

May 21-23, 1952

TREATMENT AND RE-USE OF WATER IN BEET SUGAR MANUFACTURING *

BY GEORGE S. FLEMING

Superintendent, Buckeye Sugar Company, Ottawa, Ohio

Sugar beets are grown by about 80,000 farmers in 22 states and provide about one-fourth of the sugar consumed in the United States. The 19 beet sugar processing companies own 80 factories in 16 states, having a daily slicing capacity of 148,350 tons of beets. Colorado leads the field in the number of factories with 16, and Michigan is second with 13 factories. However, California, with 11 factories, has a much larger daily capacity in tons of beets sliced.

In 1950, 924,000 acres of beets were harvested in this country with an average yield of 14.2 tons per acre, which gave 37,383,000 100-lb. bags of sugar.

Our Buckeye Sugar Company plant in Ottawa is one of three in Ohio, the other two being in Fremont and Findlay. It has a slicing capacity of 1,000 tons of beets per day.

Extraction Process

The process of extracting sugar from beets is essentially chemical. The beets are first piled over a flume and then floated into the plant, where they are washed, picked over, and raised by an elevator to a weighing hopper. They are then dumped into slicers, where they are cut into V-shaped ribbons called "cossettes." These cossettes are then fed into the diffusion battery, consisting of 14 bottom-dump cells or vats holding approximately 3 tons. Hot water is introduced into the cell that has the most nearly exhausted cossettes and passes progressively through the

battery to the cell containing the fresh cossettes, where it is drawn off as a diffusion juice. Through this counter-current flow, the fresh water comes in contact with the cossettes with the lowest sugar content and serves to remove the greatest amount of sugar possible from the beet. After all the sugar has been extracted from the cossettes, they are dumped into the battery pulp pit and pumped to pulp screens. The screened pulp is pressed and then dried in rotary driers to produce a high-grade cattle feed.

The diffusion juice then enters the first carbonation tank, where milk of lime is added, followed by the addition of carbon dioxide gas. The combination of lime and carbon dioxide forms calcium carbonate, an insoluble precipitate, which removes the impurities from the juice. The mixture is then overflowed to a 5-tray thickener. The sludge is pumped from mud trays to vacuum filters, where the washed lime cake is diluted and pumped to a lagoon (see Figure 1). The clear effluent juice is then filtered through plate and frame presses and sent to a second carbonation unit, where carbon dioxide is again added to precipitate any of the lime remaining in the press juice. After another filtering, sulfur dioxide gas is added to adjust the pH and alkalinity. After the addition of SO₂ the juice is filtered a third time and goes to evaporators, where a heavy syrup containing 50 to 60 per cent sugar is produced.

The thick syrup goes to the melters, where melted sugar is added, and then pumped through another set of filters

* Presented at 26th Annual Meeting, Ohio Sewage and Industrial Wastes Treatment Conf.; Toledo, Ohio; May 21-23, 1952.