ANDERSON ERICKSON DAIRY - WATER

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COMPANY PROFILE:

Anderson Erickson (AE) Dairy is a distinctly Iowan dairy company. Founded in Des Moines, Iowa, in the year 1930, the corporation's headquarters currently retains over 400 employees. AE Dairy produces a variety of high-quality dairy products, including milks, yogurts, juices, sour creams, and other seasonal items. Their products are almost exclusively distributed within Iowa in an effort to reduce fuel emissions, and the company partners with MidAmerican's Renewable Advantage Program to strive for carbon neutrality. For the past two years, AE Dairy has requested the help of the DNR's Pollution Prevention services for both water usage and shrink reduction.

PROJECT BACKGROUND

Throughout the summer, the intern aimed to reduce the environmental impact of AE Dairy's water usage while lowering costs. Based on collected baseline data, approximately 70 percent of AE Dairy's water costs come from sanitation processes. Tank cleanings are the largest users, consuming 45 percent of water used at the plant. To combat this, the intern tested the use of a turbidity sensor on a Clean-In-Place (CIP) skid and rotary spray heads in place of the tanks' stationary spray balls. The intern also discovered savings opportunities at the plant's rinse stations, which clean containers of product spillage from the filling process.

INCENTIVES TO CHANGE

Anderson Erickson Dairy upholds a reputation as an Iowa-local dairy company with a close connection to farmers and the land. Their motto, "ridiculously high standards," refers to the high quality of milk used in every one of their dairy products. In addition to their product standards, the company strives to be responsible stewards of the environment. AE Dairy is in the pursuit of 100 percent renewable energy and aims to transition to fully sustainable packaging. The company's next steps towards sustainability include the reduction of their water usage at the source while reducing costs in the process.

RESULTS

Product Rinse Modifications

Products packaged in bottles and cartons are transported on conveyors and pass beneath product rinses to remove any milk residue from the containers. There are numerous rinse stations throughout production and each presented opportunity to reduce excess water usage. Rinses are not all set up the same way, so recommendations were dependent on the current mechanics of each station. For many, reduced flow rates from the nozzles were found to still achieve the same level of clean while using less water. Positioning of the nozzles were also adjusted to maximize rinse effectiveness. Implementation of a sensor to shut off water flow during pauses in production would eliminate needless water usage. In combination, individualized updates to each station will save water and electricity, and improve operational efficiency. Work orders for each station upgrade have been submitted and are awaiting completion.

CIP Turbidity Sensors

The CIP system at AE Dairy consists of four timed stages. First, fresh water is flushed through the system to remove any remaining product (a "pre-rinse"). Then a wash solution is recirculated through the system to kill bacteria and remove protein buildups. Fresh water is then flushed through the system and lastly a sanitizing solution is used. Because the length of the rinse stages are timed rather than based on reaching a fully clean state, excess water is frequently used.

Turbidity sensors measure the quantity of suspended particles within a fluid, and could improve the water efficiency of the pre-rinse stage by automatically ending the pre-rinse when all remaining milk product is removed from the rinse stream. However, many variables exist that could impact their effectiveness, including the type of product being rinsed. Extensive testing was conducted on the effectiveness of turbidity sensors across all eight of the facility's CIP skids (which hold and administer the various chemicals necessary throughout the process). Based on this testing, installation of turbidity sensors is recommended on seven of the eight CIP skids. Installation is underway, with one skid completed and implementation instructions in place for the remaining six skids.

Rotary Spray Heads

AE Dairy has 75 tanks throughout its plant. When these tanks get emptied of a product or chemical, a CIP process occurs to prepare it for refilling. During this process, water and cleaning chemicals are sprayed throughout the tank using metal balls with many small holes, called spray balls. AE's current spray balls are stationary, spraying straight streams of water towards the walls of the tank, and the parts of the tank that do not receive direct water contact are cleaned by the falling water. The stationary spray balls are also prone to clogging from more viscous products. Last year's P2 intern recommended replacing these spray balls with mobile rotary spray heads, which provide a much greater water impact on all sides of the tank and reduce the volume of water needed for cleaning.

Extensive individualized testing was needed to evaluate the effectiveness of this change within the many different tank and product environments. The testing data collected on small- and medium-sized tanks indicated an average water usage reduction of 23 percent per tank and significantly higher levels of cleaning reliability. Implementation will include the purchase and installation of additional spray balls for designated tanks

along with all necessary cleaning program modifications. It will also include ongoing testing to verify compatibility with larger tanks, where more surface area cleaning coverage is required.

Filler CIP Modifications

AE's filler machines – the equipment that fill bottles and jugs with milk product – utilize a programmed CIP cycle for cleaning and sanitizing after each product run. During the internship it was observed that the timed CIP cycle was overflowing one of the filler's product holding bowls and all excess water was running to the ground before the timed cycle switched to the next step. A simple programming modification reduced the timed cycle to the correct amount of time it takes to fill the bowl, saving water and improving CIP process efficiency.

ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
PRODUCT RINSE MODIFICATIONS	$19,588	1,144,521 gallons 44,220 kWh 281 therms	IN PROGRESS
CIP TURBIDITY SENSORS	$7,954	611,615 gallons	RECOMMENDED
ROTARY SPRAY HEADS	$5,357	411,861 gallons	RECOMMENDED
FILLER CIP MODIFICATIONS	$285	21,920 gallons	IN PROGRESS