Kemps Ice Cream

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Company Background

Kemps LLC is a dairy manufacturing company that was founded in 1914 and is known for making high quality dairy products. The ice cream plant, located in Rochester, MN employs 180 people and produces 700,000 gallons of ice cream, frozen yogurt, and frozen novelties per week. The plant brings in ingredients such as sugar and cream from suppliers in the upper Midwest to make their ice cream. Despite increased competition from national brands, Kemps remains a top dairy brand in the Minneapolis-St. Paul metropolitan area, as well as in other areas of the upper Midwest.

"This was my first real-world engineering experience and it was fascinating for me to see how I learned to thrive in an industrial environment. After coming up with my own experiments to collect data and to test my theories throughout the plant, I now have a new appreciation for complex piping systems – and for the ice cream I purchase at the store!" ~AH

Project Background

The purpose of this internship was to study the ice cream making process to determine the main causes of waste in the plant and to make process change recommendations in order to reduce the waste going down the drain. Recommendations were made to improve the company's product yield, which also helps to reduce its impact on the environment. Cost-benefit analyses were also done to determine the impact of each recommended process change.

Incentives To Change

One area of focus at the Kemps ice cream plant is the amount of ice cream mix that goes down the drain as waste. This waste represents a loss for the company on three levels – lost revenue from product that could be sold, labor costs, and increased wastewater treatment fees resulting from dairy product going down the drain.

Over the years, Kemps ice cream plant has experienced high biochemical oxygen demand (BOD) levels in its wastewater, prompting the wastewater treatment facility in the city of Rochester to impose fines in response to the increased load on the facility. By being able to determine the main causes of this waste, Kemps can explore options to reduce it, thereby increasing product yield and revenue while minimizing wastewater fees and environmental impact.

Solutions

Add a Sugar Pump in the Raw Receiving Area

Liquid sugars such as corn syrup, fructose, and liquid sucrose are unloaded and brought into the receiving

tanks by a pump located on the back of each sugar truck. This pump is about four feet above the ground and pumps sugars through a 20 ft. receiving hose before they reach the 11 ft. vertical sugar receiving lines. Once the truck is empty, sugar remains in the receiving hose that cannot be pumped into the receiving lines. Water cannot be used to rinse the sugar down because it promotes bacterial growth, so the sugar in the hose is washed down and goes to waste. By installing a new sugar pump in the receiving bay, approximately 10 gallons of sugar product will be saved from each sugar shipment by eliminating the need for a receiving hose at the bottom of the unloading process. In the new process, the hose connecting the truck to the pump can be physically lifted, allowing all the sugar load to enter the system piping and eventually make its way into the sugar receiving tanks.

Replace Compressed Air Drains with Zero-Loss Drains

Currently, the plant uses four types of drains to remove moisture from the compressed air system. These include float drains, timed drains, continuously open drains, and a manually opened drain. The float drains are a basic type of zero-loss drain since they use a level sensor to ensure that only water is released from the drains. The other drains all release some amount of compressed air which takes electricity to produce. If this compressed air is not being used to do useful work in the plant and instead leaks out of an open drain, it represents a loss in the system. Therefore, it is recommended that all drains, except for the two float drains, should be replaced with zero-loss air drains.

Calibrate Flow Meters and Tank Gauges

Of all of the tanks and silos in the ice cream plant, only the two main blend tanks and the three flow meters leading to them are consistently calibrated. The gauges and other flow meters on the raw tanks, pasteurized tanks, and vat pasteurizers are not regularly calibrated, while the flavor tanks do not have any gauges. This creates a problem for the company because the tank inventories taken on a daily basis are based on unreliable information.

Therefore, it is recommended to continue to calibrate tank gauges and flow meters and to set up a schedule for an annual calibration. Though a full economic analysis of the benefits of tank and meter calibration is not possible, the data collected from correctly calibrated equipment is useful to the plant in multiple ways. First, data collected

for loss reports and product reports will be more accurate, allowing company resources to be used more efficiently. Additionally, the plant will be able to use the tank inventory values to double-check the amounts of product brought in by trucks, ensuring the company only pays for the amount of product that is actually received.

Recommendation	Annual Reduction	Annual Savings	Status
Addition of Sugar Pump in the Truck Bay	112,000 lb liquid sugars	$22,600	Recommended
Replace Air Compressor Drains with Zero-Loss Drains	256,000 kWh	$24,300	Recommended
Calibrate Tank Gauges and Flow Meters	Unknown	Unknown	Recommended