SHOWCASE PROJECT: SAINT-GOBAIN CORPORATION: ADVANCED ENERGY MONITORING WITH WIRELESS SUBMETERING

SOLUTION OVERVIEW

Saint-Gobain North America's current goal in energy monitoring is to gain more granular data on energy usage within its manufacturing sites to accelerate the achievement of its sustainability goals; namely reducing carbon emissions and lowering energy intensity. Saint-Gobain made a public commitment to reduce its company-wide energy consumption by 15% and its total carbon emissions by 20% by 2025, with a baseline year of 2010. To reach these goals, each of Saint-Gobain's 10 businesses have developed road maps. All facilities have utility meters that measure site-level energy consumption for billing purposes.

The Saint-Gobain Ceramics NorPro facility in Soddy-Daisy, Tennessee, has worked to reduce its energy consumption, but most completed projects have been simple, obvious fixes that are reactive in nature. To find less obvious opportunities and be more proactive with energy management, Soddy-Daisy sought more sophisticated information. The facility found that electricity demand accounted for almost 30% of its annual electrical costs in 2016, so the plant World Class Manufacturer (WCM) Manager, Patrick Sick, focused on decreasing peak demand to limit variable energy costs incurred by the site. If the peak demand was decreased by 50 kW each month, the site would save thousands of dollars annually. Patrick identified submetering equipment energy usage to help find these opportunities. Ancillary benefits of the submeters include the ability to monitor run hours and trends in energy consumption of individual loads to more efficiently maintain equipment, and the ability to move from preventive to predictive maintenance.

SECTOR TYPE

Industrial

LOCATION

Soddy-Daisy, Tennessee

SOLUTIONS

Once the pilot project at Soddy-Daisy was decided, the first step in implementing the technology was to select the metering points. Installing submeters at every electrical load in the plant is beneficial, but not economical or necessary. Enough submeters should be installed so that the modeled energy consumption mimics the site's actual energy curve. To determine which electrical loads the plant would benefit from determining the energy consumption of, Patrick developed a load profile that showed each electrical load and operational hours with the subsequent electricity consumption, cost, and savings if electricity consumption could be decreased by an assumed 5%.

The loads resulting in savings that were more than the cost of a sensor were chosen as metering points.

Using this method, Soddy-Daisy determined that 49 sensors accounted for 75% of the facility's electrical usage. It also needed 12 bridges, which are used to communicate the sensor signal and transmit it to the online server. There are two options for connecting the site to the network: a cellular connection (with an annual cell fee), or Ethernet drops, which Soddy-Daisy ultimately decided to use. In addition, the site would need specialized, super-miniature wire-to-board and wire-to-wire connectors, and on-site installation outside support and training. For the site's installation, an outside electrician, Ethernet connection, and other network equipment were needed, resulting in a total installation cost equal to 8.5% of annual electrical spend. After this initial cost, however, the site only has to pay the service fee for the software, equal to 1.4% of electricity cost per year.

OTHER BENEFITS

Saint-Gobain wrote a case study on the submetering project, which can be read here. This project resulted in the identification of four sub-projects. Each describe an instance where Soddy-Daisy realized energy savings that would not have been found without submetering and visualization of energy consumption.

0. Device Analyzer KPIs Enable Predictive Maintenance
0. Bulk material transfer Batch Process Enhancement
0. Identical Equipment with Different Loads
0. Optimizing Dryer Usage

Sub-Project 1: Device Analyzer KPIs Enable Predictive Maintenance

Using the device analyzer tool of the plant's energy monitoring system, plant personnel were able to see the actual run time for each piece of equipment being monitored, Soddy-Daisy can extend the maintenance cycle and make maintenance operations more predictive. This reduces the cost of labor, materials, waste, and related environmental impacts while improving budgeting. This also creates opportunities to determine and reduce the embodied energy for each product.

Sub-Project 2: Cyclonaire Batch Process Enhancement

The energy monitoring system that the plant has in place shows electricity consumption in kilowatts for the site's low-pressure blower and for a nearby air compressor using submeters. After graphing energy consumption from these two pieces of equipment, a positive correlation between the blower and the air compressor was found. The site previously decided to convert fluidization air from the low-pressure blower to compressed air so that whenever batching takes place, the air compressor starts to provide the additional pressure required for fluidization. However, because air compressors are much more energy-intensive, the site is now investigating reverting back to just using the low-pressure blower for fluidization to save on energy use and charges, which could save around 4% of electricity cost annually.

While investigating the low-pressure blower for this project, the team found that the blower's batch

cycle ran for 30 minutes instead of the required seven, because of an equipment issue involving an intermittently stuck valve. Fixing this issue could save the site an additional 3% on electricity per year. More importantly, this issue effectively stopped the batching process because subsequent batches could not be run until the previous batch was completed, slowing the site's production rate. The stuck valve has been repaired and alarms installed to alert maintenance when the low-pressure blower has been operating for an excessive period of time.

Sub-Project 3: Identical Equipment with Different Loads

Using the plant's energy monitoring system, plant personnel were able to compare energy consumption by identical motor-driven systems. Differences indicate an equipment issue, which quickly becomes a plant reliability issue. The site was able to identify that its three air compressors were all operating at different loads, costing an extra 2% in electricity year for the ones running often at part-load. The simple fix that the site was able to implement was to choose the most efficient compressor (based on performance and energy efficiency) and use it as the baseload compressor in the interim before the others are fixed.

Sub-Project 4: Optimizing Dryer Usage

The site's product dryers have five fans that operate to dry product by blowing waste heat from the kiln over the product. These fans need to operate only when there is product in the dryer. Because the fans are manually turned on and off by the kiln operator, they are often left on continuously even though there is only product in the dryer for approximately 12 hours per day. The site decided to add additional sensors to the dryer so that the fans turn on only when product is on the belt and then automatically turn off when they are not needed. The energy monitoring dashboard helped call attention to this problem, as it enabled the site to look at the load curve for the kiln and compare it to the load that the dryer fans created. This could save the site over 5% of its energy costs.

In total, the four sub-projects offer approximately 15% in annual electricity savings just through visualizing the site's energy usage and identifying issues through the dashboard. This does not include the other maintenance, quality, production, and labor savings that enhance each of the solutions. Soddy-Daisy is a relatively small site for Saint-Gobain, so this was a large accomplishment. On a usage basis, Soddy-Daisy achieved a 14% reduction in electrical energy intensity (MWh per unit of product) from 2016 to 2017. It is difficult to attribute a particular percentage of this reduction directly to energy monitoring, but the technology was implemented in April 2017 and thus was in operation for more than half the year.

Annual Energy Use

Baseline(2016)

1.00

Actual(2017)

0.86

Energy Savings

14%

Annual Energy Cost

Baseline(2016)

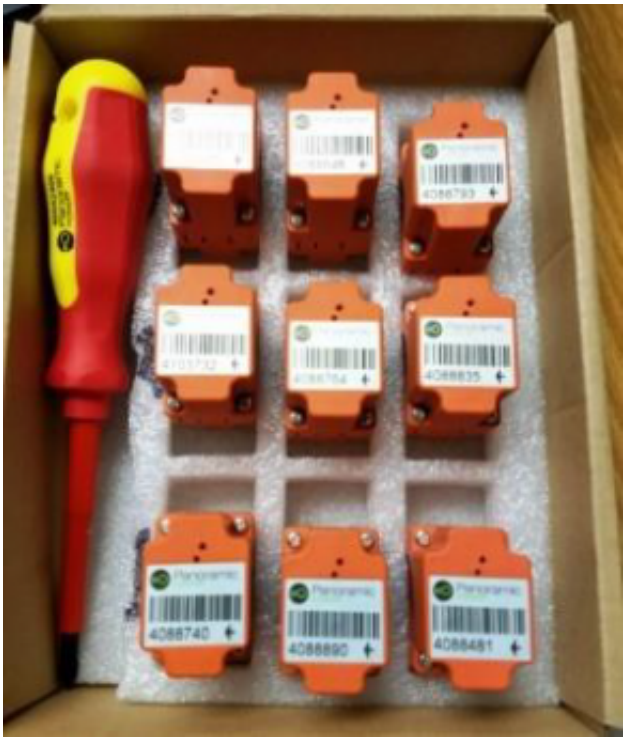
1.00

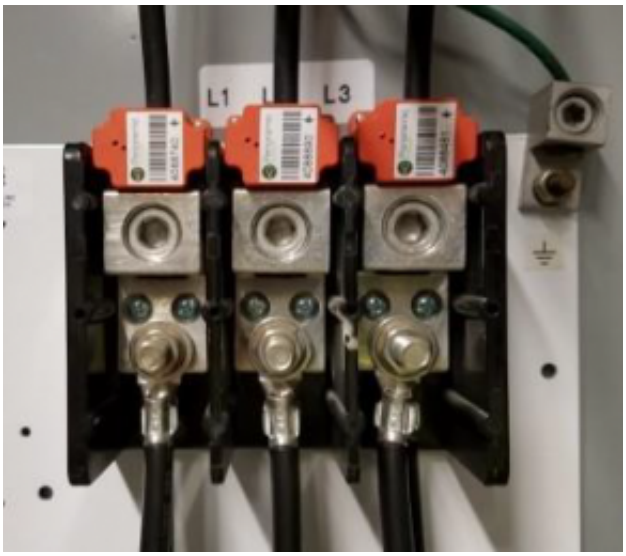
Actual(2017)

0.85

Cost Savings

15%

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