

**Production technology of sugar from sugar beets consists of several procedures in a sugar factory :**

- **Washing of sugar beets**
- **Cutting them**
- **Extraction of sugar from cut beets**
- **Cleaning diffusive juice by defecation , saturation**
- **Cleaning and filtration**
- **Thickening juice by evaporating water**
- **Crystallization of the sugar, washing and spinning crystals of sugar**
- **Drying of crystals of sugar**
- **Ready product**

## **NOTE**

In sugar terms, sugar (sucrose) conversion (inversion) to invert sugar during beet storage and beet processing is considered **sugar lost**. The formation of invert sugar not only decreases the efficiency of the factory but also increases the amounts of some nonsugars, which can contribute to operational difficulties. The invert sugar (as a nonsugar) later decomposes to acids and coloring substances that negatively affect the processing. For simplicity, scientists consider only lactic acid formation as a base for sugar-loss calculations

# **Washing of sugar beets**

**Sugar beets are the raw material from which we produce sugar in Poland. They are picked from fields in the period when they have the biggest amount of sugar. The dug out sugar beets contain a lot of pollution, such as, leaves, stones and remains of sand, which have to be removed.**

# **Beet Washer**

**The three types of beet washers commonly used in sugar factories are the following:**

- **Arm washer**
- **Drum washer**
- **Spray washer**

## **Arm Beet Washer**

**The arm beet washer is an old type of washer, consisting of a cylindrical drum with either a single or a double shaft with multiple arms. The bottom of the tank is perforated. The shaft rotates at about 5 RPM (revolution per minute). Beets enter from one side, are gradually washed by rubbing against one another as they are moved by the arms, and are discharged from the other side. The water enters the washer and moves against the beets; therefore, the water that contacts the clean beets is fresh. Immediately after leaving the washer, the beets are usually sprayed with very clean water. Arm washers cause mechanical damage to beets, so they increase the sugar losses. They also need a lot of maintenance.**

## **Drum Beet Washer**

**The drum washer is the most advanced type of beet washer. The drum rotates on a few track rollers. The rollers are mounted on a steel frame. A drum washer 3 m in diameter and 20 m long can wash about 8000 t beets per day. The drum is usually filled to 40 % of its capacity and rotates at 3 to 5 RPM. A newer drum washer that is 3 m in diameter and 10 m in length with two shafts can wash up to 20000 tons of beets per day.**

# **Spray Beet Washer**

**The spray washer is often used in factories where beets are cleaner upon arrival, usually in areas with a dry climate. This washer is also used as a finishing beet washer in factories where beets are not very clean. The washer consists of several rotating rolls (72 or more) across the length of a bar and a sprayer that constantly sprays high-pressure water to clean the beets. The beets enter at the high end and move toward the low end by the rotating rolls and by gravity.**

## **Flume-water treatment**

**A coarse metal grate (a screen with large openings) is installed at the end of the beet washer to separate water from the beets. The beets are then sprayed with fresh water. Depending on the factory design, the flume water discharged from the beet washer is cleaned in different ways. Some factories have a chip-separation system. In these factories, the flume water is directed to the chip-separation system and then to the wastewater-treatment system. In factories without the chip separator, the flume water is directly sent to the wastewater system.**



## **Mud Separation from Flume Water**

**Used wash water from the beet washer or from the chip separator contains mud (fine and watery soil) as well as dissolved sugar leached from beets during fluming and washing. The flume water is sent to the mud-separation system (mud-settling pond, flume clarifier or mud centrifuge), where the mud, sand, and trash (weeds) residue are separated.**

## **Water Consumption for Beet Fluming and Washing**

**Between 200 and 500 t of water is required to flume and wash 100 t of beet. Most of this water is supplied by various in-factory sources such as condensate, condenser water, and wastewater treatment system. Fluming and washing water are almost free of organic compounds and contain mostly suspended solids. Therefore, these waters are treated in the wastewater system of the factory and are recycled for fluming and washing beets**