

Reloading of Beet Storage Piles in Alberta, Canada

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The three factories operated by Canadian Sugar Factories Limited, are situated at Raymond, Picture Butte, and Taber, Alberta. An annual production of approximately 430,000 tons is received at sixteen separate locations with distribution as follows:

	Tons
Piles at three factory points—subsequently rehandled	210,000
Piled at six country points—subsequently reloaded	100,000
Received and cut direct from field	120,000
	430,000

Of the three types of machines presently used to recover beets from storage piles are three crawler cranes, two hydraulic overshot loaders, and one hydraulic front-end loader. One of the crawler cranes is a P. and H. and two are Northwests; one of the hydraulic overshot loaders is on a D7 Caterpillar and one on a D8 Caterpillar. The hydraulic front-end loader is a Wagner LD20 Scoopmobile. The crawler cranes are now used only at factory points where shifts are required. The D7, D8, and LD20 reload country piles where 12- to 14-hour shifts handle the recovery.

The reloading program is influenced to some extent by the railway service. Switching, often only once or twice a day, has imposed the use of spur tracks designed to accommodate twenty 55-ton cars. One "clean up" man gleans beets, bills cars, and acts as a general assistant to the machine operator.

In our climate (often 10° to 20° below zero F.) reloading equipment must be designed to withstand rough treatment under low temperatures. Machines operate without incident as long as the weather is fine but troubles increase when the temperature falls below zero.

Crawler Crane

Crawler cranes with clamshell buckets holding approximately one ton are used to recover the majority of beets at factory points. Three such machines handle about 174,000 tons each year at a rate similar to that of the factory slicing capacity. They are very effective working against a frozen pile face; piles occasionally freeze to a depth of 20 to 30 feet. They operate smoothly under most conditions but lack mobility. Economical recovery is limited

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to the boom swing. The bucket crushes and slices some beets which increases pile shrinkage. Major repairs are relatively infrequent. For a number of years, before overhead loaders were available, crawler cranes were used to reload country storage piles.

Overhead Loaders

A D7 Caterpillar tractor equipped with an overshot Athey loader was purchased in 1943. Mechanical breakdowns were numerous and maintenance costs were high. The heavy roller attached to the front of the Caterpillar crushed many beets as the machine went into the pile for a load. This roller also caused the Caterpillar frame to crack.

The Athey unit was abandoned after four campaigns and replaced by a hydraulic overshot loader designed and custom built by Curtis Hoover Limited, Edmonton, Alberta. Several difficulties were experienced during the first fall campaign. Piston rubbers failed, side-arm pins and master links were weak, and the balance wheel retained from the Athey was still smashing beets and causing stress cracks on the tractor frame. These conditions were corrected by using a superior quality rubber, enlarging side-arm pins, reinforcing master links, reducing bucket capacities and by the installation of bucket-tipping cylinders allowing lift arms to be shortened and the balance wheel junked.

On the basis of our experience with the D7, a D8 was purchased during 1948 and equipped with similar but heavier hydraulic attachments. Both machines are still in service.

Front-End Loader

An LD20 Scoopmobile was purchased during the fall of 1954 from Mixermobile Manufacturers Incorporated, Portland, Oregon. The Scoopmobile is a custom-built front-end loader powered by a Waukesha motor, which drives for pneumatic rubber-tired wheels. With a ten-yard scoop and travelling 100 feet from the pile to the railway cars, the Scoopmobile can handle approximately 200 tons of beets per hour.

The LD20 handled about 65,000 tons of beets each fall during 1954 and 1955, most of which were from country storage piles. On one of the initial demonstrations, a mixermobile operated by an experienced man and travelling approximately 50 feet under ideal conditions, loaded eight 55-ton railway cars or about 440 tons in one hour. Our operators handle an average of 200 tons of beets per hour carrying them about 100 feet from pile to car. This rate can be exceeded for short periods.

Mechanical difficulties with the planetary wheel drives, the bucket stabilizer piston rods, and the selector valve of the hydraulic system have resulted in major delays. Most of these problems have been corrected, but a few further adjustments are necessary. To cope with our severely cold weather conditions, we may find it necessary to replace the electrical starting system with a gasoline motor.

Costs

The costs of operation and maintenance are presented in Table 1. Interest and depreciation are omitted because these costs vary greatly with the tonnage handled and the life expectancy of the machine. Because the machine is relatively new, the cost of annual maintenance on the LD20 is low.

Table 1.—1954 Tonnage Handled and Cost per Ton and Maintaining Four Beet-Recovery Units in Alberta.

	D7	D8	LD20	Taber Crawler Crane
Tons loaded	40,000	31,000	65,000	71,288
Tons loaded per hour	122	135	200	92
Cost per ton				
Maintenance	.0442*	.0579*	.0157	.0617*
Operating (labor and material)	.0462	.0452	.0362	.0358
Total	.0904	.1031	.0519	.0975

* Average of three years, 1952—1953—1954.

Conclusions

The crawler crane will continue to be used to recover the majority of piled beets at factory points. With the crawler crane the piling ground maintenance costs are greater than those of the LD20; the costs were less with the crawler crane than with the D7 and D8 equipment.

The hydraulic overshot equipment, now mounted on the D7 and D8 Caterpillar tractors, has been strengthened and altered in some respects from the original design. This equipment performs an essential service in the reloading program, but in the near future, may be replaced by rubber-mounted units. The crushing of beets by the Caterpillar tracks is appreciable but largely unavoidable and must be accepted as part of this system of

handling. Bucket teeth are designed to eliminate digging but if the operator is careless or the grounds uneven, excess dirt will be loaded, thus, increasing freight and processing costs.

The LD20, highly maneuverable and reasonably economical to operate, is well adapted to reload country storage piles. A bucket discharge height of 14 feet was necessary due to the height of the railway car used, which was $12\frac{1}{2}$ feet from the ground level to the top. A smaller Scoopmobile unit, geared to factory slice, would reload beets at a very reasonable rate. Piling grounds must be entirely level before the beets are laid down. Very little if any maintenance is necessary after the beets are reloaded. With road speeds of 16 m.p.h. the LD20 is able to load from several points within a 24-hour period. This tends to ease the railroad switching problem and to facilitate a more rapid recovery of "hot spots."
