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EVALUATION OF THE ROTTNE HARVESTER AND THE ROTTNE FORWARDER

BACKGROUND

A number of different harvesting systems using various types of equipment have been tried in Alberta's mixedwood stands. The Forest Engineering Research Institute of Canada (FERIC) had the opportunity to observe Swedish equipment operating in a mixedwood stand east of Whitecourt, Alberta during the late summer of 1989. Four Rottne Rapid carriers were equipped with attachments which enabled them to fell and process trees at the stump and forward logs to the roadside.

ROTTNE RAPID CARRIER

The Rottne Rapid is an articulated six-wheel drive rubber-tired carrier upon which numerous different logging attachments can be mounted. The Rottne Rapid is powered by a 75-kW turbo diesel engine and is hydrostatically driven. A three-geared torque converter model is available as an option. All four Rottne Rapids observed by FERIC were equipped with track-type chains on the rear bogies; the chains improved traction and floatation (Figure 1).

The Rottne Rapid is 2.5-m wide and is 8.8-m long. Articulation behind the front motor-cab assembly separates the cab from the rear bogie. The cab features an insulated, air-conditioned, high visibility, roomy enclosure. The cab is mounted on rubber elements to reduce vibration and it can be fully tilted for easy access to the power-train. The operator's seat is air suspended with electrically heated cushions and adjustable elbow-rests. The instrument panel features warning lights and gauges for engine speed, temperature, time recorder, and fuel level. The warning lights also appear on the rear inside panel of the cab. The heating and ventilation system features an automatic thermostat, a three-speed fan which drives air through six adjustable air outlets, and an air-conditioner. Lexan glass windows are guarded with easily removable gratings. The Rottne's lighting system of 16 lamps, recessed in the top of the cab, affords maximum visibility during night-time operation. A tilting hood allows easy access to the motor compartment. The Rottne Rapid, with standard equipment, weighs 10 200 to 11 600 kg.

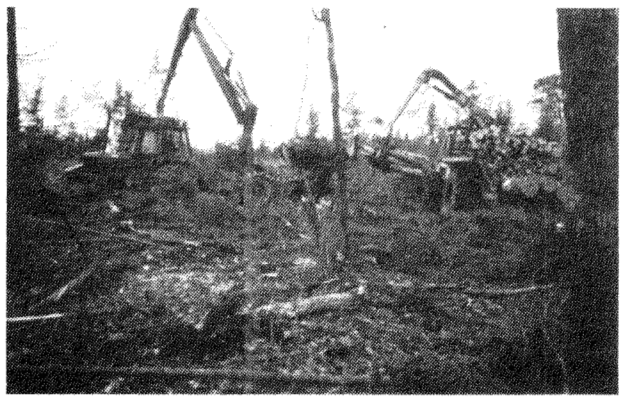

Figure 1. Two Rottne Rapids working in an Alberta mixedwood stand.

ROTTNE RAPID DOUBLE-GRIP HARVESTER

The double-grip harvester is comprised of a Rottne RF-81 felling head attached to an RG-81 crane, and a Rottne RP-860 processor mounted on a hydraulic pivoting arm on the back bogie. The crane positions the felling head around the base of a tree, and a single arm secures the tree while a hydraulically driven chain saw, capable of cutting trees up to 60 cm in diameter, cuts the stem. The crane drags the stem to the RP-860 processor and places it between the two large rubber-tired rollers. These rollers feed the stem through two moveable delimbing knives at 2.5 or 5 m/s.

The processor FERIC observed was equipped with a length-measuring device; three bucking lengths could be pre-selected by the operator. The measured logs are bucked by a hydraulically driven bucking saw and dropped to the ground alongside the access trail. The processor can rotate approximately 270° and tilt up and down 18° and 25° respectively, thus enabling the processor to build well-aligned decks along the trail. The processor can delimb and buck a maximum diameter of 53 cm. The cost of the double-grip harvester is approximately $360 000 to $380 000, depending on options.

ROTTNE RAPID SINGLE-GRIP HARVESTER

The EGS-85 feller-processor head was mounted on the RG-81 crane which was attached to the Rottne Rapid carrier. This single-grip harvester felled, delimbed, and bucked the trees as it worked its way along the trail. The head weighs 600 kg and is capable of felling and processing tree diameters up to 45 cm. The pendulum-arm mounting enables the machine to operate effectively as a feller-processor. The head is placed in front of a tree by the boom and a clamping arm near the base of the machine. A set of movable delimbing knife arms at the top of the processor holds the head securely against the tree while a hydraulically driven chain saw cuts the stem. After the tree is felled, two rubber-tired feed

rollers pull the stem through one fixed and two movable delimbing knives at speeds up to 4 m/s. The chain saw also serves as the bucking saw for the measured logs. Three pre-selected log lengths can be set on the length-measuring equipment. The head, which can turn 300° and tilt 120°, enables the processor to make good decks along the trail. The cost of this feller-processor is approximately $340 000.

ROTTNE RAPID FORWARDER

The Rottne Rapid forwarder consists of the same base model machine as the two harvesters and a set of bunks mounted on the rear frame. Two forwarders were working on the operation that FERIC observed. A Grip 83 crane, mounted on the rear bogie of each, loaded the logs onto the forwarder. The forwarder carried the load to the roadside or landing and decked the logs for later hauling. The cost of the forwarder is approximately $240 000.

OPERATION

The Rottne machinery was working in a mixed white spruce and aspen stand near Blue Ridge, Alberta, east of Whitecourt. The cutting permit was within a joint management unit area where Blue Ridge Lumber had the cutting rights for the spruce and pine, while Millar Western Industries Ltd. had the aspen cutting rights. For all species, the minimum diameter harvested was 15 cm to a 10 cm top. The contract specified that the spruce was to be cut to three preferred saw-log lengths of 5.03 m, 5.64 m, and 6.25 m; the remaining shorter and smaller diameter lengths were to be recovered as pulp logs. Pulp logs were cut to random lengths between 3.7 m and 6.25 m. An average of two logs were produced from each tree. In many instances the contractor utilized stems to a 12.5-cm stump and a 7.5-cm top. All of the trees were processed at or near the stump and decked as pulp or saw logs. The bunches were picked up by the forwarders and decked along the roadside where self-loading "high boy" trucks hauled the logs to the sawmill or pulp mill.

PERFORMANCE

The Rottne machinery was able to operate even though the region had experienced very wet spring and summer seasons. The track-equipped six-wheeled machines were able to manoeuvre throughout the permit area without getting stuck. In many instances, the processor corduroyed the strip trail with the tops of the trees to provide better trafficability. The long crane booms enabled the operator to reach 10 m from the trail; however, the majority of the trees were cut within 7 m because the operator had better control of felling and processing when working within this shorter distance. After the tree was felled by the felling saw, the tree was pulled to the strip trail and delimbed.

Comparing the productivity of the double-grip and the single-grip harvesters was difficult because the operator of the single-grip harvester was a trainee. The double-grip harvester felled and processed approximately 55 trees/h, or approximately 13 m^3/h. The contractor felt the single-grip processor, with an experienced operator, could fall and process approximately 80 trees/h or 19 m^3/h. The main reason for the difference in production is that the double-grip processor required more manoeuvring of both the machine and the processing head to get the felled trees into the delimbing knives. The single-grip processor could start delimbing the stem as soon as the tree hit the ground. The main advantage of the double-grip processor was that it could fall larger trees. Both harvesters delimbed the spruce and aspen very well.

The Rottne forwarder is capable of hauling 10 m^3 per load. The contractor-owned forwarder was hauling 150 m^3/10-h shift. The second forwarder was operated by a trainee and production was not monitored by FERIC. The maximum forwarding distance was 400 m. The operator positioned the forwarder alongside the decks and loaded the logs with the Grip 83 crane. Upon completion of loading, the grapple was set on top of the load to help keep the load secure. The load was then hauled to roadside where it was piled into appropriate decks.

CONCLUSION

The Rottne processor and forwarder together form a viable harvesting system that will have use in the forests of British Columbia and Alberta, especially in areas of very wet terrain. Processing at the stump will ensure that only merchantable volume is removed, and the limbs and tops are left to become the nutrient base for future timber stands. It produces cleanly delimbed and accurately bucked saw logs, thus eliminating the need for merchandizing decks at the roadside or the sawmill. This harvesting system may have application in the utilization of small-diameter pine stands in the Interior of British Columbia.

INFORMATION

The information contained in this report is based on limited field observations and is only published to disseminate information to FERIC member companies. More information may be obtained from:

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