JBS SWIFT PORK

COMPANY PROFILE:

JBS USA, LLC is one of the world's largest food companies. Founded in 1953, JBS has built a robust supply chain network around the globe, allowing it to obtain raw materials from different regions and achieve an efficient distribution of its product. One of the more prominent branches of this network is the JBS pork facility in Ottumwa, Iowa. This facility is known for its large pork processing and distribution operations, processing more than 21,000 hogs per day. The Ottumwa facility operates three shifts and employs more than 2,000 workers.

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MINOR: Chemistry, Business

PROJECT BACKGROUND

Large equipment at the plant such as air compressors, heavy equipment motors, and boilers generate a significant amount of heat. With three shifts, this equipment is constantly running. The project's main focus was to assess heat recovery and reuse opportunities throughout the plant. The intern evaluated ways to supply additional heat to the plant during the colder months of the year from other waste heat outputs such as heat exchangers, compressors, and cooling systems.

INCENTIVES TO CHANGE

JBS USA puts an emphasis on sustainable practices to reduce its environmental footprint and is pursuing a significant list of goals, using 2019 as a baseline. Its goals include reducing greenhouse gases and emissions 30 percent by 2030; and reaching 100 percent renewable electricity, and lowering water usage 15 percent by 2040. The company is investing $100 million in research and development projects, assisting the efforts of its producers and suppliers to also reduce emissions. Finally, JBS has set a goal to reach net-zero greenhouse gas emissions by 2040, being the first meat and poultry company to do so.

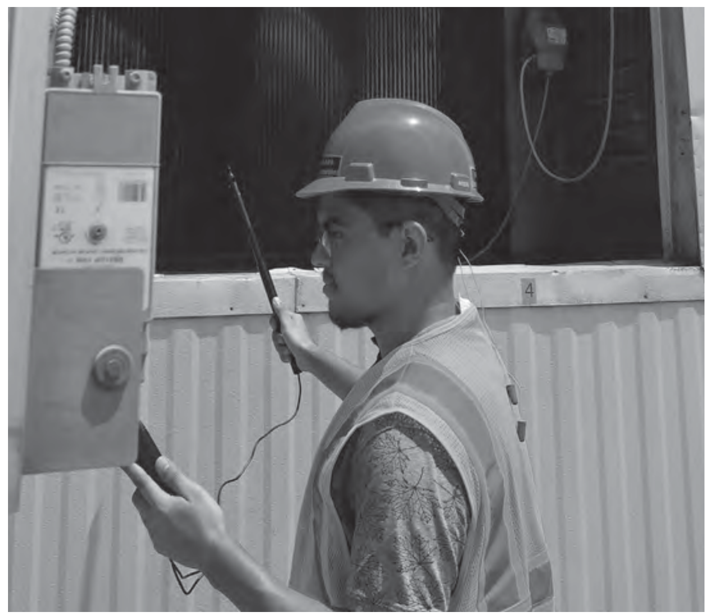
RESULTS

Double Pipe Heat Exchanger & Unit Heater: The blood dryer in the blood room is currently sending blast-air at 165°F into an air scrubber located in the rendering department. The implementation of a double pipe heat exchanger would allow for the reduction of the blast-air's temperature from 165° to 122°F. By pumping recycled water from the cooler or chillers through an outer 24-inch pipe that surrounds the core pipe, the scrubber chemicals would work more effectively. Following the heat exchanger, this hot water then could be pumped and redirected to a unit heater, located in the barns, to provide additional heating. Further research may be needed to determine the optimal area to place this heating unit.

Shell and Tube Heat Exchanger: The Butina stunners currently operate by using a large amount of carbon dioxide that is heated from liquid to a gas state with an electric heater. The current electric cost can be avoided by utilizing excess 140°F water that occurs in the production process. Installation of the heat exchanger and the necessary piping to deliver 140°F water to the heat exchanger could be installed by JBS maintenance staff. It is also recommended to leave the electric heater in place to act as an alternative route for carbon dioxide in the scenario where 140°F water cannot be delivered due to an unforeseen event. Once quotes are approved by management, maintenance can proceed with the implementation of this recommendation.

Air Source Heat Pump/CO_2 Heat Recovery: An air source heat pump can both heat and cool the intake river water that JBS uses for its internal operations. During the winter, air can be taken in and compressed in order to increase its temperature and pressure. The hot air could then be used to increase water temperature. During the summer, intake air can be cooled via a reverse valve in the air source heat pump that would decrease both the air's pressure and temperature. As an alternative to an air source heat pump, a CO_2 loop for heat recovery could be utilized where CO_2 is constantly evaporated and condensed to respectively absorb and release a heat load. This heat load would come from a heat exchanging fluid used in a cooling process and released into a heat exchanging fluid used in a heating process.

Air Compressor Exhaust Ducting: The air compressors were also assessed as a potential source of heat recovery. Up to 90 percent of heat generated from air compressors can be reclaimed and used for other applications, such as space heating. In order to provide additional heating for JBS's loading zone during the winter, a ventilation system could tap directly into the air compressor's ventilation to provide heat. This would allow JBS to provide a more comfortable working zone while saving natural gas. This same proposition could be applied to the gas dryers. These dryers are connected to ductwork that delivers the excess heat outside of the plant. The exit of this ductwork is located on the rooftop above the main offices. This exit could be redirected to deliver heat to the main offices. In both areas, a damper should be installed to redirect any excess heat. Once approved by management, the implementation of this recommendation could be completed by a contractor who is already familiar with the air compressor area of the plant.



ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
DOUBLE PIPE HEAT EXCHANGER & UNIT HEATER	$13,900	3,650,000 gallons 32,352 kWh	RECOMMENDED
SHELL AND TUBE HEAT EXCHANGER	$23,590	3,500,000 gallons 141,556 kWh	RECOMMENDED
AIR SOURCE HEAT PUMP/ CO_2 HEAT RECOVERY	Further Analysis Needed	Further Analysis Needed	RECOMMENDED
AIR COMPRESSOR EXHAUST DUCTING	$21,195	51,322 therms	RECOMMENDED