

SMITHFIELD FOODS, INC.

SIOUX CITY



COLE CARPENTER
MECHANICAL ENGINEERING
IOWA STATE UNIVERSITY

COMPANY PROFILE

Founded in 1936 in Smithfield, Virginia, Smithfield Foods, Inc. is a global food company and the world's largest pork processor and hog producer. The company has more than 50 locations on two continents, and more than 54,000 employees. With eight locations in Iowa, Smithfield's Sioux City plant is part of Smithfield's Packaged Meats division and produces BBQ meats and pre-cooked ribs. This facility can produce 270 different products and employs 610 people. Previously owned by Curly's, the plant has continued to grow and produce "Good food. Responsibly."

PROJECT BACKGROUND

Smithfield Sioux City is actively exploring ways to improve environmental performance. One focus area for this project is the detection and maintenance of compressed air leaks in the facility. Proper means of detecting and repairing leaks were investigated and implemented. Grease recovery from Smithfield's wastewater treatment pit was also evaluated. Recovery and storage are priorities for this facility, and were the emphasis of the project. Reuse of water from a reverse osmosis (RO) system for plant water purification was also evaluated.

INCENTIVES TO CHANGE

As an ISO 14001 certified facility, Smithfield Sioux City is committed to implementing changes to improve plant efficiency and reduce its environmental footprint. Several environmental incentives drive Smithfield to practice continuous improvement methodologies, such as their goals of 5 percent energy reduction and 10 percent water reduction by 2020, from a 2014 baseline. These goals provided incentive for the compressed air system leak detection survey and exploration of reuse opportunities of the RO water respectively. Improving the grease recovery process could significantly reduce wastewater contamination and disposal costs and provide a potential revenue stream.

RESULTS

Compressed Air Leak Repair: Compressed air is a system commonly utilized by many manufacturing companies and can be quite costly if not maintained properly. An ultrasonic leak detection survey was conducted and several leaks were identified in piping, hoses, machines, and machine connections. These leaks were tagged and are in the process of being repaired. The repair of these leaks will help reduce energy consumption, reduce required equipment maintenance, and extend compressor lifespan.

Leak Detection Maintenance Plan and Standard Operating Procedures:

The continual detection and repair of air leaks is crucial for efficient and cost effective operation of compressed air systems. Facilities can often reduce their compressed air usage by 5 to 10 percent of total air generated through routine maintenance such as identifying and fixing compressed air leaks. Standard operating procedures and an on-going maintenance plan were created to address compressed air leaks throughout the plant.



A standard operating procedure was written and a 12-month leak detection inspection plan was developed to facilitate timely detection and repair of leaks in the future. Internal maintenance staff will be responsible for carrying out the leak detection plan and following the standard operating procedure to properly tag, report, and repair leaks found in these areas. This will decrease energy costs, improve machine efficiency, and decrease compressor operation.

Belt Grease-Skimmer: A belt grease-skimmer could provide effective grease removal from the on-site grease pit. A tube skimmer is housed in the grease pit building but is not currently in use. In the past, a grease recycling vendor hauled grease from the pit when the tube skimmer was in use. Due to insufficient grease quantities and a lack of onsite storage options, this service was deemed economically infeasible. The pit is currently pumped out twice weekly to remove solids and grease, which are sent to the landfill.

A vertically designed belt grease-skimmer could significantly increase the quantity of recovered grease and make recycling a more cost effective option. With this system, secondary heated storage would not be needed. Additionally, the remaining contents of the pit would require less frequent pumping, which could save labor pumping costs and reduce the volume of waste going to the landfill. Initial discussions are taking place to prepare for implementation.

Reuse of RO Blowdown Water: A variety of different areas were considered when exploring opportunities for reuse of the RO blowdown water. To improve water conservation efforts at the Smithfield Sioux City plant, an RO system was implemented to help purify and filter the water received from the city. An opportunity exists to significantly reduce water usage and associated costs by capturing and reusing the blowdown water from this system. Areas considered for potential reuse of the RO blowdown water were chip burners, sanitation, and rack-washer, which have not proved feasible due to the impurity levels of the blowdown water.



Processes such as forward osmosis have the potential to further purify the RO blowdown water to an acceptable quality for use at the plant. Forward osmosis holds promise, but further research is needed to determine the most efficient and beneficial use for the Sioux City plant.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
COMPRESSED AIR SYSTEM LEAK REPAIR	\$13,111	242,820 kWh	IN PROGRESS
MAINTENANCE PLAN AND STANDARD OPERATING PROCEDURES	\$4,533	80,940 kWh	IMPLEMENTED
BELT GREASE-SKIMMER	\$287,462	990 tons	RECOMMENDED
REUSE OF RO BLOWDOWN WATER	-	2,446,080 gallons	FURTHER RESEARCH NEEDED

