



Cement manufacturer collaborates with Eaton to improve operations, reduce energy consumption

Location:

Pacific Northwest

Segment:

Cement processing

Problem:

Need to replace legacy energy monitoring system to track operational efficiency and respond to process changes in real time

Solution:

Eaton Power Xpert® 6000 and 2000 series meters

Results:

Enables plant operators to track process efficiency in real time resulting in the reduction of cost per ton of cement and provides employees with total control over the energy signature of the plant

Background

A U.S. cement manufacturer needed to rebuild a facility to convert the cement-making process from wet to dry. At the same time, many of the electrical systems related to the kiln operation were upgraded, while the systems and process post-clinker production remained fundamentally unchanged. The total electrical load at the plant is 13 megawatts and monthly electrical energy bills frequently exceed \$400,000, which is a significant component of total operating cost for the facility. As this was an older facility, its manufacturing costs per ton of cement produced here were higher than costs at other plants in the region.

Challenges

The U.S. cement industry faces many challenges. With market demand heavily linked to residential housing starts, the 2008 economic downturn in the U.S. resulted in low capacity utilization levels. In addition, new government-mandated environmental regulations requiring reduced emissions levels added to production costs with no real incremental opportunity to collect for higher costs in the marketplace.

The cement producer recognized that in this environment, making fundamental changes to its operation was critical. Electrical energy consumption was quickly identified as an area where efficiency gains could be realized. Legacy energy monitoring systems at the plant were antiquated. Historic operations included manual meter readers deployed on the last working day of every month, which had many drawbacks. Most notable were that plant operations could not track site operational efficiency in real time, nor could they respond to process changes impacting site energy use. Additionally,

departments responsible for energy use were not engaged as energy owners since systems delivered only a rear-view mirror look into site energy consumption.

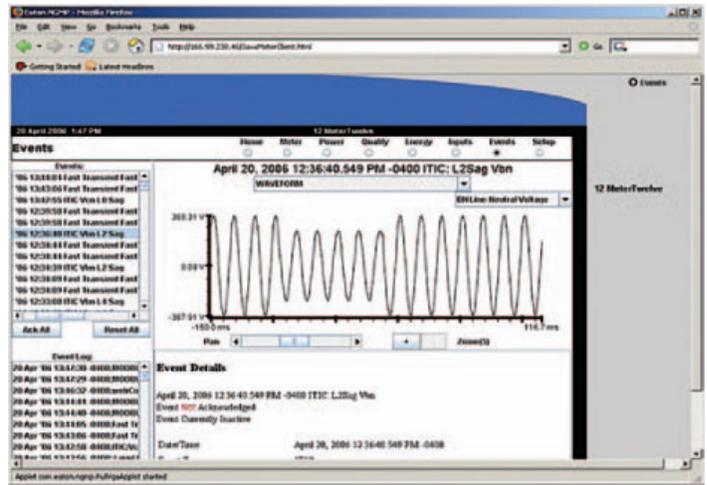
Solution

The plant assembled a multi-disciplined team to investigate alternatives for a new electrical energy management system that could be used in real time for the multiple energy users across the facility. The group completed a detailed work-scope, with plans to upgrade existing metering with new technology that would offer more accurate energy readings and communicate across the existing facility-wide distributed control system (DCS) so operators would have real-time energy information and power quality data necessary to make informed operational decisions. Parameters such as power factor, harmonics, power sags and swells, and utility momentary outages were included.

The team's goal was to replace or upgrade the protection relaying at the incoming 4160V plant service and integrate the



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new protective devices with point of service energy/power quality metering, combined with sub-metering at the downstream substations, so real-time energy data would be available and visible to all energy users across the plant. The company chose Eaton meters and relays because of their superior functionality, simple connectivity to legacy systems and flexibility to communicate over multiple networks. The company also installed two Eaton Power Xpert 6000 series power quality and energy meters at the plant's incoming point of service. Combined, the two meters provided accurate electrical energy measurement for the entire plant, which allowed the accounting department to record kilowatt hour consumption from new meters and compare them with existing utility metering to validate billing.

Eaton Power Xpert 2000 series meters were selected for sub-metering given their capability to measure power quality parameters, including measuring system harmonics up to 127 times the fundamental frequency, system sags, swells

and transients. Both the 6000 series and the 2000 series meters offer a unique embedded Web server, which enables the plant's engineering staff to access real-time energy and establish energy trending and analyze system events via the enterprise-wide network, without impacting operations or production.

An Eaton Power Xpert 2000 series meter served as a sub-meter at almost every motor control center, large motor and at some of the individual facility buildings. Since some equipment and the associated electrical loads were shared between multiple plant processes, system software was configured to break out energy use by owner, based on a percentage of total power use at each of the shared meters. Meters were connected via a Modbus[®] TCP network so information could be shared across the enterprise-wide area network, and also key operating energy data was integrated into the plant DCS. With energy information available at the DCS, plant operators were able to use it to improve operational efficiency on a real-time basis.

Results

The energy management system is delivering measurable benefits in isolating equipment and system inefficiencies. It is also being used to monitor the process and collect usage data that will be used as a baseline for justification of future energy projects.

With the added capability to measure and record power quality data, an electrical outage event is quickly recorded and analyzed against past events captured by the Eaton Power Xpert 6000 series meter system using its Web browser capability to determine the source of the problem. With these new energy management capabilities, plant operators now have the ability to track process efficiency easily in real time, ultimately reducing manufactured cost per ton of cement produced; gain immediate insight into power and energy usage; and analyze past usage trends or power quality events.

The system has enabled the plant to reduce labor requirements by eliminating manual meter reading, provided a means to verify the accuracy

of monthly utility bills, and empowered new energy owners with real-time data used to improve production efficiency. The cement plant has new life through the installed Eaton energy management system, which has delivered total control over the energy signature of the entire plant to its employees.

Power costs continue to increase annually and the control that the customer has is to take advantage of off-peak power usage, reduce overall demand usage and improve the efficiency of operations. The customer is happy with the results from the installation of the new energy management system based on Eaton metering technology. Both the hardware and software has proven to be easy to configure and offer a simple, but powerful user interface. The payback for the recently installed energy management systems is projected to be in the range of 2 to 2½ years. Since the system has the capacity to grow to meet future system needs, it also serves as a primary tool used to benchmark all future energy savings initiatives.

Eaton
 1000 Eaton Boulevard
 Cleveland, OH 44122
 United States
 Eaton.com

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