



## ASH RAMESH

**SCHOOL:** The University of Iowa  
**MAJOR:** Chemical Engineering

## JBS SWIFT PORK



OTTUMWA

### COMPANY PROFILE:

**JBS was founded in 1953 and is the largest protein producer in the world. The JBS plant in Ottumwa, Iowa, is a major contributor to this title, harvesting 21,000 hogs every day and employing more than 2,500 people. The plant operates five days a week with a three-shift schedule, two production shifts followed by a sanitation shift. During peak season, additional Saturdays will be scheduled to meet production demands. JBS Ottumwa is dedicated to producing the highest quality product for its customers and reducing their environmental footprint.**

### PROJECT BACKGROUND

The main focus of this project was to identify areas for water reduction and water reuse without hindering the operations of the plant. The intern was also tasked with updating water usage data within the plant and establishing a baseline to prioritize improvement opportunities. The intern conducted lab studies and audits to collect data. Vendors and staff were contacted to further explore the viability of the recommendations from an economic and environmental standpoint.

### INCENTIVES TO CHANGE

The large production capabilities of the Ottumwa plant mean large utility usage and potential environmental impact. A reduction in the plant's utility usage will save a significant amount of money and allow JBS to give more back to their community. JBS is committed to reducing their environmental footprint and is

pursuing several long-term goals. These goals include converting organic waste materials into energy, stewarding natural resources on supplier and company owned farms, and reducing water usage by 15 percent. The company is also investing \$100 million in research and development projects to assist its environmental efforts.

### RESULTS

#### Air Cooled Condenser

The current heat exchanger that is used to cool the vapors from the rendering process and heats the water for sanitation is inefficient. The heat exchanger requires more water than the plant can hold in their 140° F water tanks. The extra water is treated for chlorine and sent to the river with no further use in the plant. The installation of an air-cooled condenser in parallel with the heat exchanger will allow the plant to cool the rendering vapors without making additional 140° F water once the sanitation tanks are full. This will save the plant from purchasing water from the city as well as using sodium bisulfite to dechlorinate the water. A vendor has been contacted and is working with staff to determine the specifications for the air-cooled condenser's installation.

#### Rotary Drum and Screen Compactors

The feed being sent to the rendering cooker has a higher than ideal moisture content. This excess water requires the cooker to use more steam and time to render products. The current dewatering screens in place clog easily due to the high concentration of fats, oils, and grease within the feed. The installation of an internally fed rotary drum followed by two screen compactors will significantly reduce the moisture content of the feed. The reduction will also reduce the amount of rendering vapors being produced resulting in the reduction of 140° F water. A quote for this recommendation has been obtained and forwarded to management.



### Reuse Effluent Water in Press

The sludge press is used to remove solids from the wastewater before it can be sent to the river. The press requires constant cleaning to avoid buildup. The press has a belt spray locked in one position, as well as a free, movable hose used for cleaning all other parts of the press. The press is not part of the production floor and therefore does not need to be food grade. It is recommended to use the effluent water produced from the wastewater process instead of 140° F water to clean it, reducing the plant's water usage. An existing pump has been used to reroute effluent water to these two cleaning applications and a ball valve has been installed for pressure control.

### Automate Hair Hycor

The hair hydrolyzer heats removed hog hair and turns it into sellable animal feed. For optimal efficiency the hair must be dry when entering the hydrolyzer. To do this the plant has a dewatering Hycor that removes excess water. There are two water lines with several nozzles that constantly spray the screens of the Hycor to prevent hair buildup from reducing its efficiency. The lines are both active and operated manually. Installing solenoid ball valves to these lines will allow for the automation of these lines to balance the Hycor's efficiency as well as simultaneously reducing water usage. This project has been approved by management and is implemented.

### Sanitation Equipment

Sanitation workers often sweep discarded meat with a hose instead of with a broom. This meat and water are then loaded into barrels with shovels and sent to the rendering department. This causes a high moisture content for the rendering feed



causing the cooker to require more steam. Using sifting shovels to scoop the meat will prevent extra water from being added to the rendering barrels. One shovel was purchased for testing purposes, management has approved more. Additionally, several workers don't use the correct nozzles on their hoses which causes an increase in water demand. Permanently attached nozzles will greatly reduce water use. Management is working on approval for this project.

### Repair Equipment Wash Leaks

Workers use 180° F water stations to sanitize equipment. Due to high usage, these stations are prone to leaking. Because these stations use 180° F water, the leaks cost the plant both the cost of the and the cost of the steam used to heat that water. This makes fixing these leaks a priority. Three leaking stations have been identified and reported to maintenance to be repaired.

## ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
AIR COOLED CONDENSER	\$119,373	28,822,575 gallons 55,157 lbs. sodium bisulfite 31,155 kWh	RECOMMENDED
ROTARY DRUM AND SCREEN COMPACTORS	\$138,445	348,614 therms 3,583,893 gallons 6,858 lbs. sodium bisulfite	RECOMMENDED
REUSE EFFLUENT WATER IN PRESS	\$29,099	3,472,464 gallons	IMPLEMENTED
AUTOMATE HAIR HYCOR	\$35,543	4,241,355 gallons	IMPLEMENTED
SANITATION EQUIPMENT	\$55,926	3,439 therms 6,527,980 gallons	IN PROGRESS
REPAIR EQUIPMENT WASH LEAKS	\$15,533	8,140 therms 1,508,472 gallons	IN PROGRESS