

## 2018 Case Study

# Smithfield Foods, Inc.

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### Company background

Smithfield Foods Inc. is the largest producer of pork and packaged pork products in the world. It employs more than 50,000 people worldwide and is currently valued at more than \$15 billion. Based in Smithfield, Virginia, the company produces popular packaged pork such as hot dogs, sausages, bacon, hams, etc. under several brand names. The Junction City Smithfield plant produces smoked sausages in an assortment of different sizes, casings and flavors, marketed under the Amour Eckrich® brand. On average, the plant produces 500,000 pounds of packed sausage products per day.

### Project background

The Smithfield plant in Junction City has several opportunities for pollution prevention and waste reduction. Management requested recommendations regarding reduction in brine concentration in wastewater, reduction in use of natural gas to heat water, and installation of variable-speed drives for hot water pumps. Based on observations on the shop floor, the intern also looked into providing a zero-waste-generation policy to generate fuel from dry biodegradable waste, installing solar panels to offset the lighting load from the plant, reducing spice dust in the grinding area, and reducing inedible waste.

### Incentives to change

In conjunction with corporate environmental policies, Smithfield Foods Inc., Junction City has committed to five percent energy reduction, four and one-half percent water reduction, and five percent solid waste (to landfill) reduction over 2014 by 2020.

### Projects reviewed for P2 potential

#### Wastewater chloride reduction

Brine has leaked from the chiller into the wastewater stream on multiple occasions. As the wastewater treatment plant is not designed to handle wastewater with high chlorides, the plant could run into Clean Water Act violations. Three main strategies were

suggested, i.e., improved brine management protocols, automated brine addition and drainage, and improved evaporative cooling. Since the cost of salt is negligible, advantages of the project are chiefly environmental. The main economic advantage would be a reduction in labor required to monitor and fix issues caused by brine leakages.

#### Reduction of natural gas use for water heating

One strategy to reduce natural gas usage was to use heat from the air compressor to preheat sanitation water. Currently, water from the main condenser sump is separately being used to cool the single-stage air compressor. As almost 80 percent of heat is lost to air compression and the compressor runs all year round, 420,480 kWh of heat is available for preheating water. Recovering 75 percent of this heat could reduce natural gas usage by 14,350 therms annually, resulting in a payback period of approximately two and a half years.

#### Variable frequency drives (VFDs) for hot water pumps

The Smithfield Junction City plant uses hot water at 135 psi and 110 psi for sanitation and washing purposes, respectively. During shift changes, maintenance operations and on Sundays, the amount of water used is considerably reduced, which results in unnecessary usage of pumping power. Hence, it was proposed the plant use VFDs to lower the speed of the five pump motors when water utilization is low. As the motor loading is expected to reduce to around 70 to 80 percent of full-load operation, nearly 129,000 kWh of energy would be saved annually, resulting in a payback of approximately two and a half years.

#### Solid waste reduction

The plant produces around 873 tons of spent cellulose casings per year. Currently, Smithfield is evaluating a proposal to compost these casings at a composting facility in Salina, Kansas. Alternative approaches were analyzed in case the pending proposal is not accepted. A pyrolysis and gasification system was considered, but cellulose casings would likely cause frequent clogs, making this option impractical. Spent cellulose casings may be suitable

for use in feed for ruminants, but this would require more research. A biomass briquetting machine on-site has the potential to generate revenue from cellulose waste by forming solid briquettes that could be used as fuel. Using biomass briquetting, nearly \$118,633 could be generated annually by the sale of briquettes.

Solar energy for lighting

The feasibility of using solar energy to offset lighting loads in the plant was also analyzed. Different zones were proposed for this study, including the car parking lot. Given current energy costs, a system to offset the parking lot lighting load would cost nearly \$50,000 and would yield a payback of close to 15 years. The cost of solar energy decreases by 10 to 12 percent annually, and megawatt-scale applications have a shorter payback. Installation of solar panels is not recommended at this time, but this project has been suggested to be included in a future five-year budgeting plan at a larger capacity.

Spice dust prevention

Tipping large vats of spices into mixers in the blending area results in a dusty work environment and

requiring the air filters in the air-handling units to be changed weekly. After close observation, it was suggested two types of nozzles, preventative (hollow cone) and symptomatic (misting), be installed around the periphery of the vat and the mixer. Installation of these nozzles on each mixer would result in a cleaner working environment and savings of around \$7,385 per year for the air filters, yielding a payback of only three months. Furthermore, dust that settles on the fans, heat exchanger coils and other critical equipment results in a decrease in operational efficiency by nearly five percent, wasting close to 10,000 kWh annually.

Inedible waste prevention

An average of 300 pounds of inedible waste is generated daily on collators of packaging lines one and two due to improper product handling techniques. Appropriate training while sorting sausages and changing totes, in addition to covering sections where sausages are prone to falling on the floor, can prevent substantial product loss. Preventing this loss will result in an increase in yield and a yearly reduction of 4.6 MTCO<sub>2e</sub> — cost savings of \$2,543.

*Summary of 2018 P2 intern recommendations for Smithfield Foods Inc.*

Project	Annual estimated environmental impact	Estimated cost savings (\$/year)	Status
Wastewater chloride reduction	131,797 kWh	\$10,557	More research needed
Reduction in natural gas use	420,480 kWh or 14,350 therms natural gas	\$6,171	Recommended
Variable-speed drives for pumps	129,010 kWh	\$10,192	Recommended
Solid waste reduction	26,663 kWh	\$118,633	More research needed
Solar energy for lighting	37,790 kWh	\$2,986	Not recommended
Spice dust prevention	9,838 kWh	\$8,163	Recommended
Inedible/rework waste prevention	9,343 kWh or 348 therms natural gas	\$2,543	Recommended
Total <sup>1</sup>	568,671 kWh	\$27,069	
GHG reductions <sup>1,2</sup>	773 metric tons CO <sub>2e</sub>		

<sup>1</sup>Does not include projects “not recommended” or with “more research needed”

<sup>2</sup>EPA P2 GHG Calculator with Cost, Apr. 7, 2016 & EPA WARM Tool- Version 14