OSCEOLA FOODS, LLC

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COMPANY BACKGROUND

Osceola Food, LLC, established in 1995, is a wholly owned subsidiary of Hormel Foods. Started in Austin, Minnesota in 1891, Hormel Foods is a multinational manufacturer and marketer of consumer-branded food and meat products, many of which are among the best known and trusted in the food industry. The main purpose of the Osceola Food plant is to make hams and bacon. This state-of-the-art, 330,000-square-foot facility employs about 670 people who work first, second and weekend shifts. Adjacent to the plant, an independently owned distribution center handles not only the products made at Osceola Food, but also the majority of the midwest production for Hormel Foods.

PROJECT BACKGROUND

This is the third internship project in a continued relationship between Osceola Food and the Pollution Prevention Intern Program. While previous interns focused on water usage and wastewater treatment, this year's intern examined the refrigeration system for energy reduction opportunities. The refrigeration system at Osceola Food accounts for approximately 50 percent of the company's annual electrical usage, so even minor system inefficiencies can be costly.

INCENTIVES TO CHANGE

Hormel Foods has a progressive environmental policy statement and sustainability committee that addresses energy use, water use, recycling and environmental concerns. The committee monitors progress on the corporate initiative of reducing energy use at U.S. manufacturing facilities by 10 percent over five years, ending in calendar year 2011. A significant reduction in electrical usage by the refrigeration system will help make this initiative a success for the third consecutive year.

RESULTS

Raise Low Suction: The suction pressure set point determines the lowest saturated ammonia temperature in the refrigeration cycle. The coldest freezers in the plant set the allowable low side suction pressure set point. The initial set point allowed a much larger temperature differential than necessary between the saturated ammonia in the evaporator and the lowest room temperature. The low side suction pressure can therefore be raised 7 psi in the winter and 5 psi the rest of the year while still maintaining efficient heat transfer. This change has been implemented and is currently saving $7,860 annually by reducing compressor usage by 121,486 kWh per year.

Raise High Suction: The majority of the refrigeration system operates on the high side of the multi-stage system. The maximum high side suction pressure is determined by the lowest room temperature set point on this part of the system. The current set point is lower than necessary for efficient heat transfer. The high side suction pressure can be raised 6 psi in the winter when heat loads are low, and 4 psi the rest of the year. This change is currently being tested. If implemented, it would save $56,433 annually by reducing 872,228 kWh in electrical usage per year.

Reconfigure Compressors: The last step in optimizing the suction pressures in this system would be to reconfigure the compressors. This would involve using an intermediate suction pressure in order to increase the suction pressure for the majority of the high side compressors. A single high side compressor would be run to the coolers that have the lowest temperature set point on this part of the system. This change would allow approximately 80 percent of the high side compressors to operate at a much higher suction pressure. The company could save an estimated $76,663 annually by reducing 1,184,896 kWh in high side compressor energy usage.

Compressor VFDs: Refrigeration systems have high load variations due to changes in outdoor conditions and production loads. Though compressor electrical usage isn't currently trended, it appears there are screw compressors modulating to match varying loads for much of the year. Screw compressors operate inefficiently at partial loads, using more energy than necessary. This inefficiency can be reduced by using a variable frequency drive on one compressor on each stage of the system to slow the motor when the compressor unloads. The utility provider offers a rebate for variable frequency drives that would offset some of the upfront cost of implementing this recommendation.

Reduce Hot Gas Times: Evaporators remove heat and condensation from refrigerated areas. Since the coils on the evaporators are the coldest objects in these areas, frozen condensation is formed, which blocks air flow over the evaporator coils, preventing efficient heat removal. The frost must therefore be melted at preset intervals using a hot gas defrost cycle. It was determined that the typical amount of time hot gas flowed through these coils to melt the frost was longer than necessary. These hot gas times were reduced, saving at least $1,800 annually in unnecessary heat removal alone.

Close Cooler Doors: Many cooler doors are currently left open for most of the day. While this is convenient for people and forklifts moving throughout the plant, it also increases demand on the compressors. All cooler doors currently open and close relatively easily, so it is possible to keep these doors closed most of the day. Another option is to install doors that open quickly and automatically close after a short time. It is estimated that open cooler doors are costing at least $13,030 annually considering conduction and infiltration only.

Heat Recovery: The discharge temperature of screw compressors is approximately 180° F and the discharge of reciprocating compressors is approximately 220° F. Some of the sensible and latent heat can be removed from this superheated ammonia vapor and used to heat water for sanitation purposes using a heat exchanger. The heat exchanger would heat incoming city water, offsetting some of the cost of the current water heating system. Recovering this heat all year would offset approximately 58,442 therms of natural gas usage, with an approximate annual savings of $46,754.

Lighting: Several cost-effective lighting upgrades could be made to reduce electrical usage. Many 400-watt metal halide bulbs could be replaced by 315-watt ceramic metal halide bulbs and 250-watt metal halide bulbs could be replaced by 205-watt bulbs. Additionally, there are areas in the plant that would benefit from retrofitting metal halide fixtures with fluorescent fixtures that use about half of the energy. The utility provider offers rebates for the fluorescent retrofit, and these simple lighting upgrades could save $36,820 and 569,088 kWh of electricity usage annually, with an approximate two-year payback.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO_2	SO_2	CH_4	N_20	CFC	PM-10
2,567.78	12.76	150.84	0.30	29.21	0.30

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
RAISE LOW SUCTION	$7,860	121,486 KWH	IMPLEMENTED
RAISE HIGH SUCTION	$56,433	872,228 KWH	IN PROGRESS
RECONFIGURE COMPRESSORS	$76,663	1,184,896 KWH	RECOMMENDED
COMPRESSOR VFDS	$19,783	305,765 KWH	RECOMMENDED
REDUCE HOT GAS TIMES	$1,800	27,821 KWH	IMPLEMENTED
CLOSE COOLER DOORS	$13,030	201,391 KWH	RECOMMENDED
HEAT RECOVERY	$46,754	58,442 THERMS	RECOMMENDED
LIGHTING	$36,820	569,088 KWH	RECOMMENDED