JBS USA, LLC

MARSHALLTOWN

COMPANY PROFILE

JBS USA, LLC is an American food processing company and a subsidiary of JBS S. A., one the world's leading producers of fresh beef, pork, and lamb products and byproducts. Headquartered in Greeley, Colorado, JBS USA has 40 processing facilities across the country. In 2020, the company exceeded $50 billion in sales and employed more than 230,000 people. In its Marshalltown, Iowa, pork facility, JBS processes 20,000 to 21,000 head per day with more than 2,000 employees.

Connor Nygaard

Major: Mechanical Engineering
School: Iowa State University

PROJECT BACKGROUND

The goal of this internship was to accurately map utility usage (electric, natural gas, and water) in the Rendering Department. JBS' Rendering Department produces lard, choice white grease, blood meal, and bone meal. Utility usage in this area is highly impacted by the upstream production processes. JBS sought to have the intern develop a dynamic, interactive calculator model using the baseline data that could allow for staff to input theoretical adjustments to run times, equipment, and other variables to see the resulting impacts on Rendering utility usage. Based on results of the baseline analysis, the intern worked to identify opportunities for utility savings and develop recommendations to improve conservation and efficiency.

INCENTIVES TO CHANGE

JBS' Marshalltown plant goal is to reduce the overall utility usage in the Rendering Department by 10 percent. Establishing the baseline is a critical first step to prioritizing opportunities and quantifying progress in meeting the 10 percent reduction. This plant goal is a part of a corporate-level effort by JBS to achieve net-zero greenhouse gas (GHG) emissions at each of their processing plants by 2040. In an effort to reach this goal, the company is investing more than $1 billion USD in emissions reduction projects across their facilities.

RESULTS

Development of Utility Usage Baseline: JBS Marshalltown recognized the importance of understanding their Rendering Department's utility usage at the equipment level, to strategically target increased utility efficiencies. Benchmarking utility usage in any facility operation is a valuable analysis, but in rendering operations it can be a particularly complex undertaking as multiple pieces of equipment work in harmony under heavy load. Operation of the system is interconnected – changing one piece of equipment has the potential to impact the performance of numerous other pieces. It is important to have an accurate measure of both the utility usage and the operating parameters of each individual piece of equipment, and how each one can vary, to measure true usage and cost.

Utilities included in the baseline analysis included electricity, water, steam, and natural gas. To obtain these usages, data was compiled using existing equipment records and company-available data, along with intern-compiled equipment records and measured or calculated usages. A variety of monitoring equipment was utilized to aid in data collection including data loggers, non-contact temperature scanners, and a portable flow meter. All collected data was further analyzed and various calculations were completed to assemble the completed baseline.

The baseline of utility usage in the rendering area, provides the necessary data for critical decision-making moving forward. The largest utility users can be identified and prioritized for further analysis of possible savings opportunities. Benchmarking will also allow for quicker identification of inefficiencies and the enhancement of maintenance procedures to optimize system performance. Immediate

valuation of the baseline deliverable is based on the intern's time invested in the study itself, but the true value is projected to be realized in subsequent projects and savings, stemming from the analysis results.

Utility Usage Calculator: Upon completing the Rendering Department baseline, a comprehensive calculator model was constructed to allow JBS to make theoretical adjustments to run times, equipment specs, and other variables, and project how changes could affect overall utility usage. The compiled baseline data was built into the calculator, along with current utility rates. Built in Excel, it utilizes numerous sheets to maximize user customizability.

The Tutorial Sheet includes all the essential information to navigate the calculator and add or remove equipment. The Equipment List Sheet includes the related data, along with an array of sorting features. Various utility sheets house all the equipment specs from which adjustments can be made. Finally, the Rates and Calculations Sheet contains utility rates and calculations that may be updated as necessary.

The sorting tools built into the calculator model allow the user to instantly categorize equipment by location, utility, and other sort parameters. This will enable JBS to quickly find high utility users or pinpoint equipment that may have unnecessary consumption. The calculator can be used to make theoretical changes to equipment specs, run times, and flow rates to determine combinations that will optimize consumption.

In conjunction with the populated calculator, a calculator template was also developed that follows the same build format. JBS can use this template across other department and plant locations to document utility usage, add in the resulting data, and generate similar model benefits. This calculator was shared with other production departments at the Marshalltown facility and will be shared with other JBS plant locations in the future.

Air-Cooled Condenser: The shell and tube water-cooled condenser that cools the rendering cooker is the largest water user in the plant. Hot water generated by the condenser is used throughout the plant for numerous cleaning processes. When more hot water is generated beyond what can be used, the excess gets directed to wastewater. It is recommended that an air-cooled condenser be installed to assist the current water-cooled condenser. When the water-cooled system generates enough hot water to fulfill the cleaning process demand, the system will switch to the air-cooled condenser, eliminating the excess water usage. A quote for the air-cooled condenser system has been obtained and implementation is being assessed by Rendering Department staff and plant engineers.

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
DEVELOPMENT OF UTILITY USAGE BASELINE	$10,500 (one-time)	—	IMPLEMENTED
UTILITY USAGE CALCULATOR-DEVELOPMENT	$3,000 (one-time)	—	IMPLEMENTED
UTILITY USAGE CALCULATOR-APPLICATION	$27,500	144,522 kWh 34,412 therms 4,895,201 gallons	RECOMMENDED
AIR-COOLED CONDENSER	$220,320	81,600,000 gallons	RECOMMENDED