APPLICATION NOTE: Sugar Beet Processing's Rigorous Demands Met by Electromagnetic and Positive Displacement Flow Meters

Sugar beets provide approximately 55% of all sugar domestically. They are grown and harvested in colder climates and run short 4-7 month campaigns from harvest through production. The process is multi-staged and can be labor intensive as the short season forces production to operate 7 days a week with multiple shifts.

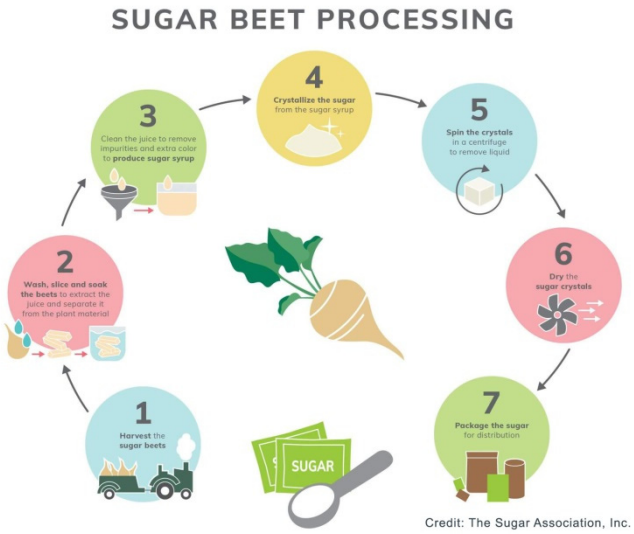

Diagram showing steps in sugar beet processing

After the beets are harvested and delivered to the production facility, the process of transporting into the building and washing can begin. A substantial amount of water is used to transport the beets into the building and through wet hoppers to the washer for deep cleaning to remove leaves, dirt and sand before they are sent to the slicer. In the slicer they are cut into thin strips known as "cossettes" and then sent to a diffuser where hot water is used to extract the sugar, resulting in a sugar-laden water byproduct called "raw juice." The remaining beet pulp is removed from the diffuser and used for animal feed. During these initial stages water usage and wastewater transfer to holding ponds is monitored, tracked, and controlled.

Next the raw juice is sent to a purifier and any additional impurities and contaminants are removed in a multi-stage process. Lime milk (calcium hydroxide) is used to remove impurities, control pH and improve the color of the sugar mixture. The mixture moves onto boilers used to evaporate the water from the juice into thick juice, a concentrated dark syrup made up of liquid sugar and molasses. After the thick juice undergoes the crystallization process, the sugar crystal and molasses mixture moves to a centrifuge where the crystals are separated from the liquid by spinning the mixture against a screen. The molasses passes through the barrier and crystals are left behind. Sugar crystals are conveyed to the granulator for drying while the molasses is transported for use as animal feed.

HIGHLIGHTS

Industry: Industrial
Service: Flow Rate/Total
Fluid: Water/Wastewater, Molasses

Application

Monitor water usage, wastewater transfer, calcium hydroxide injection and molasses transfer throughout the beet processing facility.

Problem

- Tough, wide-ranging applications, environment and intense schedule
- Need an accurate, reliable, low maintenance low flow measurement solution

Solution

- FTI EL1222 Series insertion electromagnetic flow meter
- FTI EL2200 Series flanged, electromagnetic meter
- FTI DC-I Series positive displacement flow meter

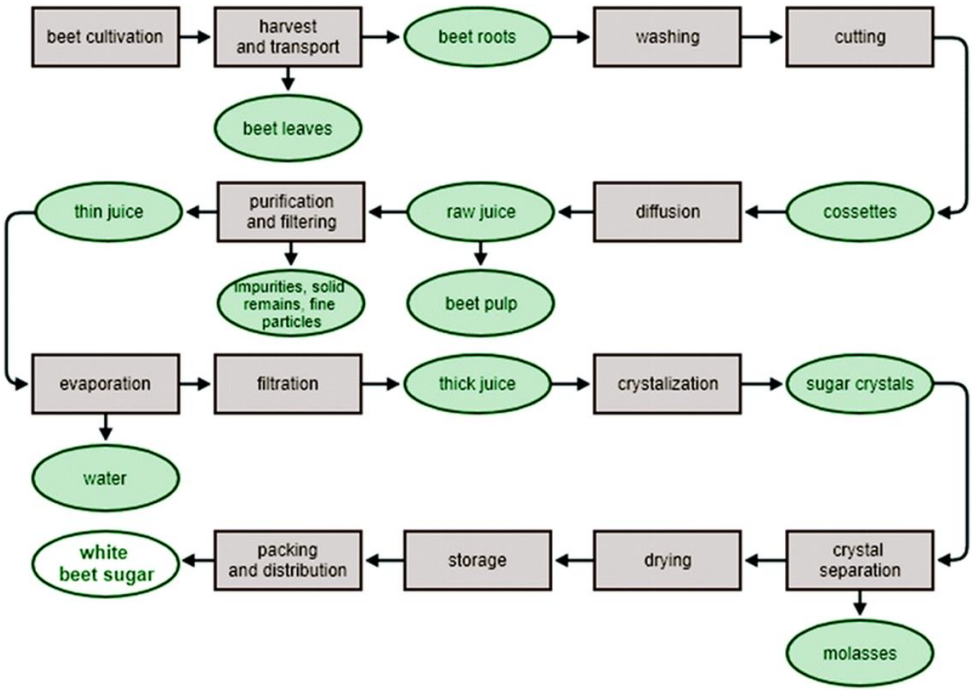

Diagram overview of the sugar beet production process

WIDE RANGE OF TOUGH MONITORING NEEDS

A sugar beet processing plant needed an accurate, reliable, and low maintenance low flow measurement solution for monitoring water usage, wastewater transfer, calcium hydroxide injection, and molasses transfer throughout the facility.

FTI Flow Technology was able to meet this wide array of demanding flow measurement needs throughout the process. An EL1222 insertion electromagnetic flow meter was used during washing, beet transfer, and disposal of water and wastewater. It was chosen for its easy hot-tap installation, ability to be used in various line sizes, and no-moving-parts design. The mag meter's capability to measure conductive liquids accurately and cost-effectively while being low maintenance made it a smart selection. An EL2200 in-line ultrasonic flow meter measured the amount of lime milk injected during the purification stage. Each flow meter was paired with an MC608 A/B magnetic flow transmitter to provide a rate and total local display, and a 4-20mA and Modbus output to integrate with the customer's programmable logic controller (PLC).

Measuring thick juice and molasses can be very challenging due to their relatively high viscosity and potential to contain abrasive particulate. FTI's positive displacement flow meters offer a unique loose geometry designed to measure viscosities up to one million centipoise; also offered with materials of construction to handle small, abrasive particulate in the liquid flow. The FTI DC-I Series positive displacement flow meter was selected due to its durable, bullet-proof design, wide 1000:1 turn down, high repeatability and ease of repair. An FTI IS160-01 Hall effect sensor transmitted the meter's pulse output directly to the customer's PLC.

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