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National Cranberry Cooperative

On February 14, 1971, Hugo Schaeffer, vice president of operations at the National Cranberry Cooperative (NCC), called his assistant, Mel O'Brien, into his office and said:

> Mel, I spent all day yesterday reviewing last fall's process fruit operations at receiving plant No. 1 [RP1] with Will Walliston, the superintendent, and talking with the co-op members [growers] in that area. It's obvious to me that we haven't solved our problems at that plant, yet. Even though we spent $75,000 last winter for a fifth Kiwanee dumper at RP1, our overtime costs were still out of control this fall, and the growers are still upset that their trucks and drivers had to spend so much time waiting to unload process fruit into the receiving plant. I can't blame them for being upset. They are the owners of this cooperative, and they resent having to lease trucks and hire drivers to get the berries out of the field and then watch them stand idle, waiting to unload.
>
> Walliston thinks that the way to avoid these problems next fall is to buy and install two new dryers [$25,000 each], and to convert our dry berry holding bins so that they can be used to store either water-harvested or dry berries [$5,000 per bin]. I want you to go out there and take a hard look at that operation and find out what we need to do to improve operations before the 1971 crop comes in. We're going to have to move quickly if we are going to order new dryers, since the equipment and installation lead times are in excess of six months. By the way, the growers in that region indicated that they plan on about the same size crop this year as last. But it looks like the percentage of water-harvested berries this year will increase to 70% of total process fruit from last year's 58%.

NCC and the Cranberry Industry

NCC was an organization formed and owned by growers of cranberries to process and market their berries. In recent years 99% of all sales of cranberries were made by the various cooperatives that are active in the cranberry industry. NCC was one of the larger cooperatives and had operations in all the principal growing areas of North America: Massachusetts, New Jersey, Wisconsin, Washington, Oregon, British Columbia, and Nova Scotia. *Table A* contains industry data for U.S. production and sales of cranberries.

This case represents a major revision of the case "American Cranberry Cooperative," HBS Case Services No. 9–672–141, written by J. Jucker. It was prepared as the basis for class discussion rather than to illustrate effective or ineffective handling of an administrative situation.

Table A Data on U.S. Cranberry Harvest

Crop Year	Acreage Harvested	Barrels per Acre	Production/Utilization (in barrels)[a] Production	Fresh Sales	Process	Average Price (all uses, $ per barrel)[b]
Five-Year Average						
1935–39	26,022	23.7	615,100	466,844	148,256	11.06
1940–44	25,434	24.9	634,300	380,965	253,335	15.50
1945–49	26,205	31.3	822,580	381,320	436,060	17.15
1950–54	24,842	39.8	983,660	439,170	532,070	11.71
1955–59	21,448	51.2	1,096,160	427,520	543,860	9.79
1960–64	20,778	62.6	1,300,120	468,340	755,760	10.90
1965–69	20,988	73.7	1,546,120	327,980	1,169,360	15.88
Annual						
1965	20,640	69.6	1,436,800	389,600	1,033,200	15.50
1966	20,760	77.0	1,598,600	328,000	1,249,600	15.60
1967	21,220	66.2	1,404,300	278,300	1,034,900	15.50
1968	21,135	69.4	1,467,800	301,900	1,111,200	16.50
1969	21,185	86.1	1,823,100	342,100	1,417,900	16.30
1970[c]	21,445	95.1	2,038,600	367,000	1,418,600	12.90

Source: Annual reports of Crop Reporting Board, Statistical Reporting Service, USDA.

Note: Data gathered on five states—Massachusetts, New Jersey, Oregon, Washington, and Wisconsin.

[a]Differences between production and utilization (fresh sales and process) represent economic abandonment.

[b]Beginning in 1949 the series represents equivalent returns at first receiving station, fresh and processing combined. Years prior to 1949 represent season average prices received by growers for all methods of sale, fresh and processing combined.

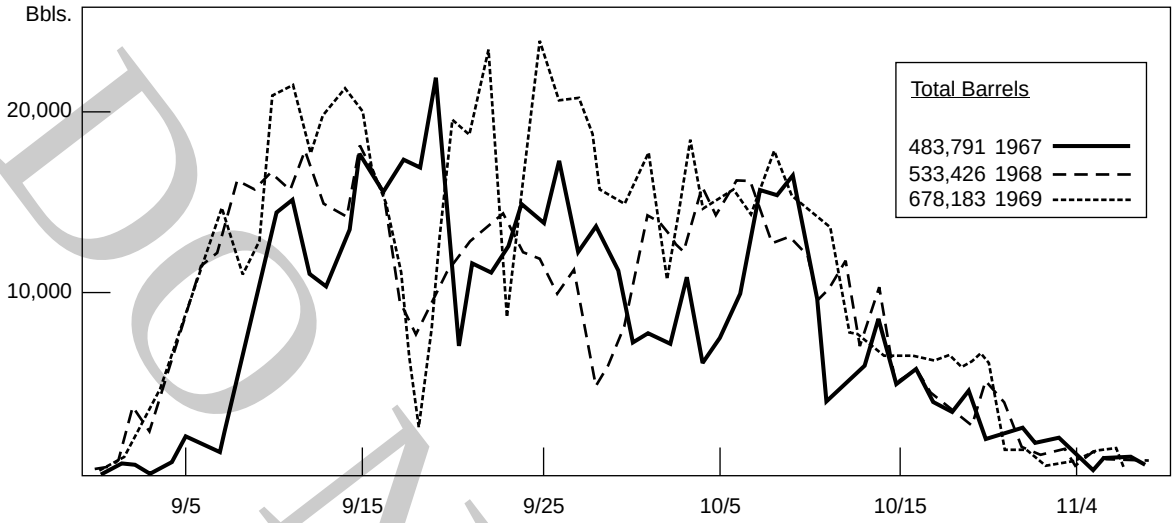
[c]Preliminary figures for 1970.

Some significant data are observable in *Table A*. Probably the most important trend was the growing surplus of cranberries produced over those utilized. This surplus was serious enough by 1968 for the growers to resort to the Agriculture Marketing Agreement Act of 1937. Under this act, growers can regulate and control the size of an agricultural crop if the federal government and more than two-thirds of the growers by number and tonnage agree to a plan for crop restriction. In 1968 this act was used to create the Cranberry Marketing Order of 1968, which stipulated that no new acreage was to be developed over the next six years and that each grower would have a maximum allotment at the end of six years equal to the average of the grower's best two years from 1968 through 1973. Eighty-seven percent of all growers voted in favor of the order, making it binding on all cranberry growers.

In 1970 the growers resorted to the Agriculture Marketing Agreement Act once again. Under the Cranberry Marketing Order of 1970, the growers and the government agreed that 10% of the 1970 crop should be set aside. The set aside berries (berries that are either destroyed or used in a way that will not influence the market price) amounted to more than 200,000 bbls. (A barrel of cranberries weighs 100 lbs.) Handlers physically set aside 10% of the berries before harvesting, under the supervision of a committee of growers and representatives from the Department of Agriculture.

Another important trend was the increasing mechanization of cranberry harvesting. *Water harvesting,* in particular, was developing rapidly in the vicinity of receiving plant No. 1. Under the traditional *dry harvesting,* berries were handpicked from the bushes. In water harvesting, the bogs were flooded, the berries were mechanically shaken from the bushes, and the berries then were collected easily since they floated to the surface of the water. Water harvesting could result in yields up to 20% greater than those obtained via dry harvesting, but it caused some damage and it shortened the time that harvested fruit could be held prior to either its use or freezing for long-term storage. Water harvesting had developed at a remarkable rate in some areas. Receiving plant No. 1 received 25,000 bbls. of water-harvested fruit in 1968, 125,000 bbls. in 1969, and 350,000 bbls. in 1970.

Figure A Daily Deliveries of Both Fresh and Process Berries to RP1



Water harvesting was not the preferred harvesting method for fruit that was to be sold fresh, since fresh fruit must be undamaged and have as long a shelf life as possible. It was also necessary to ship fruit that was to be sold fresh to receiving plants in field boxes that contain about 1/3 bbl. of berries rather than in bulk (trucks holding up to 400 bbls.) to avoid damage. Fresh fruit was inspected berry by berry prior to packaging. Altogether, fresh fruit production remained a very labor-intensive process.

Receiving Plant No. 1 (RP1)

RP1 received both fresh fruit and process fruit during a season that usually started early in September and was effectively finished by early December (see *Figure A*). The fresh fruit operation was completely separate from the process fruit operation and took the fruit from receiving through packaging. This operation involved more than 400 workers during the peak of the season. Most of the workers were women, who inspected berries as they moved by on teflon-coated conveyors. Packaged fresh fruit was shipped from RP1 directly to market by truck. No problems had been experienced in fresh fruit processing in the past.

The handling of process fruit at RP1 was highly mechanized. The process could be classified into several operations: receiving and testing, dumping, temporary holding, destoning,[1] dechaffing,[2] drying, separation, and bulking and bagging. The objective of the total process was to gather bulk berries and prepare them for storage and processing into frozen fresh berries, sauce, and juice.

Process Fruit Receiving

Bulk trucks carrying process berries arrived at RP1 loaded with anywhere from 20 to 400 bbls. These trucks arrived randomly throughout the day as shown in *Exhibit 1*. The average truck delivery was 75 bbls. When the trucks arrived at RP1 they were weighed and the gross weight and the tare (empty) weight were recorded. Prior to unloading, a sample of about 30 lbs. of fruit was

[1] *Destoning* was the separation of foreign materials, such as small stones, that might be mixed in with the berries.
[2] *Dechaffing* was the removal of stems, leaves, and so forth that might still be attached to the berries.

taken from the truck. Later, this sample would be run through a small version of the cleaning and drying process used in the plant. By comparing the before and after weight of this sample, it was possible to estimate the percentage of the truck's net weight made up of clean, dry berries. At the same time, another sample was taken to determine the percentage of unusable berries (poor, smaller, and frosted berries) in the truck. The grower was credited for the estimated weight of the clean, dry, usable berries. In 1970, on the average, the growers were credited for 94% of the scale weight of dry deliveries and 85% of the scale weight of wet deliveries. (See *Exhibit 2* for total 1970 deliveries of process berries.)

At the time the truck was weighed, the truckload of berries was graded according to color. Using color pictures as a guide, the chief berry receiver classified the berries as Nos. 1, 2A, 2B, or 3, from poorest color (No. 1) to best (No. 3). There was a premium of 50 cents per bbl. paid for No. 3 berries, since color was considered to be a very important attribute of both juice products and whole sauce. Whenever there was any question about whether or not a truckload was No. 2B or No. 3 berries, the chief berry receiver usually chose No. 3. In 1970 the 50-cent premium was paid on about 450,000 bbls. of berries. When these berries were used, however, it was found that only about half of them were No. 3's.

To improve this yield, Schaeffer was considering the installation of a light meter system for color grading. This system was projected to cost $10,000 and would require a full-time skilled operator at the same pay grade as the chief berry receiver.

Temporary Holding

After a truckload of process berries had been weighed, sampled, and color graded, the truck moved to one of the five Kiwanee dumpers. The truck was backed onto the dumper platform which then tilted until the contents of the truck dumped onto one of five rapidly moving belt conveyors. Each of the five conveyors took the berries to the second level of the plant and deposited them on other conveyors capable of running the berries into any one of 27 temporary holding bins. Bins numbered 1–24 held 250 bbls. of berries each. Bins 25, 26, and 27 held 400 bbls. each. All of the conveyors were controlled from a central control panel.

It usually took from 5 to 10 minutes to back a truck onto a Kiwanne dumper, empty its contents, and leave the platform. At times some trucks had to wait up to 3 hours, however, before they could empty their contents. These waits occurred when the holding bins became full and there was no place in the receiving plant to temporarily store berries before further operations.

The holding bins emptied onto conveyors on the first level of the plant. Once the bins were opened, the berries flowed onto the conveyors and started their way through the destoning, dechaffing, drying (water-harvested berries), milling, and either bulk loading or bagging operations.

Destoning, Dechaffing, and Drying

Holding bins 25–27 were for wet (water-harvested) berries only. Holding bins 17–24 could be used for either wet or dry berries. Wet berries from these bins were taken directly to one of the three dechaffing units (destoning was unnecessary with water-harvested berries) which could process up to 1,500 bbls. per hour each. After dechaffing, these wet berries were taken to one of the three drying units where they were dried at rates up to 200 bbls. per hour per dryer for berries that were to be loaded into bulk trucks, and approximately 150 bbls. per hour per dryer for berries that were to be bagged. Wet berries that were to be bagged had to be drier than bulked berries, since the bags tended to absorb moisture and would stick together when frozen.

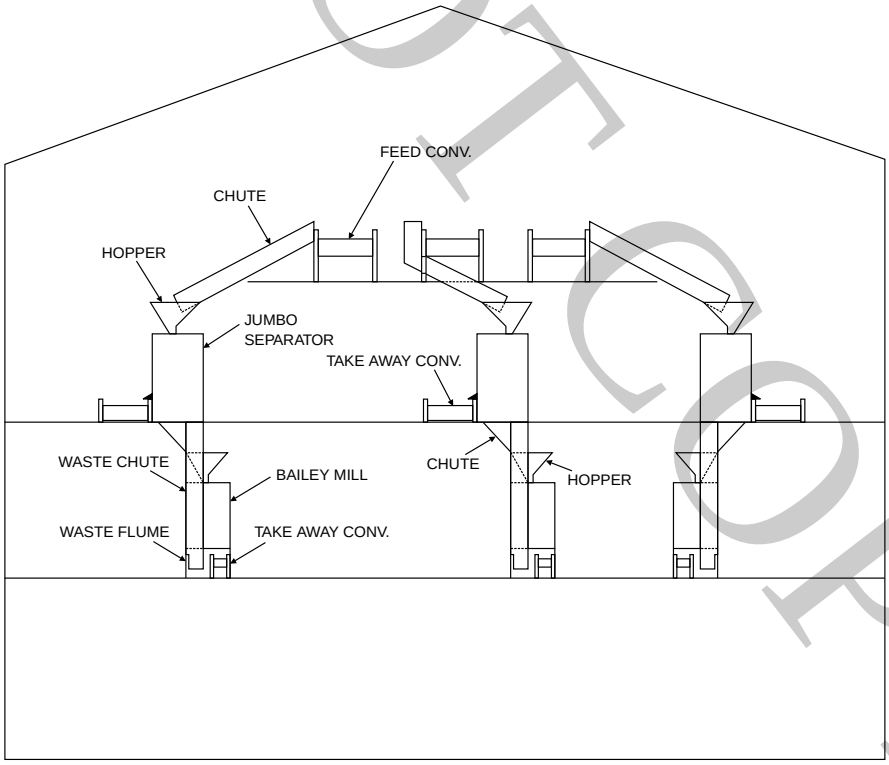
Holding bins 1–16 were for dry berries only. Berries from these bins were routed through one of three destoning units which could process up to 1,500 bbls. of berries per hour before going

through the dechaffing units. Frequently, both wet and dry berries were processed at the same time through the system. The wet berries would be processed through the part of the system that included the dryers, while the dry berries were processed through different machines.

Milling—Quality Grading

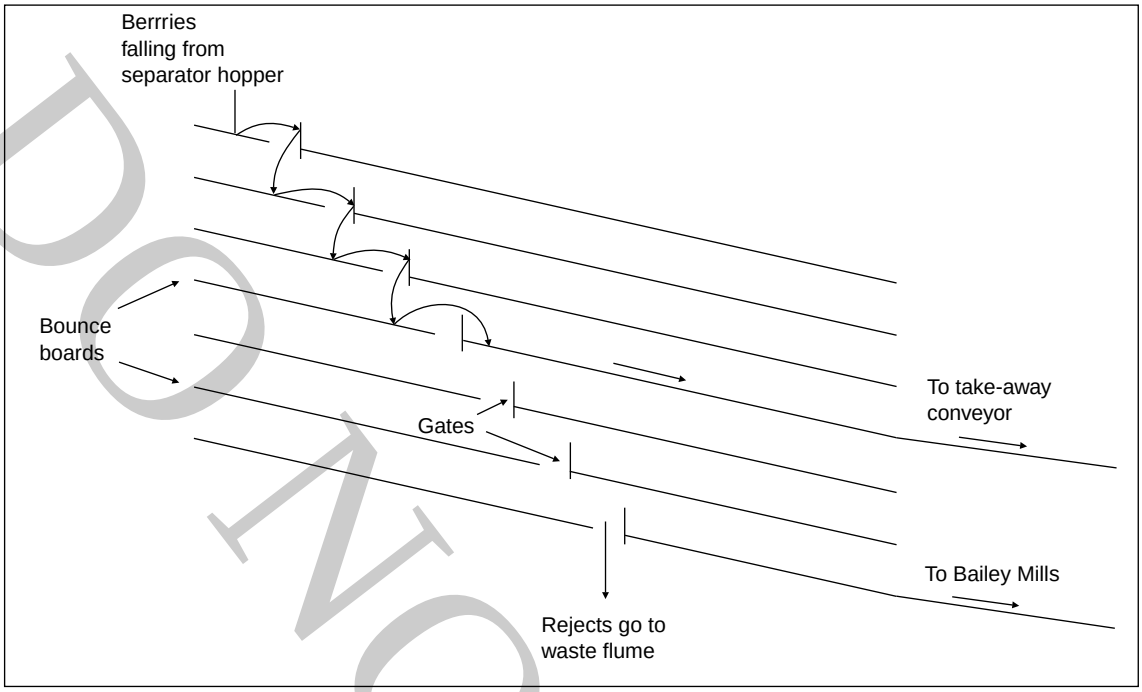
After destoning, dechaffing, and drying, berries were transported to one of three large take-away conveyors that moved berries from the first level of the receiving building to the third level of the adjoining separator building. Here these same conveyors were called feed conveyors as they were now feeding berries into the jumbo separators (see *Figure B*). There were nine jumbo separators along each of the three feed conveyors. The jumbo separators identified three classes of berries: first quality berries, *potential* second quality berries, and unacceptable berries. The separation process was a simple one that was based on the fact that good cranberries will bounce higher than poor cranberries (see *Figure C* for a drawing of the separation process). The first quality berries went directly onto one of three take-away conveyors on the second level and were transported to the shipping area. The unacceptable berries fell through waste chutes into water-filled waste flumes on the first level and were floated off to the disposal area. The potential second quality berries fell into the Bailey mills on the second level of the building. The Bailey mills separated the stream of incoming berries into second quality berries and unacceptable berries. The Bailey mills operated on the same principle as the jumbo separators. Over the years the percentage of second quality berries had consistently been close to 12%.

Figure B RP1 Separator Building



Each of the three separator lines could process up to 450 bbls. per hour, but the rate of processing declined as the percentage of bad fruit increased. It was estimated that the average effective capacity was probably slightly less than 400 bbls. per hour for each line.

Figure C Separator Operation



Bulking and Bagging

Six conveyors carried berries from the separator building into the shipping building—three from the jumbo separators and three from the Bailey mills. Each of those six conveyors could feed berries onto any one of the three main flexible conveyors in the shipping area. Each of the three conveyors in the shipping area could be moved to feed berries into any one of four bagging stations, any one of four bulk bin stations, or any one of two bulk truck stations. The berries left RP1 in bulk trucks for shipment directly to the finish processing plant, in bins for storage at freezers with bulk storage capability, or for storage in freezers that could handle only bagged berries. These frozen berries were then held for year-round usage by one of the NCC processing plants. Some processing plants could receive only bagged berries, while others could receive either bulk or bagged berries.

A maximum of 8,000 bbls. could be bagged (60 lbs. of berries per bag) in a 12-hour period. To attain this output, three five-member teams ran three of the bagging machines and stacked bags in trucks. A fourth bagging machine was kept as a spare in case there was a jam or a breakdown on one of the three operating machines. A study had shown that it cost about $.05 more in direct labor per barrel for bagging than for bulk loading and the cost of bags was $.12 each. In 1970, four commercial freezers were under contract with NCC to accept bagged fruit according to the rate and capacity schedules shown in *Table B*. Trucks were under contract with NCC to haul berries to the freezers at the freight rates also shown in *Table B*. They were available 24 hours per day and there was rarely a holdup for want of a truck. Freezers were generally open 24 hours per day, seven days per week.

Table B also shows the rate and capacity schedules for those freezers that were equipped to handle bulk berries. Included are NCC's own freezer and the local NCC processing plant which converted the bulk berries to finished products. The local processing plant utilized an average of 700 bbls. daily from bulk bins that could be filled at the rate of about 200 bbls. per hour at each of the four bin stations. Berries could be loaded directly into bulk trucks at two stations, each capable of loading up to 1,000 bbls. per hour. One worker ran both stations. There was normally about a 10-minute delay

between the time when one truck was filled and the time when another truck was in position, ready for filling.

Table B Freezer Rates and Capacities, 1970 ($ per barrel)

	Freight Cost	Initial Cost[a]	Continuing Monthly Cost	Total Capacity (bbls.)
Bulk Berries				
Frostway[b]	.25	.81	.22	280,000
Inland	.30	.76	.23	25,000
NCC freezer	.23	—	—	30,000
NCC process	.23	—	—	—
Total				335,000
Bagged Berries				
Farmers	.29	.76	.23	75,000
Northern (5½-day week)	.29	.80	.22	–[c]
American (6-day week)	.60	.75	.22	–[c]
Freeze-Rite (6-day week)	.70	1.24	.34	–[c]

[a]Initial cost included in and out handling cost and freezing cost.
[b]The contract with Frostway included a guarantee that at least 280,000 bbls. would be put in the Frostway freezer. For every bbl. less than 280,000, NCC would pay a penalty of $0.81.
[c]Total capacity was not a constraining factor.

Scheduling the Work Force

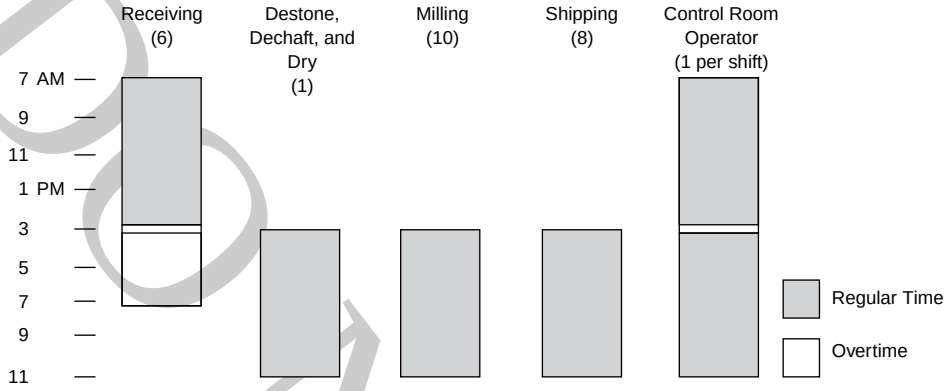
During the harvest season, September 1 to December 15, the process fruit side of RP1 was operated seven days a week with either a 27-member work force or a 53-member work force, depending on the relative volume of berry receipts. When the volume of berry receipts was expected to be low, the plant operated with 6 workers in receiving (two 3-member teams operating one Kiwanee dumper each), 10 workers in the milling area (one 5-member team per feed conveyor), 8 workers in shipping (one 5-member team on a bagging station, one worker operating the two bulk stations, and 2 workers together operating a bulk bin station), one worker supervising the destoning, dechaffing, and drying operations, and 2 workers (one on each of two shifts) in the control room. *Figure D* shows the planned daily manning schedule for the low-volume periods which were anticipated before the 1970 harvest season began.

During the peak of the season, the 53 workers who operated the process fruit side of RP1 were assigned as follows: 15 workers in receiving (five 3-member teams, each assigned to one dumper), 15 workers in milling (three 5-member teams, each assigned to one of the feed conveyors), 20 workers in shipping (three 5-member teams, each assigned to one bagging station, one worker operating the two bulk stations, and two 2-worker teams, each assigned to one bulk bin station), one worker supervising the destoning, dechaffing, and drying operations, and 2 workers (one on each of two shifts) in the control room. *Figure E* shows the planned daily work schedule for the high-volume periods anticipated at RP1 before the 1970 harvest season began.

There were 27 employees at RP1 who were employed for the entire year; all others were hired for the season only. The 27 nonseasonal employees were all members of the Teamsters Union, as were 15 seasonal workers. Seasonal workers could work only between the dates of August 15 and December 25 by agreement with the union. Most seasonal workers were employed via a state employment agency that set up operations each fall. The employment agency helped in placing seasonal workers in the receiving plant and in harvesting jobs with the local growers. The pay rate for seasonal workers in the process fruit section was $2.25 per hour. They were paid the overtime rate of

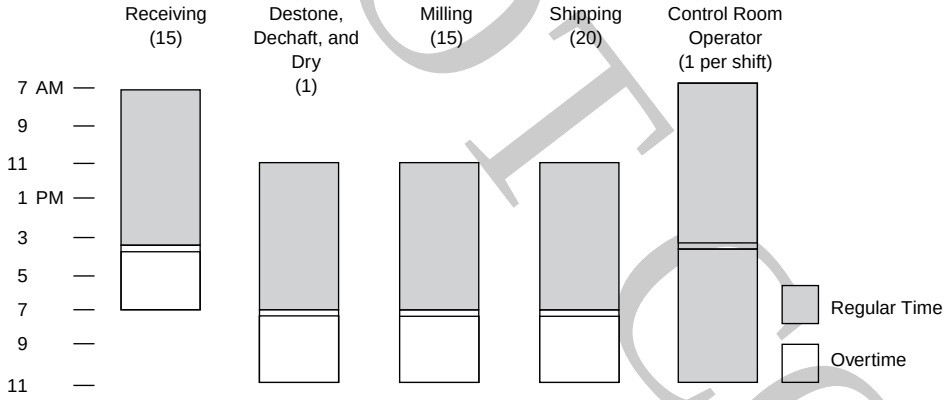
1 times their straight-time rate for anything over 40 hours per week. The straight-time pay rate for the full-year employees averaged $3.75 per hour.

Figure D Schedule for 27 Workers, Low-Volume Period



Note: Numbers in parentheses represent workers required for September 1–19 and October 11 through December 15.

Figure E Schedule for 53 Workers, High-Volume Period



Note: Numbers in parentheses represent workers required for September 20 through October 10.

The amount of overtime used in a day or week depended on how effectively workers could be scheduled. If it was known, for instance, that the plant would have to run beyond the normal 11 P.M. shutdown time, then it would be desirable to have some workers report for work at 6 P.M. or later, but it was not always possible to find workers who would do this. There was also the problem of absenteeism, which caused Walliston to carry more employees on the payroll than he really needed. He had to have 20 on the payroll to be reasonably sure he'd have 15 on hand. Higher than expected absenteeism, of course, often resulted in overtime for those who were there. For the 1970 season, the process fruit operation at RP1 utilized about 22,000 man-hours of straight-time direct labor and about 12,000 man-hours of overtime.

When it was necessary to work beyond 11 P.M., a crew of only eight or nine workers was required to run the holding bins empty and do bulk loading. Although dry fruit could be held in the bins overnight, it was considered undesirable to hold wet fruit any longer than necessary, so wet fruit was always run out before shutting down. The plant never ran more than 22 hours a day, since at least 2 hours were required for cleaning and maintenance work. (Downtime due to unscheduled

maintenance was very small; said Walliston: "We ran 350,000 bbls. through the wet system in 1970 and we were down a total of less than 8 hours.")

Exhibit 1 Log of Total Deliveries on September 23, 1970

Time	Color	Wet/Dry	Weight	Time	Color	Wet/Dry	Weight	Time	Color	Wet/Dry	Weight
411	3	D	33940	633	3	D	3600	949	2	W	11540
413	3	D	9980	634	2	W	7280	954	3	W	12580
416	3	D	10020	636	3	W	9240	957	3	D	11040
428	1	D	12200	638	3	W	12700	959	3	D	7740
439	3	D	8980	640	3	W	28780	961	3	W	12500
445	3	D	7520	645	2	D	18000	962	3	D	7000
446	3	D	4140	648	3	D	8240	968	3	D	7340
448	3	D	11720	650	3	W	13820	969	3	D	4260
451	2	D	6520	651	2	W	11280	975	3	D	1660
456	3	D	1480	655	3	D	1280	977	3	D	4980
459	3	W	12660	660	3	D	500	980	3	W	12640
460	3	D	31640	663	2	D	29560	982	3	D	6420
462	3	W	11920	664	2	D	9720	984	3	D	11200
463	3	D	2060	665	3	W	8000	996	3	D	11920
468	3	D	6020	666	3	W	24640	1000	3	W	12320
471	3	W	12640	671	3	D	1880	1005	3	W	8860
472	3	D	3940	673	2	W	12760	1008	2	W	7140
477	3	D	6060	674	3	D	9980	1010	3	D	7180
480	3	D	4660	677	3	W	12980	1011	2	D	11220
482	3	D	1880	678	2	D	7860	1012	2	D	6840
485	3	D	7260	681	3	W	11480	1022	3	D	9600
495	3	D	4960	684	3	D	12680	1040	3	D	11100
498	2	D	3160	698	2	D	5640	1043	3	W	11080
499	2	D	3320	780	3	D	2220	1046	1	W	11020
500	3	D	17820	790	2	W	11500	1047	1	W	11240
508	3	D	3360	791	3	W	9460	1050	3	D	35060
511	3	D	10420	793	3	W	12660	1051	3	W	31580
512	2	D	5780	809	2	W	5620	1056	3	D	7420
513	3	W	5500	811	2	D	2540	1061	3	D	4500
515	3	D	8880	817	3	D	11760	1064	2	D	5700
519	3	D	17880	818	2	D	7720	1068	3	D	4640
522	3	D	1580	823	2	W	7080	1073	2	D	2420
524	3	D	6440	825	2	W	20400	1079	3	D	9440
527	3	W	7860	838	3	D	12200	1081	2	D	11620
528	3	W	33720	841	2	D	7420	1082	3	D	8360
533	2	W	11340	842	2	W	3140	1084	3	D	10500
534	2	D	6480	843	3	D	13740	1085	3	D	3240
535	3	D	5280	845	3	D	2840	1090	3	W	10280
538	3	D	11640	846	3	D	15240	1091	3	D	8140
543	2	W	11180	848	2	D	11540	1092	2	W	2440
551	3	D	2900	850	3	W	31460	1095	3	D	13720
560	3	D	3580	855	3	W	9300	1103	3	W	43180
565	3	D	8400	862	3	D	4580	1111	3	W	13420
567	3	D	3920	874	3	W	11280	1116	3	D	7400
570	3	D	1200	876	2	W	12720	1126	3	D	7260
572	3	D	3480	877	2	D	14140	1127	3	D	6240
577	3	D	3580	878	3	D	26700	1129	2	W	13120
580	3	W	8440	879	3	W	11820	1132	3	D	8340
581	3	D	8500	882	3	D	12800	1134	3	D	6160
584	2	D	7560	887	2	D	7980	1140	3	D	9020
586	3	D	4540	895	3	D	8900	1140	3	D	9020
587	3	D	9040	897	3	D	11420	1140	3	W	9240
588	2	D	3360	900	3	W	7160	1140	2	D	7660
591	3	D	2820	904	3	D	17680	1140	3	D	3960
594	3	W	13500	916	3	D	8780	1140	3	D	4100
597	3	W	11560	922	3	D	3660	1140	2	W	11860
599	3	D	19340	924	3	W	14840	1140	3	D	11460
601	3	D	20340	937	3	W	9160	1140	2	W	11240
604	3	D	9600	942	3	W	15960	1140	3	D	1980
609	3	W	13020	945	3	D	1280	1140	3	D	10480
625	2	D	2620	947	3	D	10300	1140	2	D	11600
630	2	W	11460								

Cranberries Delivered	
Wet	768,600
Dry	1,065,420
Color #1	34,460
Color #2	401,080
Color #3	1,398,480
Total pounds	1,834,020
Total number of trucks	243

Note: All weights are in pounds. The time recorded was *minutes after 12:00* A.M. For example, the recorded time of 411 was equivalent to 6:51 A.M.

Exhibit 2 Deliveries of Process Berries, 1970

Day	*Total Deliveries (scale weight in bbls.)*	*Delivered Wet*	*Color No. 1*	*Color No. 2*	*Color No. 3*
9/1–9/19	44,176	54%	6%	72%	22%
9/20	16,014	31	0	44	56
9/21	17,024	39	0	35	65
9/22	16,550	39	0	22	78
9/23	18,340	42	0	22	78
9/24	18,879	41	0	21	79
9/25	18,257	36	0	14	86
9/26	17,905	45	0	10	90
9/27	16,281	42	0	18	82
9/28	13,343	38	0	15	85
9/29	18,717	43	1	11	88
9/30	18,063	59	1	9	90
10/1	18,018	69	1	11	88
10/2	15,195	60	2	18	80
10/3	15,816	60	3	12	85
10/4	16,536	57	5	21	74
10/5	17,304	55	2	26	72
10/6	14,793	46	7	32	61
10/7	13,862	61	3	39	58
10/8	11,786	56	0	36	64
10/9	14,913	54	0	33	67
10/10–12/10	238,413	75	0	22	78
Total barrels	610,040	58	1	25	74