SHOWCASE PROJECT: TYSON FOODS: DOE'S VIRTUAL IN-PLANT TRAININGS ON INDUSTRIAL REFRIGERATION UNCOVER BIG SAVINGS

SOLUTION OVERVIEW

2021 BETTER PROJECT WINNER

Tyson Foods is a processor and marketer of chicken, beef, and pork products with more than 130 processing facilities throughout the United States. The company joined the Better Plants program in December of 2018 with the commitment to reduce energy intensity over 10 years to align with Tyson Foods' Science Based Target of reducing greenhouse gas (GHG) emissions 30 percent by 2030 against a 2016 baseline. A primary target for energy savings is the company's ammonia industrial refrigeration systems—the largest energy user in Tyson Food's processing facilities. Approximately 50 percent (2,175 GWh) of the total electricity consumption at the company processing facilities is from ammonia refrigeration systems.

Tyson Foods hosted two Better Plants In-Plant Training energy treasure hunts at the Rogers, Arkansas, and Carthage, Mississippi, plants. Actions taken from the energy treasure hunts directly resulted in over 3,312,081 kWh in annual energy cost savings, with the majority of energy savings potential associated with industrial refrigerations sytems (more than 15%). The success of these treasure hunts led the Tyson Foods team to investigate deeper energy savings from refrigeration-related improvements and other energy intense areas of improvement. They worked with their Better Plants technical account manager (TAM) to organize a Virtual In-Plant Training on ammonia refrigeration systems and designated key members from each plant to attend.

SECTOR TYPE

Industrial

LOCATION

Springdale, Arkansas

SOLUTIONS

Tyson Foods quickly realized that performing energy treasure hunts at all of their 131 processing

facilities was not feasible, especially during COVID. To address this, Tyson Foods worked with the Better Plants team to plan out a Virtual In-Plant Training series that engaged employees and replicated many of the activities of the in-person energy treasure hunt. When thinking of a training session that would meet their goals, Tyson Foods laid out three main objectives that they sought to accomplish during the Virtual In-Plant Trainings:

1. To find the operating limits and to be able to answer the question of "why can we not go further to realize more energy savings?"
2. To identify energy savings opportunities, quantify the savings, and report these estimates back to the corporate management team for goal-setting.
3. To achieve a mindset shift towards saving energy. Once we find success in the industrial refrigeration system, where else can we find energy savings?

Tyson Foods began brainstorming with their assigned Better Plants Technical Account Manager (TAM) on how to provide the largest impact to Tyson's footprint in the shortest timeframe possible. The company concluded that it could have a large and quick impact with a virtual format focused on ammonia-based refrigeration systems serving their plants. Tyson Foods required all their facilities that use ammonia refrigeration to attend the 4-week training which took place from October 27th, 2020, to November 19th, 2020. Key facility employees who were required to attend included refrigeration managers, process safety management coordinators, maintenance managers, operators, environmental managers, and plant and corporate engineers. This added up to approximately 220 individual attendees from over 140 facilities in attendance.

Attendees were trained on a variety of energy conservation measures associated with industrial refrigeration systems, including decreasing discharge pressure; increasing suction temperature and pressure; cycling and sequencing compressors in a more efficient manner; reducing excess superheat; and optimizing defrosting. The attendees were then given homework assignments designed to reinforce what they had learned during the webinar presentations. Once the training was complete, attendees were provided with energy savings forms to use in their plants. The forms were developed by Tyson Foods to collect data, identify energy savings opportunities, and quantify savings related to the energy conservation measures discussed in the training. All facilities were asked to fill out the forms and return them to the corporate office.

After the training, 68 (62 percent of those who attended) of the facilities submitted their completed forms. The plants that participated identified a total of estimated 55,991,128 kWh in annual energy savings. This estimated savings' figure can be disaggregated into the following energy conservation measures:

- Reduction in Discharge Pressure: 22,196,192 kWh
- Increased Suction Pressure: 25,564,192 kWh
- Optimized Compressor Sequencing: 6,797,094 kWh
- Removal of Excess Superheat: 1,433,650 kWh

Once facilities began to implement the measures identified during the training, Tyson Foods was able to quantify and track the energy savings. Energy and production data from the 3 months following the training (October to December of 2020) revealed energy savings of approximately

29,000,000 kWh across the enterprise. These energy savings are calculated from electric utility billing, so it's not isolated to solely energy savings from refrigeration.

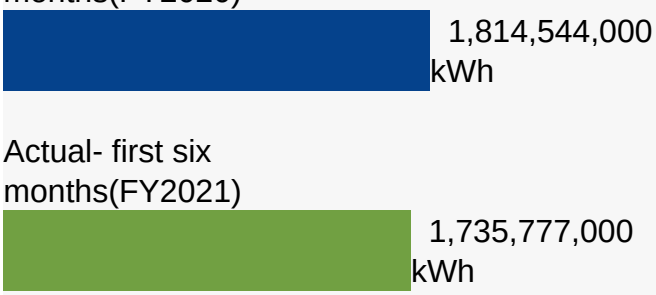
A strong performer that emerged from the training sessions was the Robards, Kentucky, plant. Using the ammonia refrigeration training, Robards identified energy savings from reducing discharge pressure by approximately 10 psi during cooler months and increasing suction temperatures in 6 ammonia compressors. These two actions resulted in an annual energy savings of 2,217,495 kWh. This turned out to be an underestimate as electric billing tracking has further revealed that the Robards plant has already saved 2,100,000 kWh in the first 4 months (October, November, December, and January) of the fiscal year. This underestimate is due to the plant finding additional opportunities not reported to corporate and implementing energy conservation measures outside of the ammonia systems.

OTHER BENEFITS

Not only did the Virtual In-Plant Training generate significant energy and cost-saving benefits, but it also increased employee awareness of the numerous opportunities for energy savings at existing Tyson Foods facilities. Environmental managers now hold monthly meetings with plant managers, maintenance managers, and refrigeration managers to discuss new opportunities and share the billing data to summarize savings they have achieved. These meetings also allow teams to probe for more savings and ask questions about ways to improve the energy efficiency of current systems and how principles learned during the trainings can be applied to other energy systems.

The Robards, Kentucky, plant is an example of how the continuous improvement and system-level approach learned in the refrigeration In-Plant Training can be applied to discover additional opportunities beyond refrigeration. Robards has two 200 horsepower (hp) air compressors, one of which was always running because of the fire suppression system. The team realized that the fire suppression system can be supported with just two ¾-hp and one 1-hp compressor. So now instead of running the 200-hp compressor constantly, they will be running a separate 2.5-hp system for the fire suppression system. Also, the plant began shutting down the engine rooms on weekends when they are not in production—saving additional energy and extending the life of the equipment.

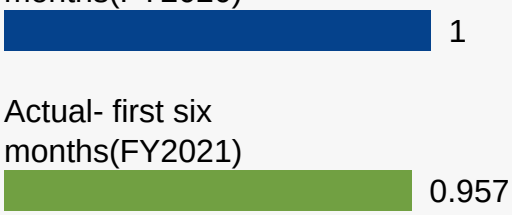
Annual Energy Use



Energy Savings

4.3%

Annual Energy Cost



Cost Savings

4.3%