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Reduction of Washhouse Sugar Losses through Water Management at Minn-Dak Farmers Cooperative.

ABSTRACT

Sugar enters the washhouse with the dirty sugarbeets. It exits the washhouse in the clean beets, in the dirt, in the wastewater and in small beet pieces mixed with weeds and other vegetative matter (often called trash). In addition, microbes consume some of the sugar in the wash water. The traditional ways of reducing sugar losses in the washhouse include minimizing contact time with the wash water and minimizing damage to sugarbeets in and before entering the washhouse.

In the Red River valley sugarbeets are harvested in October and piled. Slicing campaign runs as late as the following May or June. The sugarbeets are purposely frozen during the winter for long-term storage. Washing frozen beets significantly increases the amount of sugar leached into the wash/flume water relative to washing non-frozen beets, and consequently has changed the way Minn-Dak manages sugar losses in the washhouse.

When processing frozen beets at Minn-Dak, the flume temperature must be maintained at 50°F (10°C) to keep the flume from freezing and to thaw a portion of the beet for slicing. Thawed beet tissue readily exchanges its juice with the flume water resulting in up to 10 percent of the juice being leached into the flume with an equal volume of flume water being absorbed into the tissue. Consequently, a washed, frozen beet can carry more than 10 percent of its weight in flume water into the factory. This compares with less than one percent exchange of juice and flume water in a non-frozen beet.

Minn-Dak found that taking the following steps greatly reduced sugar loss when processing frozen beets. Aggressively controlling microbes in the flume water and keeping the wash/flume water sugar concentration as high as possible.

Microbes feed on the sugar in the flume water, excreting organic acids and other nonsugars. Absorption of non-sugar laden flume water by the beets significantly lowers the purity. Since washed, frozen sugarbeets can carry so much flume water into the factory, it is very important to control microbes. To do this, Minn-Dak keeps the flume pH between 11 and 12 by addition of 8-20 tons daily of calcium oxide. A side benefit of keeping the pH controlled with calcium oxide is good settling of the mud in the flume clarifier.

Because so much flume water comes into the factory with the washed, frozen beets, it makes sense to increase the flume water sugar concentration by minimizing dilution and minimizing wash/flume water leaving the washhouse. To accomplish this, Minn-Dak personnel first conducted an inventory of water additions to the washhouse. Wherever possible, recycled flume water was substituted for condensate or other water coming to the washhouse. Some water uses, such as wash water for trash screens and mud presses, required clean water and substitution with flume water was not possible. Wherever possible, this water was captured after use and sent directly to the sewer, not allowing it to dilute the flume water.

To reduce wash/flume water exiting the washhouse, Minn-Dak uses double belt mud presses. The dirt is thickened in a clarifier. The thickened mud is pumped to an equalization

tank, then to the mud presses. A coagulating polymer is added to the mud in the pipe between the equalization tank and the mud presses. The presses remove about two-thirds of the flume water from the mud. This significantly reduces the flume water sugar loss relative to a mud pond.

By taking these steps, Minn-Dak has been able to significantly increase the sugar concentration and purity of the flume water when processing frozen sugarbeets. At times the flume water has reached over 8 percent sugar and 85 purity. With as much as 10 percent by weight flume water coming in to the factory with the sugarbeets, up to 70 tons of extra sugar is coming into the factory each day.

Ongoing research to improve wash/flume water management includes 1) reclaiming all the beet pieces skinned of the frozen beets, 2) purification of high-sugar flume water, and 3) lowering the sugar loss to the pressed mud.