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BURKE MARKETING CORPORATION – HORMEL FOODS

NEVADA

COMPANY PROFILE:

Burke, a subsidiary of Hormel, manufactures fully-cooked meat products with many applications, including restaurant or cafeteria service, and at-home cooking. Burke is headquartered in Nevada, Iowa, and employs about 500 people. The facility uses two plants to produce over 1,200 products. Production starts when raw meat is received. The raw meat is ground, then spices are added, and the meat is cut into the correct shape. The meat is then cooked on one of five oven lines. After this, the meat is frozen, bagged, boxed, labeled, and shipped.

PROJECT BACKGROUND

The plant utilizes a wastewater treatment facility to pre-treat wastewater, which can take two routes. First, the greasy water generated from the cooking process is pumped to a grease decanting tank. The wastewater is held, grease and water separate, and the water can be drained and undergo the facility's treatment. Second, water that's wasted throughout the plant goes directly to the treatment facility. In treatment, wastewater undergoes solids removal, pH treatment, coagulant addition, and aeration. This separates, binds, and removes contaminants. With these treatment processes, the plant struggles to reduce Carbonaceous Biochemical Oxygen Demand (cBOD) and stay below the city of Nevada's limits. cBOD is a measure of the oxygen required to remove organic pollution from water.

INCENTIVES TO CHANGE

The plant's discharged, treated water regularly exceeds the city's cBOD limits. cBOD comes from complex organic materials, like sugar or lard, breaking down into carbon dioxide and water. The amount of organic matter processed by the plant's wastewater treatment results in the opportunity for excess cBOD being discharged. Wastewater is collected and a composite sample is tested daily. Composite wastewater samples make it difficult to pinpoint specific sources of high contaminants. cBOD exceedances represent a significant monetary cost for the Burke plant. Reduction of these would represent both significant savings and positive environmental impact. cBOD reduction means reduction of organic waste, decreased energy use from treatment, improved water quality, and increased plant sustainability.

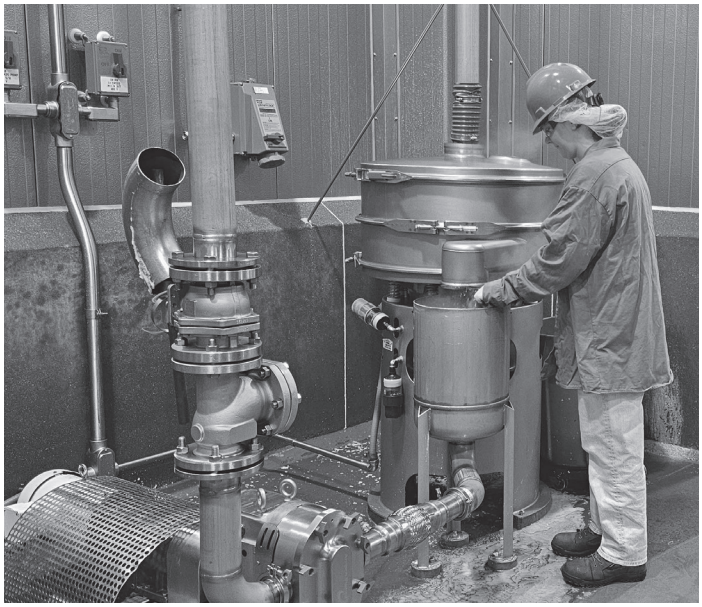
RESULTS

This project consisted of two parts. First was pinpointing the source of increased cBOD. To determine trends from the plant's historical wastewater data, the daily cBOD and oil/grease data were analyzed to determine the number and magnitude of exceedances per month. Additionally, for the last two years, the daily cBOD measurements were plotted against the pounds of product, pounds of meat, and pounds of spice produced. The graphs were created with data from all the products, and then broken down by product type (beef, pork, poultry, and mix). This suggested no correlation between product type, pounds of product, pounds of meat, or pounds of spice with excess cBOD. For each month, the daily cBOD was also plotted against the daily Total Suspended Solids (TSS) and Total Kjeldahl Nitrogen (TKN). These showed much stronger correlations with cBOD, so it's possible that treating TKN/TSS will reduce cBOD.

Specific product samples needed to be analyzed to pinpoint the source of cBOD. To do this, the greasy water captured directly from oven lines was sampled. Each sample was tested

for TSS, TKN, and chemical oxygen demand (COD). COD is similar to cBOD, but they differ in sources. To account for the differences in cBOD and COD, the plant's historical COD data was correlated with cBOD data. Fifty-four products were sampled (13 beef, 27 pork, eight mix, six poultry). Significant examination of each product was done. For each product, an ingredients list was compiled, and product yield was analyzed. This information was used to categorize the sampled products. These categories helped determine what products/ingredients were contributing to excess cBOD. The test results show that there are a few product-based cBOD sources. These sources include products with a high cooking yield, products with water as an ingredient, Italian seasoning blends, pork products, and the ingredients sodium phosphate and corn syrup solids. The plant's decanting operation is a known source of excess cBOD, but is not product-based.

The second part of this project was determining methods to remove excess cBOD from the plant's wastewater. This was done through conversations with the plant's operators, examination of the current wastewater treatment facility, and outside research. cBOD represents the amount of substances in wastewater that are oxidizable. This means they consume oxygen and cause oxygen demand. To remove BOD, the oxidizable substances in the water must be oxidized with oxygen that's added to the water.



Hydrogen Peroxide Addition

The most efficient way to remove cBOD is adding an oxidizing chemical directly into the wastewater. One of the least expensive and strongest oxidizers is hydrogen peroxide (H2O2). H2O2 immediately releases dissolved oxygen into water and decomposes completely into hydrogen and oxygen, so it does not generate by-products. H2O2 completely oxidizes cBOD, and reduces TSS by about 10 percent and TKN by about 20 percent. The best location for injection is the pipe that takes the decanted water to the plant's wastewater treatment facility. The next-best location is directly into the effluent tank. Adding to the decanted water gives operators more control over the dosing effects. Operators would require minimal training, and the process would require minimal monitoring, because it is similar to the plant's current chemical addition processes. A few steps must take place before implementation. Communication must happen with the city of Nevada to ensure that adding H2O2 into the wastewater stream follows regulations. H2O2 must be tested on a large scale to ensure it works in practice at the site. If it works in practice, then the cost from exceedances would be eliminated. The cost from surcharges will decrease proportionally to the amount of cBOD, TSS, and TKN removed. Safety information sheets of the specific H2O2 purchased must be obtained.

ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
HYDROGEN PEROXIDE ADDITION	$39,556	56,890 lbs. cBOD Exceeded 27,612 lbs. TSS Exceeded 43 lbs. TKN Exceeded 97,940 lbs. cBOD Surcharged 3,763 lbs. TSS Surcharged 83 lbs. TKN Surcharged	RECOMMENDED