



Lorentz Meats



Nicholas Drews
Chemical Engineering
University of Minnesota Twin Cities

Company Background

Lorentz Meats is a full-service meat packing company that specializes in natural, organic and grass-fed meat processing. They are United States Department of Agriculture inspected and Safe Quality Food certified, putting them in-line with the Global Food Safety Initiative standards. They place a high value on obtaining and retaining the mutual respect of their employees, community, products, industry and the environment. They serve national niche meat brands as well as local farmers, providing services from slaughter to retail-ready packaging, which includes sausage making as well as custom curing and cooking.



“My work with Lorentz Meats has given me the opportunity to interact with so many different people throughout the organization, from operator to owner and everything in between. I’ve come away from the internship with a greater appreciation of the viewpoints of others that may be in opposition of my own. My experiences during this MnTAP internship have undoubtedly started me in the right direction as I look to start my professional career.” ~ND

Project Background

Lorentz Meats applied to host an intern to optimize the industrial refrigeration system used in the plant for its continual cold storage needs and analyze the water usage of the various meat processing and sanitation practices for potential reductions.

Incentives To Change

The cost of processing and storing meat can be high. The process requires the use of water, electricity and natural gas. In 2015, Lorentz Meats used 2,136,000 kWhs of electricity, 5,835,000 gallons of water, and 31,600 therms of natural gas. In 2015, Lorentz Meats paid \$230,000 for electricity, \$112,000 for water and sewer, and \$23,000 for natural gas.

3 degrees. Cleaning both condensers and evaporators is now a scheduled task.

Lower Minimum Condensing Head Pressure

Lowering minimum condensing temperature allows the refrigeration compressor head pressure to float down with decreasing outdoor air temperatures, which reduces how hard the compressors work to move heat out of the facility. This can be accomplished to a degree through manual adjustment of the setpoint, which could save 89,000 kWh and \$6,800 annually.

SOLUTIONS

Clean Evaporator and Condenser Coils

Condenser coils were blinded with chaff and dirt reducing air flow through the coil to near zero in places and thus reducing system capacity. Cleaning the coils reduced fan operating hours and energy consumption by about 9,400 kWh and \$700 per year. Cleaning a visibly dirty evaporator allowed increasing the evaporator temperature setpoint by



Install Electronic Expansion Valves on Evaporators

Greater saving can be generated by installing electronic expansion valves on the evaporators which allow a greater reduction in condensing temperature by better controlling refrigerant flow. Upgrading the refrigeration system, at a cost of \$77,000, should save 428,000kWh and \$32,500 per year.

Install ECMs on Evaporator Fans

Electronically Commutated Motors (ECM) are about 30% more efficient than the traditional shaded pole motors used at Lorentz Meats. There are 109 evaporator fans in the facility, 87 of which have drop-in ECM replacement options. Replacing the 87 fan motors with ECM should reduce electric consumption by about 162,000 kWh and save \$12,000 annually. Replacing all the fan motors immediately would cost about \$58,000, with a 5 year payback, so Lorentz has made the decision to replace the motors when they fail where the incremental cost for replacing all the fan motors over time will be about \$9,000. During the two months following the project, three motors have been upgraded to ECMs.

Water Reduction Options to be Evaluated Further

A carcass washer is important for the initial cleaning of the meat being processed and uses 27 gallons per half carcass. The bottom two rows of nozzles spray 16% of the total flow but this water only touches the very largest carcasses. During the next plant expansion, planned for the next few years, the possible automation of nozzle selection by carcass size will be further evaluated. This could save 119,000 gallons of water and \$3,400 per year. Sanitation is done by a contractor and, while food safety is paramount, if hot water use can be reduced by 10% using lower flow nozzles, there is the potential to save 220,000 gallons and \$5,300 in water and gas costs.

Improve Lighting Efficiency

Older sections of the building have T8 and some T5 lighting, upgrading to LED fixtures and adding motion sensors to lights in seven rooms where occupancy is variable should annually save 76,800 kWh in direct lighting electrical consumption and another 4,000 kWh in reduced refrigeration, saving \$7,100. Lighting upgrades are expected to cost \$16,000.



Recommendation	Annual Reduction	Annual Income/Savings	Status
Clean evaporator and condenser coils	9,400 kWh	\$700	Implemented
Lower minimum condensing head pressure	89,500 kWh	\$6,800	Recommended
Install electronic expansion valves on evaporators	428,000 kWh	\$32,500	Recommended
Install ECMs on evaporators	162,000 kWh	\$12,000	Recommended
Install carcass cleaner shut-off valve to lower rows	119,400 gallons 1,400 therms	\$3,400	Recommended
Install lower flow nozzles on overnight sanitation equipment	220,000 gallons (10%) 1,500 therms (10%)	\$5,300	Recommended
Improve lighting efficiency	76,700 kWh	\$7,100	Recommended