examines the most important aspects of this management. Although based on information specific to Quebec, it has some application to western Canada. The report discusses the characteristics of suitable stands, stand selection, the characteristics of the wood produced by thinning, and provides a good summary of suitable harvesting equipment and harvesting systems (Tables 1 and 2).

Stand characteristics and stand selection

- minimum residual basal area of 15 m²/ha
- dense, homogeneous, few openings in canopy
- stumpage credits (in Quebec) are calculated as a function of mean diameter harvested
- use historical survey information
- well marked boundaries
- road network established or minimal construction
- long-distance forwarding vs. road construction

Wood and product considerations

- availability of a mill that can use the products

- estimate volume and quality of product produced
- greater proportion of small-diameter logs (lower lumber recovery)
- lower proportion of decay

Implementation

- Develop expertise in the selection of the stands, equipment and harvesting system and operational management.
- Establish minimum acceptable product characteristics with the customers.
- Establish the selection criteria and stand characteristics by accounting for the objectives of the overall management plan.
- Monitor the operations closely and make any necessary corrections quickly.
- Consider pre-treatment densities of unmerchantable stems and the volume-removal intensities, because both factors affect the operation's viability.
- Select the system and equipment for the long term to guide capital investment and create favourable conditions for the contractors.
- Emphasize mechanization options that maximize the utilization rate of the equipment and thereby minimize wood costs.
- Favour workers with experience in stem selection and manual felling as you progressively increase the degree of mechanization.

Table 1. Summary of Equipment Suitable for Commercial Thinning

	Forwarders for cut-to-length thinning	Single-grip harvesters for ghost trails	Single-grip harvesters with long booms for thinning	Large single-grip harvesters for thinning	Processors for commercial thinning
Width (m)	2.6	2.2	2.9	3.0	3.0
Min. boom reach (m)	4.5	6.0	9-11	7-8	3-6
Single-grip head (kg)	n/a	< 400	< 800	turret or boom with ability to rotate in a restricted space	stroke- or roller- feed mechanism
Drive system	4-, 6-, or 8- wheel drive	4-, 6-, or 8-wheel drive or tracks	4-, 6-, or 8-wheel drive or tracks	4-, 6-, or 8-wheel drive or tracks	4-, 6-, or 8-wheel drive or tracks

Based on P. Meek. 2000. FERIC Advantage Report 1(31).

Table 2. Summary of the Harvesting Systems Suitable for Commercial Thinning

	Cut-to-Length		Fully mechanized full-tree	Tree-length or full-tree with manual felling
	Fully mechanized	With manual felling		
Advantages	<ul style="list-style-type: none"> proven system acceptable production costs narrow trails 	<ul style="list-style-type: none"> narrow trails good selection of the stems to be felled provides significant job creation 	<ul style="list-style-type: none"> flexible felling machine (small excavators with directional felling head) acceptable production costs moderate mechanical maintenance requirements 	<ul style="list-style-type: none"> availability of the equipment provides significant job creation
Disadvantages	<ul style="list-style-type: none"> long training period for operators few trained operators high mechanical maintenance requirements 	<ul style="list-style-type: none"> high production costs high supervision costs 	<ul style="list-style-type: none"> trail widths are moderate to wide relatively new system high risk of damage to residual stems 	<ul style="list-style-type: none"> high production costs high risks of damage to residual stems high supervision costs
Typical felling productivity (0.07 m ³ /tree)	5 to 7 m ³ /PMH	0.6 to 1.5 m ³ /PH	5 to 7 m ³ /PMH	2.0 to 3.5 m ³ /PH
Usage context	<ul style="list-style-type: none"> large area to treat annually availability of experienced contractors 	<ul style="list-style-type: none"> availability of workers low annual volumes to harvest by commercial thinning 	<ul style="list-style-type: none"> availability of experienced contractors acceptance of tree-length wood at the mill possibility of mechanized single-tree selection 	<ul style="list-style-type: none"> acceptance of tree-length wood at the mill availability of workers
Production phases	<ol style="list-style-type: none"> felling and processing extraction 	<ol style="list-style-type: none"> felling and processing extraction or felling processing extraction 	<ol style="list-style-type: none"> felling extraction delimbing 	<ol style="list-style-type: none"> felling-delimiting-extraction or felling-extraction delimbing
Required investment	high	low	moderate	low

From P. Meek. 2000. FERIC Advantage Report 1(31).

For further information, contact:

Philippe Meek, FERIC, 580 Boulevard St. Jean,
Pointe Claire, Quebec H9R 3J9 Tel.: 514-694-1140
E-mail: philippe-m@mtl.feric.ca

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BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Buncher #4 Model: Tigercat 845

References

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustrations

- Tigercat 845B feller-buncher (Figures 1 and 2)

Locations

FERIC, Eastern Division observed the Tigercat feller-buncher in a thinning operation in the Mastigouche wildlife reserve near St-Alexis-des-Monts, QC.

FERIC also observed the feller-buncher at Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Contractor

Gérard Crête et Fils Inc., Quebec

Equipment specifications

See Table 1. Additionally,

- Tigercat observed in Quebec had a Gilbertech 1272 continuous rotation saw head with 220° lateral tilt
- can also use a Waratah, Logmax, AFM Magnum, or Rosin single-grip harvesting head
- can work from "offshoots" off the main skid trail for commercial thinning to maximize inter-trail distances

Table 1. Tigercat 845B Feller-Buncher Specifications

	Tigercat 845B feller-buncher
Engine power (kW)	157
Engine	Cummins 6CT8.3
Approximate weight (kg)	21 300
Width (m)	3.04
Tail swing (m)	0.95
Length (m)	4.40
Height (m)	3.53
Boom reach (m)	7.62
Ground clearance (m)	0.79



Figure 1. Tigercat 845 feller-buncher (Source: Tigercat brochure).

- 360° continuous rotation
- track width 60 cm or 90 cm
- single, double or triple grouzers available
- skylight for increased visibility

Equipment Manufacturer and Distributor

Tigercat feller-bunchers are manufactured by Tigercat and in BC are distributed by Woodland Equipment Inc., Surrey, BC.

The approximate (2001) price of the harvester with the harvesting head is \$450 000.

For further information, contact:

Woodland Heavy Equipment (Vancouver) Inc., 103-18760 96th Ave., Surrey, BC V4N 3P9 Tel.: 604-882-5051 Fax: 604-882-9091.

Tigercat, 40 Consolidated Dr., PO Box 544, Paris ON N3L 3T6 Tel.: 519-442-1000 Fax: 519-442-1855.
E-mail: sales@tigercat.com
www.tigercat.com

Rod Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140 Fax: 514-694-4351.
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Figure 2. Tigercat 845B feller-buncher (Source: Tigercat brochure).



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #30

Model: Valmet Harvester Simulator

Illustration

- Valmet Harvester Simulator (Figure 1)

Location

Oregon Logging Conference equipment demonstration, Eugene, OR, February 2000.

Simulator description

- driver seat, control levers, brake and accelerator pedal provide operator's position identical to real Valmet 911 (4 and 6 wheel) and 921 harvesters
- data is based on actual felling sites, actual tree data
- topographical maps that were used as the basis when creating the driving environments
- platform for the simulation and the graphics is provided by Silicon Graphics' powerful graphics computers.

Silicon Graphics Onyx2 Infinite Reality

- double R12000 250 MHz processors
- 1 MB cache memory
- 32 MB texture memory
- 556 MB RAM
- 9,5 GB hard disc
- 20" (50.8 cm) monitor or 240x180 cm screen

Silicon Graphics Octane MXE

- dual R12000 250 MHz processor
- 4 MB cache memory
- 64 MB texture memory
- 512 MB RAM
- 9,5 GB hard disc
- 24" (61 cm) monitor or 240x180 cm screen

Terrain Generation

- Valmet simulator contains a number of pre-defined forests, or the instructor can create his own felling sites with the terrain and forest generator
- used in conjunction with topographical maps and simple graphical aids to create a forest and terrain with rocks, water and other obstacles to suit the current training task
- harvester simulator software
- interface module

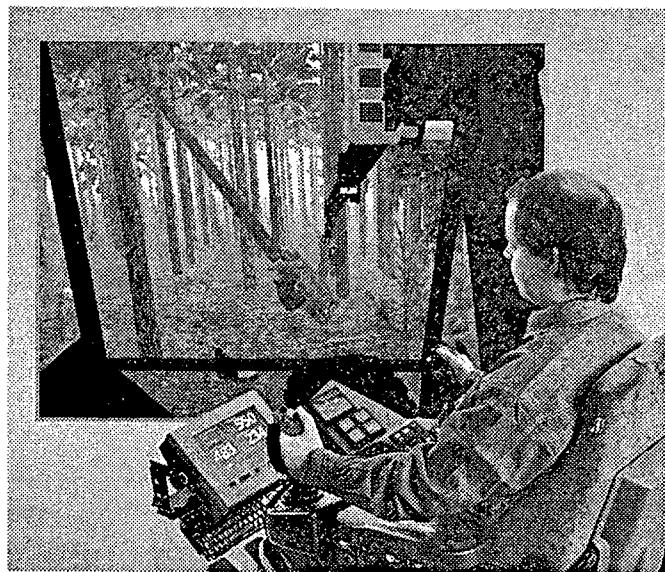


Figure 1. Valmet Simulator (Source: Partek Forest).

- Maxi machine control system, Maxi Log measuring system including quality grade crosscutting and selective crosscutting
- possibility for on-line training through an Internet connection with Oryx Ab

Benefits

- trainees learn to operate harvesters without damage to expensive machines or residual trees
- difficult operating situations can be simulated and learned without safety hazard
- operator strengths and weaknesses can be evaluated
- an opportunity for students pre-screening before operator training with real machines
- an opportunity even for a skilled operator to adapt a new operating system
- inexpensive learning as no machine transportation or other operational machine expenses needed
- simulator training easy to organize all year around even during the breakup season
- quality of the work can be evaluated with bird's-eye view of the remaining stand

Equipment Manufacturer

The Valmet Simulator is manufactured by Oryx Ab , Umeå, Sweden and distributed by Partek Forest LLC, 103 North 12th Street, PO Box 401 Gladstone MI 49837 USA Tel.: 906-428-4800 Fax: 906-428-3922.

The approximate (2001) price of the Valmet simulator is C\$ 390,000.

For further information, contact:

Heikki Suomala, Partek Forest LLC, PO Box 401, Gladstone, MI 49837 , USA Tel.: 909-428-0014 Fax: 906-428-3922.
E-mail: heikki.suomala@partekforest.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #31

Model: Timberjack Harvester Simulator

Illustrations

Timberjack harvester in virtual landscape (Figure 1)

Timberjack simulator (Figure 2)

Locations

The Timberjack harvester simulator was demonstrated at the Oregon Logging Conference in Eugene, OR, February 2000 and 2001. The simulator was also demonstrated at DEMO 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

Hardware components

- moveable wooden simulator chassis and transportation cover
- stand for data projector
- operator seat, armrest and machine controls identical to the real harvester
- 2 monitors (operator view and instructor view)
- PC-based computer system for simulation and visualization
- complete Timberjack 3000 measuring and control system

Software components

- harvester simulator software
- SilviA (PC program to create optimization files for harvesters)
- PlusCalc (Timberjack logging operations and cost management software)
- ForeCom (Timberjack PC program to read and analyze harvester production data)
- Timberjack Simulog student follow-up database system

Options

- Timberjack forest landscape simulator (FORSI)
- LCD data projector

Advantages for the industry:

- safety hazards can be minimized
- better raw material optimization
- testing of new harvesting systems, for productivity and cost, before actual application
- more accurate evaluation of harvesting operations

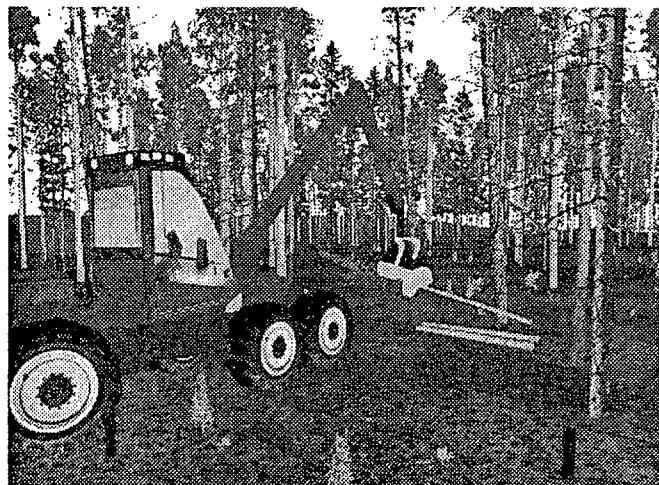


Figure 1. Timberjack harvester in virtual landscape
(Photo courtesy of Timberjack Inc.).

- environmental and public education of forest machines and timber harvesting

Advantages for logging contractors:

- training prior to harvester delivery
- less damage to the machines and crop trees and higher productivity from the start
- better utilization of machine features
- objective evaluation of current and new operators

Advantages for training schools:

- more effective training
- virtual training creates a learning curve: software produces feedback reports on the trainees' strengths and weaknesses
- safe, low-cost training environment
- no forest required for beginners' training
- savings when compared with training in a real forest (total cost/training-hour/trainee)

Virtual logging conditions

- landscape simulator is used to produce a 3-dimensional virtual landscape by applying digital map information and forestry databases
- forest is depicted with photo-quality trees, so the landscape is extremely life-like (Figure 1)

- trainees have unrestricted movement in the harvested area and can view the site from various perspectives and altitudes

Progress reports

- trainees' use of different machine components and the time spent on different machine functions can be evaluated
- software reports on the trainees' strengths and weaknesses can be used to target training to their individual needs
- "Simulog" (Timberjack software) transfers the training results to a PC, making it possible to view the trainees' individual results and development in comparison with other students in the same forests

Equipment manufacturer and distributor

The Timberjack harvester simulator was designed by Plustech Oy, a Timberjack affiliate company in Tampere, Finland. The simulator is distributed by Timberjack Inc., Woodstock, ON.

The 2001 price of the Timberjack harvester simulator is \$84 630 (plus \$3 372 for the optional FORSI software), compared to purchasing a Timberjack 1270B harvester at \$631 000.

For further information, contact:

Tim White, Timberjack Inc., PO Box 160, 925 Devonshire Ave., Woodstock, ON N4S 7X1
Tel.: 519-537-6271 Fax: 519-537-8395
E-mail: tim.white@ca.timberjack.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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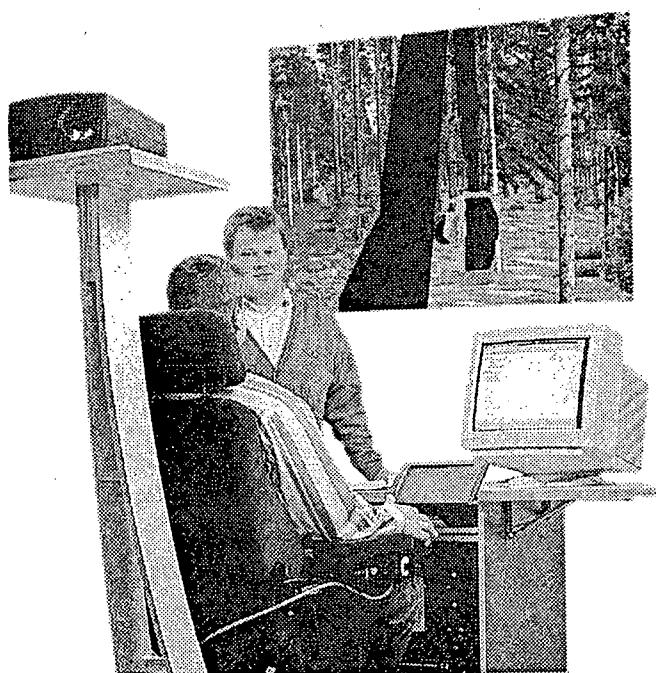


Figure 2. Timberjack simulator (Source: Timberjack brochure).



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #32 Model: Valmet 911.1

References

- FERIC compendium articles Operations Cut-to-Length #14 and Equipment Feller-Processor #10.

Illustration

- Valmet 911.1 harvester with 965 harvesting head (Figure 1)

Location

Thinning and final felling operation at the Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

See Table 1. Additionally,

- on-board computer records stems cut average diameters and lengths and volumes by species
- self-leveling cab with 315° rotation
- cab and crane located on the same slew platform
- very good visibility and operator comfort
- choice of Cranab's telescopic or parallel knuckle boom cranes available
- Valmet 945, 960 or 965 harvesting head
- Maxi control system for the base machine, crane, harvesting head high-quality cross cutting
- user friendly colour screen

Table 1. Valmet 911.1 Harvester Specifications

Valmet 911.1 harvester	
Engine power (kW)	129
Engine Torque (Nm)	700 at 1400 rpm
Engine	Sisudiesel 620 DWRE 6-cylinder turbo diesel
Power transmission	hydrostatic
Cutting capacity (cm)	64 - 75
Approximate weight (kg)	
4-wheel drive	15 200
6-wheel drive	16 900
Width (m)	2.69 - 2.80
Length (m)	6.45 - 7.25
Height (m)	3.99
Boom reach (m)	8.7 - 10.0
Outer turning radius (m)	6.5
Ground clearance (m)	0.64



Figure 1. Valmet 911.1 harvester (Source: Partek Forest).

Equipment Manufacturer

Valmet equipment is manufactured by Partek Forest LLC, Gladstone, MI, USA.

The approximate (2001) price of the Valmet 911.1 harvester is C\$695 000.

For further information, contact:

George Schmidt, Area Sales Manager, Partek Forest USA, 141 49th St., Delta, BC V4M 2P1 Tel.: 604-943-9692 Fax: 604-943-1565.

E-mail: george.schmidt@partekforest.com

Partek Forest LLC, Sales & Marketing Department, PO Box 401, Gladstone, MI 49837, USA Tel.: 906-428-4800 Fax: 906-428-3922.

E-mail: info.us@partekforest.com

Web: www.partekforest.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #33 Model: Fabtek FT663

Illustrations

- Fabtek FT663 rubber-tired harvester with a FT180 processor head (Figures 1 and 2)

Location

Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

See Table 1. Additionally,

- 6-wheel drive
- tracked version also available
- house leveling of 15° in all operating directions
- Parker hydraulics
- Deere cylinders
- Sauer Sundstrand hydrostatic drive
- 530 L fuel capacity
- 322 L hydraulic reservoir
- Fabtek telescopic boom
- Fabtek FT180 processing head has a delimiting speed of 3-4.5 m/sec and a 3400-kg delimiting force
- 46-cm spike rollers standard, rubber rollers with chains are an available option
- diameter measuring capability optional
- printer data port available for production data

Equipment manufacturer and distributor

Fabtek equipment is manufactured and distributed by Fabtek Corporation, Menominee, MI. Fabtek.

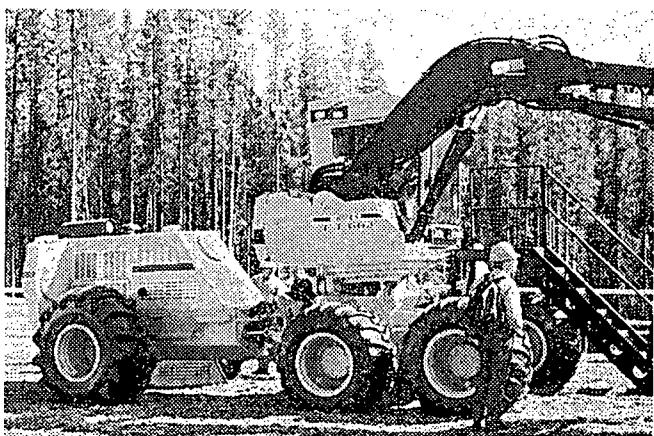


Figure 1 Fabtek FT663 rubber-tired harvester.

Table 1. Fabtek FT663 Rubber-tired Harvester Specifications

Fabtek FT663 harvester*	
Engine power at 1900 rpm (kW)	127
Engine	JD 6068 T250
	6 cylinder
	turbo charged
Power transmission	hydrostatic
Cutting capacity (m)	0.50
Approximate weight (kg)	20 432
Length (m)	6.60
Height (m)	3.82
Boom reach (m)	8.2
Maximum speed (kph)	19.2
Ground clearance (m)	0.61

* With a Fabtek FT180 processor head.

For further information, contact:

Fabtek Corporation, N1715 Hwy. 41, Menominee, MI 49858 USA Tel.: 906-863-9977 Fax: 906-863-1176.
www.fabtek.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

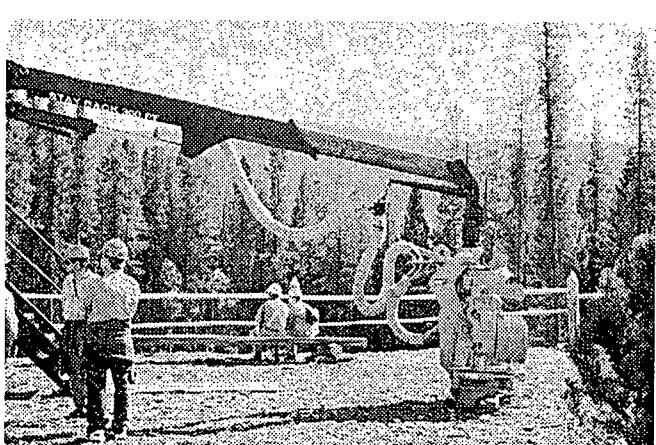


Figure 2. Fabtek FT180 harvesting head.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Feller-Processor #34 Model: Fabtek FT153

Illustrations

- Fabtek FT153 tracked boom harvester with the FT180 processor head (Figures 1 and 2)

Location

Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

See Table 1. Additionally,

- FT 133 is smaller version
- 379 L fuel capacity, 227 L hydraulic reservoir
- cab tilts for easier access during service
- good visibility
- Fabtek telescopic boom
- Fabtek FT180 processing head has a delimiting speed of 3-4.5 m/sec and a 3400-kg delimiting force
- 46-cm spike rollers standard, rubber rollers with chains are an available option
- diameter measuring capability optional
- printer data port available for production data

Equipment manufacturer and distributor

Fabtek equipment is manufactured and distributed by Fabtek Corporation, Menominee, MI.

Table 1. Fabtek FT153 Tracked Boom Harvester Specifications

	Fabtek FT153 harvester*
Engine power at 1900 rpm (kW)	116
Engine	Deere 6068T 6 cylinder
Cutting capacity (m)	0.50
Approximate weight (kg)	18 180
Width (m)	2.84
Length (m)	3.96
Height (m)	3.48
Maximum boom reach (m)	7.01
Minimum boom reach (m)	3.66
Tail swing (m)	0.23
Ground clearance (m)	0.68

* With a Fabtek FT180 processor head.



Figure 1 Fabtek FT153 tracked boom harvester.

For further information, contact:

Fabtek Corporation, N1715 Hwy. 41, Menominee, MI 49858 USA Tel.: 906-863-9977 Fax: 906-863-1176.
www.fabtek.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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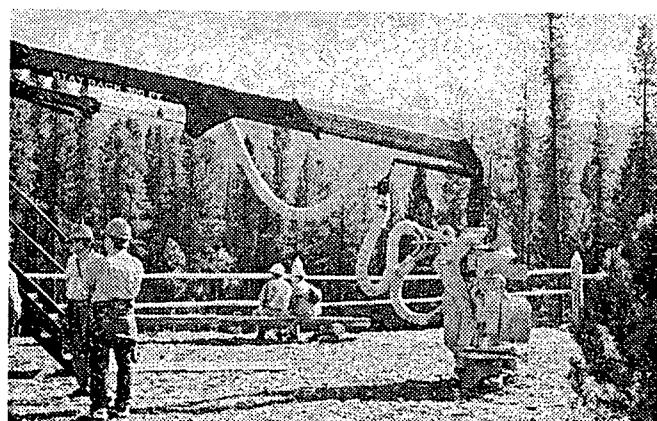


Figure 2. Fabtek FT180 harvesting head.



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #8
Model: Tuff Tug 2000

Illustrations

- Tuff Tug 2000 conveyor/winch (Figures 1 and 2)

Location

FERIC observed the Tuff-Tug winch in Vancouver, January, 2001.

Contractor

A.H. Lundberg Systems, Richmond, BC

Equipment specifications

See Table 1. Additionally,

- lockable handbrake allows for slowing down or stopping
- adjustable vee sheave pulley works with various types of rope between 6-16 mm in diameter (braided nylon, 3-strand nylon, Kevlar™, Kernmantle™, Spectra™ and Dyneema™)
- not suitable for wire rope
- variable line speed
- forward and reverse operation
- unlimited rope length
- continuous pull, up to 450 kg
- rated at 2200 kg maximum pull in conveyor configuration
- fastening clips allow products to be clipped onto the endless "clothesline"/ rope conveyor
- easily-maintained, modular system
- brackets designed to attach to trees or be free-standing on a pack frame stand
- adaptable for vehicle attachments with 2" receptical (Figure 1)
- could be used to pull stems to the trail edge for forwarding to the landing

Table 1. Tuff Tug Conveyor/Winch Specifications

Tuff Tug 2000 conveyor/winch	
Engine power (kW)	3.7
Engine	2-stroke gasoline
Power transmission	hydrostatic
Approximate weight (kg)	27
Line speed (m/min)	0-56



Figure 1. Tuff Tug 2000 conveyor/winch mounted on the front of a blade (Photo courtesy of AH Lundberg Systems).

Equipment manufacturer and distributor

The Tuff-Tug 2000 conveyor/winch is manufactured and distributed by A.H. Lundberg Systems, Richmond, BC.

The introduction price of the winch is \$4 500 plus optional accessories.

For further information, contact:

Bruno Iten, A.H. Lundberg Systems, 5480 Parkwood Way, Richmond, BC V6V 2M4 Tel.: 604-273-5204 Fax: 604-273-7231. www.tufftug.com

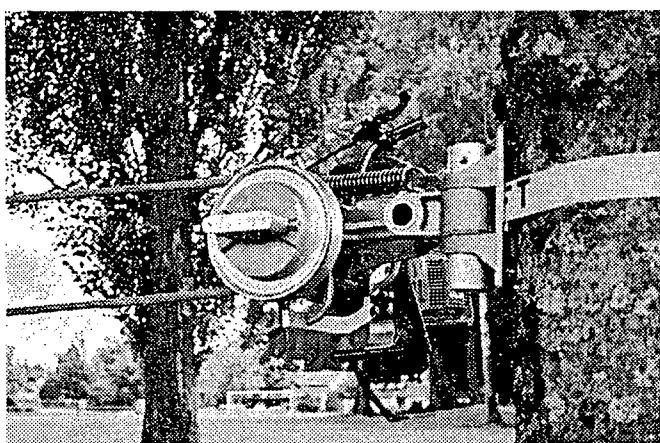


Figure 2. Tuff Tug 2000 conveyor/winch mounted on a tree (Photo courtesy of AH Lundberg Systems).

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC, V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #9
Model: Future Forestry Product's Arches

Illustrations

- ATV forwarding arch (Figure 1)
- Fetching arch (Figure 2)
- Junior arch (Figure 3)
- Tractor arch (Figure 4)

Location

Oregon Logging Conference, Equipment Demonstration, Eugene, Oregon, February 2000.

Contractor

Future Forestry Products Inc., Willamina, OR

Equipment specifications

See Table 1. Additionally,

ATV forwarding arch

- self-loading
- log is suspended 1.5 m back on the ATV arch to allow more weight of the log to be suspended
- larger logs would be skidded
- can be towed by ATV, small tractor or pick-up truck
- 2-speed, 1450-kg winch
- uphill limited by traction of the ATV

Fetching arch

- has self-loading tongs that open to 61 cm
- carrying capacity of 500 kg (900 kg with high-flotation tires)

Table 1. ATV Forwarding Arch Specifications

	ATV forwarding arch
Weight (kg)	96
Carry capacity (kg)*	455
Maximum log diameter (cm)	50.0
Maximum log length (m)	
trailing	4.87 - 6.10
suspended	3.05 - 3.65
Width (m)	1.52
Length (m)	2.77
Height (m)	1.22

* Depending on tires, up to 900 kg with high-flotation tires



Figure 1. ATV forwarding arch (Photo courtesy of Future Forestry Products).



Figure 2. Fetching arch (Photo courtesy of Future Forestry Products).

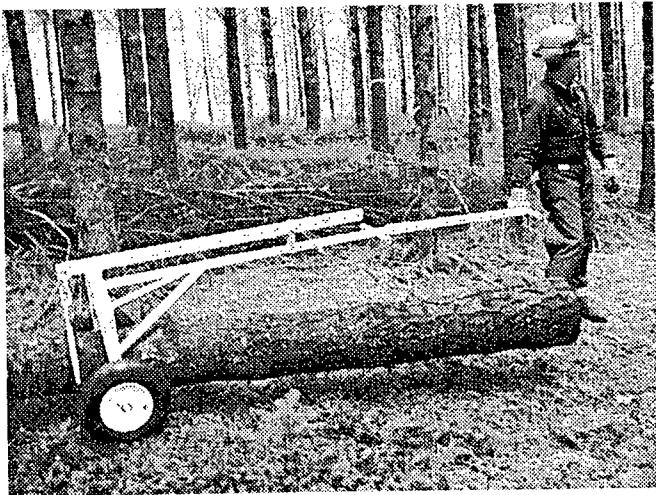


Figure 3. Junior arch (Photo courtesy of Future Forestry Products).

Junior arch

- for bunching, felling hang ups and walking the logs, or a bunch of logs, to the roadside or landing
- lightweight (26 kg)
- maximum 41 cm diameter log (10-30 cm is ideal)
- ideal log length is 4.8 m
- extension handle available to allow operator to walk in front of the log



Figure 4. Tractor arch (Photo courtesy of Future Forestry Products).

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Tractor arches

- 2 models are available that mount to a trailer hitch or with a PTO winch
- both are available with brakes
- T30 has maximum diameter of 30" (76 cm)
- T40 has maximum diameter of 40" (102 cm)

Equipment manufacturer and distributor

The skidding arch is manufactured and distributed by Future Forestry Products Inc., Willamina, OR.

The approximate (2001) prices of the Junior arch, the ATV forwarding arch and the fetching arches are C\$675, C\$2 316, and C\$2 473 respectively (not including shipping). The T30 tractor arch is C\$3 100 and the T40 tractor arch is C\$3 533 (not including shipping).

For further information, contact:

Mark Havel, Future Forestry Products Inc., PO Box 1083, Willamina, OR 97396 USA Tel./Fax: 503-876-4488 Toll free: 1-888-258-1445.
www.futureforestry.com



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Skidder #10
Model: Forcat 2000

References

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustration

- CM 2000 mini-skidder (Figure 1)

Location

Launay, Quebec (Abitibi region)

Equipment specifications

See Table 1. Additionally,

- hydrostatic traction
- hydraulic power for grapple with log trailer
- hydraulic winch, front blade and back plate
- can turn within its length
- can skid tree-length or full-tree stems using a mainline and chokers
- cab is not enclosed
- can be transported in a pick-up truck
- options include log trailer, log loader and wider front blade
- log trailer, adapted for the Forcat 2000, has guard gate, 4 stakes, 2 hitches (one for road vehicle and one for Forcat 2000)

Table 1. Forcat 2000 Mini-Skidder Specifications

	Forcat 2000 mini-skidder
Engine power (kW)	17.9
Engine	Onan
Fuel tank capacity (L)	28
Approximate weight (kg)	1250
Width (m)	1.17
Track width (m)	0.26
Length (m)	2.41
Carrying capacity (m^3) with trailer	0.50 2.50
Boom reach (m)	2.60
Maximum speed (kph)	10.0
Ground clearance (m)	0.34



Figure 1. CM2000 mini-skidder (Photo courtesy of FERIC, Eastern Division).

- Hardy 850 ST loader with flow divider and remote hydraulic controls for the Forcat 2000

Equipment manufacturer and distributor

The Forcat 2000 mini-skidder is based on the CM2000, a forwarder originally designed by Concept Mechanics. The Forcat 2000 is now manufactured and distributed by Berfor Inc., a division of Rad Technologies Inc., Thetford Mines, QC.

Hardy loaders are manufactured and distributed by Hardy, 100, St-Arthur St., Notre-Dame-de-Portneuf, QC G0A 2Z0 Tel.: 418-286-6621 Fax: 418-286-3733.

The approximate (2001) prices of the Forcat 2000, the trailer and loader are \$25 600, \$3 520 and \$5 940, respectively.

For further information, contact:

Berfor Inc., a division of Rad Technologies Inc., 2835 Aeroport Road, Thetford Mines, QC G6G 5R7
Tel.: 418-338-4499 Fax: 418-338-6090
E-mail: berfor@radinter.com

Roderick Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.
E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
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**Equipment: Forwarder #21
Model: NovaJack**

Illustration

- NovaJack forestry trailer with loading mast and winch (Figure 1)

Location

DEMO 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Contractor

NovaJack, Asbestos, Quebec

Equipment specifications

See Table 1. Additionally,

- NovaJack forestry trailer
- trailer can haul logs up to 4.9 m in length
- trailer has a removable box, that can be used to transport the ATV on the highway
- loading mast has manual winch and 7.6-m polyester cable
- loading pivot
- Bombardier all terrain vehicle (ATV)
- many accessories available
- skidding arch available for logs up to 60 cm in diameter
- skidding cone can be used to guide logs (up to 51 cm in diameter) around obstacles

Table 1. NovaJack Forestry Trailer Specifications

	NovaJack forestry trailer
Approximate weight (kg)	295
Width (m)	1.30
Length (m)	
with tow bar retracted	2.92
with tow bar extended	3.40
Height (m)	1.22
Carrying capacity (kg)	
on-road loading	682
off-road loading	1 590



Figure 1. NovaJack forestry trailer with loading mast and winch.

Equipment manufacturer and distributor

The NovaJack forestry trailer is manufactured by NovaJack, Sherbrooke, Quebec and distributed in North America by dealers of Bombardier Recreational Products.

For further information, contact:

Pierre Roy, NovaJack, a division of Turboforest Novasylva Inc., 73 St-Georges Road N, Asbestos, QC J1T 3M7 Tel.: 819-879-2447 Toll free: 1-800-567-7318 Fax: 819-879-4999.
E-mail: info@novajack.com
www.novajack.com

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Equipment: Forwarder #22 Model: Fabtek 546B

References

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustration

- Fabtek 546 forwarder (Figure 1)

Locations

Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000. FERIC, Eastern Division observed the forwarder in a commercial thinning operation near Nouvelle, Quebec.

Contractors

Fabtek Inc., Menominee, MI

Coprofor G.D.S. Inc., Pointe-a-la-Croix, Quebec

Equipment specifications

See Table 1. Additionally,

- articulated loader, many sizes available
- 4-, 6-, or 8-wheel drive

Table 1. Fabtek 546C Forwarder Specifications

	Fabtek 546C forwarder
Engine power (kW)	116
Engine	John Deere 6 cylinder Electronic 4-speed power shift
Power transmission	
Approximate weight (kg)	14 772
Width (m)	3.05
Length (m)	9.95
Height (m)	3.60
Crane reach (m) with extension	5.64 6.93
Carrying capacity (kg)	13 636
Maximum speed (kph)	23.2
Turning radius (m)	9.3
Ground clearance (m)	0.58



Figure 1. Fabtek 546 forwarder (Photo courtesy of E. Philips).

- integrated joystick/seat for increased ergonomics
- hydraulic tilt cab for easy access during service
- seat swivels 180° for forward and rearward steering
- 12 halogen lights for 360° coverage
- Fabtek FT 130 grapple has continuous rotation

Equipment manufacturer and distributor

Fabtek equipment is manufactured and distributed in North America by Fabtek Inc., Menominee, MI.

The approximate (2000) price of the Fabtek 546C forwarder is \$338 250.

For further information, contact:

Fabtek Inc., N 1715 - US 41, Menominee, MI 44858
USA Tel.: 906-863-9977 Fax: 906-863-1176.
www.fabtek.com

Hughes Boudreau, Coprofor G.D.S. Inc., Pointe-a-la-Croix, QC Tel.: 418-788-5906.

Rod Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.
E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

**Equipment: Forwarder #23
Model: Fortrans MT-408**

Illustration

- Fortrans MT-408 forwarder (Figure 1)

Location

Normandin, Quebec.

Contractor

Donald Fortin, St-Edmond, QC

Equipment specifications

See Table 1. Additionally,

- small 4-wheel drive articulated forwarder
- 1.4-m blade on front for handling wood or for trail maintenance
- suitable for narrow trails
- 1-m diameter wheels can be equipped with chains to increase traction
- seat swivels 180° for forward and rearward steering
- visibility is good
- Majaco M120 loader

Equipment manufacturer and distributor

The Fortrans forwarder was designed and manufactured by Donald Fortin, St-Edmond, QC.



Figure 1. Fortrans MT-408 forwarder (photo Courtesy of FERIC, Eastern Division).

Majaco loaders are manufactured and distributed by Atelier Majaco Inc., Chesterville, QC.

The approximate (1999) price of the Fortrans MT-408 forwarder is \$60 000.

For further information, contact:

Donald Fortin, 605 rue Principal, St-Edmond, QC G0W 2M0 Tel.: 418-274-3526.

Atelier Majaco Inc., 5127 de la Plaisance, Chesterville, QC G0P 1J0 Tel.: 819-382-9977 Fax: 819-382-9970.

Roderick Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140. E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555. E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Table 1. Fortrans MT-408 forwarder Specifications

	Fortrans MT-408 forwarder
Engine power (kW)	48
Engine	Mitsubishi
Power transmission	2-range, variable speed hydrostatic
Approximate weight (kg)	2 800
Width (m)	1.92
Length (m)	5.2
Height (m)	2.3
Boom reach (m)	3.5
Carrying capacity (m ³)	2.2
Bunk length (m)	2.5
Ground clearance (m)	0.30



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #24 Model: Rotobec F2000B

Reference

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustrations

- Rotobec F2000B forwarder (Figure 1)

Location

Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000. The Rotobec F2000B forwarder was also part of a study conducted by FERIC, Eastern Division, in a first thinning operation on Crown land managed by Alliance Forest Products Inc. (Mistassini Division).

Contractors

Rotobec Inc., Kelowna, BC
The Coopérative Forestière de Girardville, QC

Equipment specifications

See Table 1. Additionally,

- 4-wheel drive, articulated forwarder
- nine halogen lights (3 forward facing, 2 rear

Table 1. Rotobec F2000B Forwarder Specifications

	Rotobec F2000B forwarder
Engine power (kW)	87
Engine	Cummins
Power transmission	4 cylinder diesel hydrostatic
Approximate weight (kg)	5 500
Width (m)	2.6
Width of bunk (m)	2.0
Length (m)	7.6
Length of bunk (m)	3.6
Height (m)	3.4
Crane reach (m)	5.6
Carrying capacity (kg)	4 040
Maximum travel speed (kph)	10
Turning radius (m)	5.3
Ground clearance (m)	0.60



Figure 1. Rotobec F2000B forwarder (Photo courtesy of FERIC, Eastern Division).

facing, and 2 on each side of cab)

- 2 pumps supply power: one to the boom and the other to the transmission, articulation and the blade
- fuel tank is beneath the bunk as part of the chassis
- Rotobec 40F loader with a lifting moment of 48.5 kN and a lifting capacity of 900 kg at 5.5 m
- grapple has continuous rotation
- adjustable seat swivels 180° for forward and rearward steering

Equipment manufacturer and distributor

Rotobec equipment is manufactured and distributed by Rotobec Inc., Ste Justine, QC.

The Rotobec F2000B forwarder is only available in Eastern Canada, but in BC, other Rotobec equipment is distributed by Rotobec West, 3530 Alcan Road, Kelowna, BC V1X 7R4 Tel.: 250-548-0041 Fax: 250-548-0043.

The approximate (2001) price of the Rotobec F2000B forwarder is \$150 000.

For further information, contact:

Rotobec Inc., 200 Rue Industrial, Ste Justine, QC G0R 1Y0 Tel.: 418-383-3002 Fax: 418-383-5334.
www.rotobec.com

Roderick Ewing, FERIC, 580 Boulevard St. Jean,
Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.
E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
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Equipment: Forwarder #25 Model: Métal Marquis

Reference

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustration

- Métal Marquis tracked forwarder (Figure 1)

Location

North of St Eugene de Chazel in the Abitibi region of Quebec

Contractor

Coopérative Forestière de St-Dominique, Abitibi region of Quebec

Equipment specifications

See Table 1. Additionally,

- modified Komatsu D37E crawler tractor with trailer
- grapple loader is mounted on the roof of the cab
- 8 lights (4 rear-mounted, 2 side-mounted and 2 front-mounted) for nighttime operations
- original blade replaced with a lighter 1.8-m-wide straight blade with no tilt feature
- hydraulic pump on the rear of the carrier supplies the hydraulics for the loader
- trailer has bogie-wheels and a walking-beam

Table 1. Métal Marquis Tracked Forwarder Specifications

	Métal Marquis tracked forwarder
Engine power (kW)	60
Engine	Komatsu
Power transmission	3 speed with torque converter
Approximate weight of trailer (kg)	1 500
Width (m)	2.1
Track width (m)	0.60
Bunk length (m)	2.5
Boom reach (m)	5.6
Carrying capacity (tonnes)	5.0
Maximum speed (kph)	8.0
Ground clearance (m)	0.35

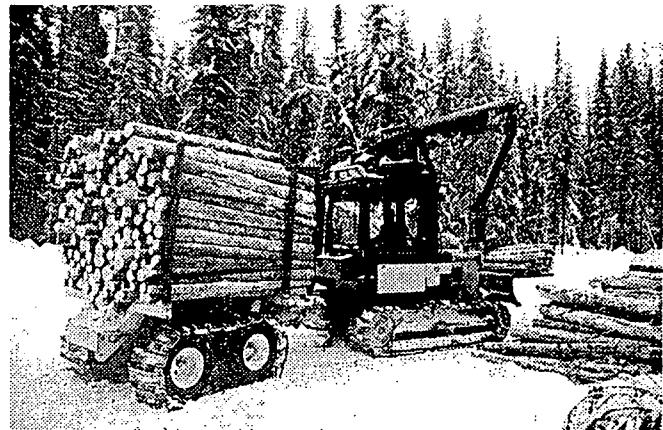


Figure 1. Métal Marquis tracked forwarder (Photo courtesy of FERIC, Eastern Division).

- design to minimize swaying on rough ground
- tires on trailer had flexible tracks for increased flotation

Equipment manufacturer and distributor

The Métal Marquis was designed and manufactured by Métal Marquis Inc., La Sarre, QC.

The approximate (1999) price of the Métal Marquis tracked forwarder is \$130 000.

For further information, contact:

Métal Marquis Inc., 159 E 9th Ave., La Sarre, QC J9Z 2L1 Tel.: 819-333-4816.

Roderick Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.
E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Forwarder #26 Model: Valmet 890

Illustration

- Valmet 890 forwarder (Figure 1)

Operation and location

Thinning and final felling operation at the Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

See Table 1. Additionally,

- 18 tonne (metric) articulated forwarder
- hydraulically controlled oscillation lock
- Cranab 850 Combi or 1250 loader
- Cranab G-series grapple, continuous rotation
- loader has telescopic extension
- several different frame lengths available
- grader blade available for the 8-wheel drive model
- cab tilts electrically for easy access during service
- load sensing hydraulic system with 280 L/min flow and 125 L hydraulic reservoir
- seat swivels 180° for forward & rearward steering

Table 1. Valmet 890 Forwarder Specifications

	Valmet 890 forwarder
Engine power (kW)	154
Engine Torque (Nm)	885 at 1200 rpm
Engine	Sisudiesel 634 DWBIE
Power transmission	6 cylinder diesel 6- or 8-wheel hydrostatic/mechanical drive, Maxi Forwarder control system
Approximate weight (kg)	
6-wheel drive	15 600
8-wheel drive	18 400
Width (m)	3.00
Length (m)	3.82
Height (m)	3.97
Max. driving speed (km/h)	24.0
low gear	8.5
Crane reach (m)	7.5 (850) or 9.2 (1250)
Carrying capacity (kg)	18 000
Ground clearance (m)	0.68

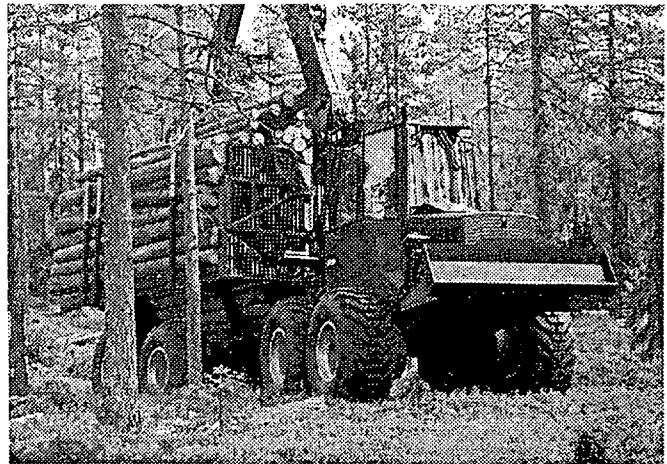


Figure 1. Valmet 890 forwarder (Source: Partek Forest).

Equipment manufacturer

Valmet equipment is manufactured by Partek Forest LLC, Gladstone, MI, USA.

The approximate (2001) price of the Valmet 890 forwarder is C\$645 000.

For further information, contact:

George Schmidt, Area Sales Manager, Partek Forest LLC, 141 49th St., Delta, BC V4M 2P1 Tel.: 604-943-9692 Fax: 604-943-1565.
E-mail: george.schmidt@partekforest.com

Partek Forest LLC, Sales & Marketing Department, PO Box 401, Gladstone, MI 49837, USA Tel.: 906-428-4800 Fax: 906-428-9444.
E-mail: info.us@partekforest.com
Web: www.partekforest.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

**Equipment: Forwarder #27
Model: Valmet 860 Forwarder**

Illustration

- Valmet 860 forwarder (Figure 1)

Operation and location

Thinning and final felling operation at the Demo 2000: International Forestry Trade Fair, Kelowna, BC, September 14-16, 2000.

Equipment specifications

See Table 1. Additionally,

- 14 tonne (metric) articulated forwarder
- hydraulically controlled oscillation lock
- portal high ground clearance bogie design
- Cranab 720 Combi or 850 loader
- Cranab G-series grapple, continuous rotation
- loader has telescopic extension
- cab tilts electrically for easy access during service
- 130 L fuel capacity
- Load sensing hydraulic system with 220 L/min flow and 110 L hydraulic reservoir
- seat swivels 180° for forward & rearward steering

Table 1. Valmet 860 Forwarder Specifications

	Valmet 860 forwarder
Engine power (kW)	127
Engine torque (Nm)	700 at 1400 rpm
Engine	Sisudiesel 620 DWRE 6 cylinder turbo diesel
Power transmission	6- or 8-wheel hydrostatic/mechanical drive with DTC-II digital control system
Approximate weight (kg)	
6-wheel drive	12 455
8-wheel drive	12 985
Width (m)	2.59
Length (m)	9.50
Height (m)	3.71
Max. driving speed (km/h)	25.0
low gear	9.0
Crane reach (m)	7.2 (720) or 7.5 (850)
Carrying capacity (kg)	14 061
Ground clearance (m)	0.68



Figure 1. Valmet 860 forwarder (Source: Partek Forest).

Equipment manufacturer

Valmet equipment is manufactured by Partek Forest LLC, Gladstone, MI, USA.

The approximate (2001) price of the Valmet 860 forwarder is C\$520 000.

For further information, contact:

George Schmidt, Area Sales Manager, Partek Forest LLC, 141 49th St., Delta, BC V4M 2P1 Tel.: 604-943-9692 Fax: 604-943-1565.
E-mail: george.schmidt@partekforest.com

Partek Forest LLC, Sales & Marketing Department, PO Box 401, Gladstone, MI 49837, USA Tel.: 906-428-4800 Fax: 906-428-3922.
E-mail: info.us@partekforest.com
Web: www.partekforest.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

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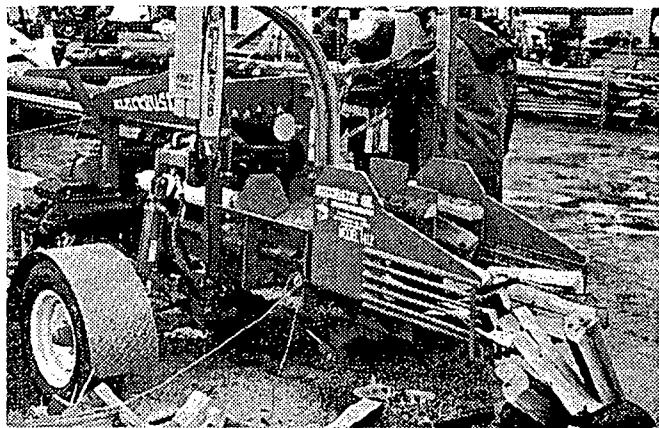
Equipment: Other #12 Model: Blockbuster Firewood Processor

Illustration

- Blockbuster firewood processor (Figure 1)

Location

The Blockbuster firewood processor was observed by FERIC at the Oregon Logging Conference Equipment Demonstration in Eugene, Oregon, February, 2000.



Equipment specifications

See Table 1. Additionally,

- 3 models
- electric or stationary units available
- 4-, 6-, or 8-way, adjustable splitting head
- chain-driven trough for continuous log access
- hydraulic saw with bar and chain
- operator's seat and platform
- all-weather operator's cab (Model 2222)
- operator's lights
- tandem axles with electric brakes

Table 1. Blockbuster Firewood Processor Specifications

	Blockbuster firewood processor		
	2222	2220	1820
Engine power (kW)	60	37	
Engine		Perkins diesel	
Cylinders	4	4	3
Approx. weight (kg)	4 730	3 182	2 364
Width (m)			
transporting	2.41	1.98	1.98
operating	3.96	2.59	2.59
Length (m)	8.08	7.47	7.0
Height (m)			
transporting	2.74	2.29	2.13
operating	1.65	1.52	2.13
Log deck length (m)	3.05	1.52	1.52
Splitter cycle time (sec)	5.5	8.0	9.0
Cutting capacity (cm)	56	56	46
Max. splitter opening (cm)	76	76	61

Figure 1. Blockbuster firewood processor.

- optional equipment includes 6.1-m or 9.1-m elevator
- firewood grapples available for tractors or loaders

Equipment manufacturer and distributor

Blockbuster firewood processors are manufactured and distributed by Blockbuster Inc., Mt. Pleasant, IA

For further information, contact:

Blockbuster Inc., 2756 Kentucky Ave., Mt. Pleasant, IA 52641 USA Tel.: 319-986-5525 Toll free: 1-888-775-4883 Fax: 319-986-6858.

Janet Mitchell FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #13
Model: Koller SKA 2.5 Log Carriage

References

Compendium articles Operations Cable #19, #26 and
Equipment Yarder #11
FERIC Advantage Report Vol. 1 No. 35

Illustration

- Koller SKA 2.5 log carriage (Figure 1)

Location

The log carriage was observed by FERIC during a field visit to a cable logging operation near New Hazelton, BC. October 1998.

Equipment specifications

See Table 1. Additionally,

- versatile carriage capable of passing intermediate supports
- skyline clamps and load arms operated by internal hydraulic system
- direction change activates the carriage to lock to the skyline and release the load hook

Equipment manufacturer and distributor

The Koller SKA 2.5 log carriage is manufactured by Koller, Kufstein, Austria and distributed by Northwest Harvesters Incorporated, Portland OR.

Approximate (2000) price of the Koller log carriage is \$20 280.

Table 1. Koller SKA 2.5 Log Carriage Specifications

	Koller SKA 2.5 log carriage
Length (cm)	100
Width (cm)	30
Height (cm)	135
Weight (kg)	250
Skyline diameter (mm)	20 - 33
Mainline diameter (mm)	13 - 15
Load capacity (kg)	2500



Figure 1. Koller SKA 2.5 log carriage.

For further information, contact:

Des Trent, Northwest Harvesters Incorporated, 8828 NE Killingsworth St., Portland, OR 97220-4664
USA Tel.: 503-257-7696 Toll free: 1-800-821-1475
Fax: 503-257-2704.

Kollerus@hevanet.com

Michelle Dunham, FERIC, 2601 East Mall,
Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.

E-mail:michelle-d@vcr.feric.ca or admin@vcr.feric.ca

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Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #14

Model: Mini-Mak II Log Carriage

References

Compendium articles Operations Cable #6, #10, #16, #25, Equipment Yarder #5, #6, and #10
FERIC Technical Note TN-125

Illustration

- Mini-Mak II log carriage (Figure 1)

Location

The log carriage was observed by FERIC during a field visit to a cable logging operation near Kitwanga, BC, September 1998.

Equipment specifications

See Table 1. Additionally,

- carriage is balanced to pass support jacks carrying partially or fully suspended loads
- optional gas or diesel powered engine
- line gates are automatically unlocked by tree jack
- built in motorized mechanical drive slack puller
- self-clamping radio controlled brakes and slack puller controlled by yarder operator and/or chokersetter
- skidding line and mainline can be clamped to hold slack
- flip away unique skyline clamp accommodates 65% chord slope change
- passes 8 degrees horizontal skyline misalignment and skyline extension shackles
- accommodates skyline diameters of 20-26 mm.

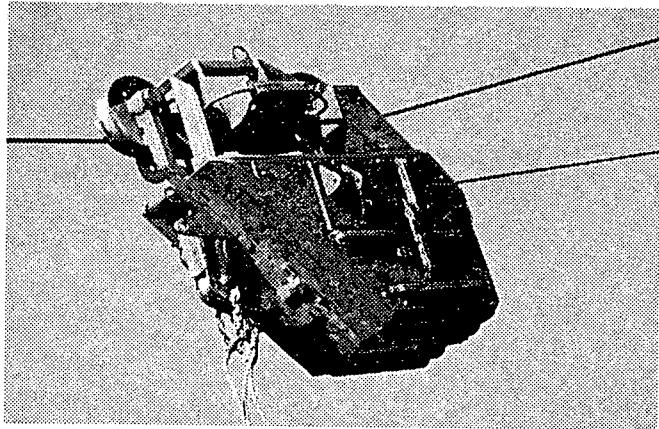


Figure 1. Mini-Mak II log carriage.

Equipment manufacturer and distributor

The Mini-Mak II carriage is manufactured by Maki Manufacturing Inc., Pierce, ID and distributed by Skylead Logging Equipment Corporation, Enderby, BC.

Approximate (1999) price of the Mini-Mak II log carriage is \$50 000.

For further information, contact:

Bill Varner, Skylead Logging Equipment Corporation, PO Box 880, Enderby, BC V0E 1V0 Tel: (250) 838-6845 Fax: 250-838-7877.

Maki Manufacturing Inc., HC 64, Box 60, Pierce, ID 83546 USA Tel./Fax: 208-464-2120.

Michelle Dunham, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: michelle-d@vcr.feric.ca or admin@vcr.feric.ca

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Table 1. Mini-Mak II Log Carriage Specifications

	Mini-Mak II log carriage
Engine power (kW)	
gas	6.7
diesel	7.5
Weight (kg)	636
Slackpulling speed (m/min)	45 - 90
Load capacity (kg)	6818



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #15

Model: Valtra Tractors

References

- FERIC Compendium article Operations Cut-and-Skid #10
- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).
- FERIC Field Note FN-General-53

Illustrations

- Valtra 8400 tractor (Figure 1)
- Valtra 8150 tractor with Arbro-Stroke harvesting head (Figure 2)

Locations

FERIC has observed Valtra tractors at the PartCuts'99 Equipment Demonstration, near Vanderhoof, BC, September 2000, Oregon Logging Conference, Eugene, OR, February, 2000 and Victoriaville, Quebec.

Equipment specifications

See Table 1. Additionally,

- 4-wheel drive
- seat swivels 180° for front and rearward steering
- bidirectional controls "TwinTrac" system

Table 1. Valtra Tractors Specifications

	Valtra 8150 tractor*	Valtra 8400 tractor
Engine power (kW)	92	103
Engine	620 DW	620 DSRE
Power transmission	36 speed mechanical powershift	
Approximate weight (kg)	7 200	5 160
Max. cutting capacity (cm)	30.0	n/a
Width (m)	2.20	2.18
Length (m)	4.85	4.75
Height (m)	2.87	2.87
Boom reach (m)	5.60	n/a
Turning radius (m)	5.50	5.10
Max. driving speed (kph)	40.0	40.0
Ground clearance (m)	0.49	0.53

*With Arbro-Stroke harvesting head.

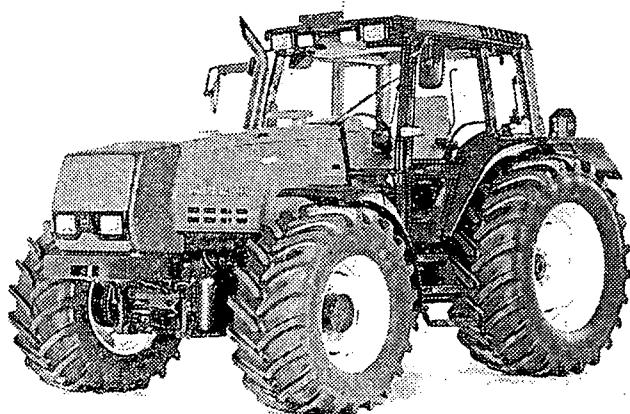


Figure 1 Valtra 8400 tractor (Photo courtesy of Global Forest Equipment Ltd.).

- tire chains for the tractor are available
- narrow width, makes the tractor suitable for ghost trails
- low centre of gravity provides good stability
- Valtra 8150 tractor had a dealer-built protective structure to protect the cab, engine canopy, radiator, and underbelly
- Valtra 8150 had an Arbro-Stroke harvesting head mounted on the rear
- 3-point hitch was replaced with a rear-mounted frame bolted to the differential's drive housing to mount the Nokka 3855 boom
- other attachments available through Global Forest Equipment include Farmi forestry trailers and cranes (for cut-to-length or shortlog harvesting), a IMx grapple (for skidding), a Farmi loader and Hypro processor (for trail-side processing)
- Valtra tractors are also suitable for brushcutters (e.g. the Meri Crusher)

Equipment manufacturer and distributor

Valtra tractors are manufactured by Valtra Inc., Suolohti, Finland. In BC, they are available through Global Forest Equipment, Courtenay, BC.

In Quebec, the Valtra tractors are available through regional dealerships and the Arbro-Stroke harvesting heads and Nokka loaders are available through Hakmet Ltd., Dorion, QC.

The approximate (2000) price of the Valtra tractor is \$110 000. The Valtra 8150 tractor with Arbro-Stroke harvester head is \$180 000 - \$190 000 (depending on boom, felling head and protective package used).

For further information, contact:

Richard DeLuca, Global Forest Equipment Ltd., 1109 Comox Rd., Courtenay, BC V9N 3P7 Tel.: 250-334-9694 Fax: 250-334-9338.

www.globalforest-equipment.com

Valtra Inc., FIN-44200 Suolohti, Finland Tel.: 358-14-549-111 Fax: 358-14-549-1386.

www.valtra.com

Hakmet Ltd., 881 Boulevard Harwood, C-P 248, Dorion, QC J7V 7J5 Tel.: 514-455-6101.

Roderick Ewing, FERIC, 580 Boulevard St. Jean, Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.

E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver, BC V6T 1Z4 Tel.: 604-228-1555.
E-mail: janet-m@vcr.feric.ca or admin@vcr.feric.ca

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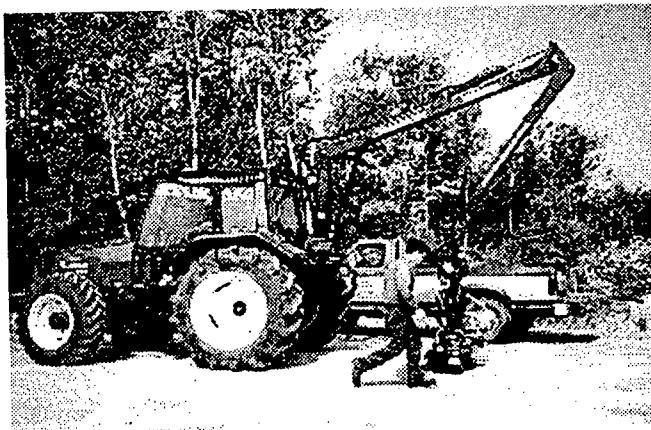


Figure 2. Valtra 8150 tractor with Arbro-Stroke harvesting head (Photo courtesy of FERIC, Eastern Division).



Forest Engineering Research Institute of Canada, Western Division Compendium of Commercial Thinning — Equipment

Equipment: Other #16 Model: Inchworm Processor

References

- FERIC Internal Report IR-1999-06-14E (Exploratory assessments of potential commercial thinning equipment: 1997-1999).

Illustration

- Inchworm processor on a Tree Farmer C6 forwarder (Figure 1)

Location

FERIC, Eastern Division observed the Inchworm at the factory.

Equipment specifications

See Table. Additionally,

- designed to be mounted on a forwarder, skidder or large tractor
- fed by a grapple loader
- can be installed on the front of the bunk of a midsized forwarder, between the base of the loader and the rear axle
- takes 30 minutes to install or remove from the carrier
- supplementary gear-based pump is installed in tandem with the forwarder's standard pump
- supplementary hydraulic reservoir is mounted on the roof
- programmable control system processes the stem automatically using pre-set lengths and minimum diameters

Table 1. Inchworm Processor Specifications

	Inchworm processor
Average weight (kg)	700
Cutting diameter (cm)	50.0
Delimbing diameter (cm)	46.0
Delimbing force (tonnes)	4
Delimbing speed (m/sec)	0.7
Hydraulic requirements (L/min)	135
Hydraulic reservoir (L)	225 - 315
Operating pressure (bar)	138 - 276

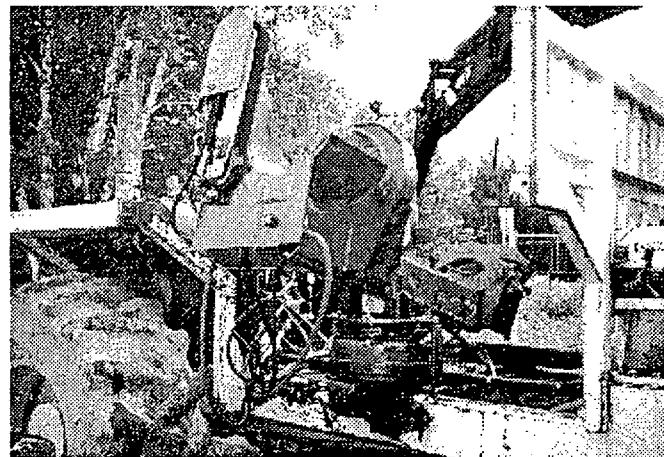


Figure 1. Inchworm processor on a Tree Farmer C6 forwarder (Photo courtesy of FERIC, Eastern Division).

- can process multiple stems at a time
- can reach for the next stem while processing another stem
- operator can choose different lengths
- processor can be transported on a 1/2 ton truck

Production

A short-term study on a prototype by the Forest Training Centre in Miramichi, NB measured a productivity ranging from 9.5 to 11.5 m³/PMH in a clearcut (average volume of 0.17 to 0.24 m³/tree). FERIC estimates that the machine should be able to produce 5 to 7 m³/PMH in a commercial thinning operation from the extraction trail, or set up at the landing.

Equipment manufacturer and distributor

The Inchworm processor is manufactured and distributed by Sunny Corner Enterprises Inc., 259 Dalton Ave., Miramichi, NB E1V 3C4 Tel.: 506-622-5611 Fax: 506-622-5657.

The approximate (2001) cost of the Inchworm processor is \$70 000 depending on the type of carrier used and the modifications to the hydraulic system that are required.

For further information, contact:

Roderick Ewing, FERIC, 580 Boulevard St. Jean,
Pointe Claire, QC H9R 3J9 Tel.: 514-694-1140.
E-mail: rod-e@mtl.feric.ca

Janet Mitchell, FERIC, 2601 East Mall, Vancouver,
BC V6T 1Z4 Tel.: 604-228-1555.
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