

Energy Savings for Brick Manufacturers

Most people think that bricks are a commodity product—that one brand of brick is as good as another. But the Oklahoma State University IAC team members learned to distinguish premium from commodity bricks during their assessment of Boral Bricks in Muskogee, Oklahoma on October 18, 2012.

Company Background

Headquartered in Sydney, Australia and with dozens of manufacturing facilities across Australia, Asia, and the USA, Boral prides itself in producing the highest quality, most attractive bricks available. Employing more than 2,300 people, Boral plants in the USA manufacture not only bricks but also concrete & clay roof tiles, stone veneer products, and concrete for the construction markets.

Summary

Under the supervision of Dr. William Kolarik, the OSU IAC team visited the site and identified sixteen opportunities for cost savings. Boral's management, engineering, and facility staff responded positively to the assessment report by implementing many of these recommendations. The initial client request for the IAC assessment was coordinated by Judy McCombs, the manufacturing extension agent (MEA) from the Oklahoma Manufacturing Alliance. Our center director, Dr. William Kolarik, has maintained effective working relationships with MEA's, and this networking has provided many quality leads for the center's assessments.



Boral's Muskogee brick plant includes 110,000 square feet under roof on a property of seventy-five acres, which includes an on-site clay mine. *Photo from Boral Bricks.*

Plant Description

Boral's Muskogee brick plant utilizes 110,000 square feet under roof on a property of seventy-five acres. This includes a clay mine, which has been in operation for more than thirty years. The plant normally operates one shift, Monday through Friday, but the kiln department runs 24/7, as the kiln must be continuously maintained at 1,925 degrees F.

Implementation

Prior to the site visit, the OSU IAC team carefully examined and evaluated the gas, electric, and water billing for the twelve months preceding the assessment. They noticed that the plant's electric bills recorded a monthly average power factor of 80%, resulting in a low power factor charge paid to the distribution utility. During the assessment, they noted the presence of large inductive loads and associated drives that often suppress average power factor. In response, the team recommended the installation of a capacitor bank to correct the power factor to a more appropriate value above ninety percent.

Assessment Highlights

- Boral compared the total utility cost for the first eight months of 2012 (before the IAC assessment) with the first eight months of 2014 and found a savings of nearly \$25,000, or \$37,500 in cost savings per year.
- Terry Skaggs, Boral's maintenance manager, concisely summed up the value of the OSU IAC when he stated, "[They] were very helpful with Boral's quest to become lean and energy efficient."

Boral's reaction to this recommendation was first an evaluation, followed by budgeting for implementation the year after the assessment was delivered. The capacitors were then installed in October of 2013 and Boral staff now reports a daytime power factor of 93% with a nighttime average of 99%, as many of the inductive loads are not energized during the night hours. The result is an annual savings of \$12,090.

In the kiln area, the client implemented the IAC's recommendation to install VFD's to control four 7.5 horsepower kiln-car haulages. Previously, these car transport units operated at only one speed, and sometimes the system would move a car too fast, causing it to bump into adjacent cars with excessive force. These VFD's provide dynamic braking so that the operators can precisely control the speed of each car, which helps to protect the bricks before and after firing. The client was very satisfied with this improvement, as it maintains quality and enhances production line control. Both of these factors were key goals for the plant staff when considering a process-related retrofit.

Phasing in Efficient Lighting

Boral is currently accelerating its program to upgrade the lighting of the production area, which is currently illuminated by old probe-start open high-bay metal halide fixtures. Most of these fixtures are high-quality Holophane and Hubbell housings with glass refractors, in good condition. We believe that the pulse-start metal halide extended-life lamp is the best option for this client for several reasons. Some of the benefits of installing these lighting fixtures at Boral Bricks are detailed to the right.

Pulse-Start MH Lighting

- Long lamp life reduces maintenance hours for hard-to-reach fixtures.
- A single bulb is easier to clean than multiple T5HO lamps, in dusty conditions.
- Metal halide fixtures are more tolerant of power quality problems than solid-state light sources.
- Retrofit kits are available to withstand high ambient temperatures in plant ceilings above heat sources such as kilns.

Implemented Recommendations

Assessment Recommendations	Annual Resource Savings	Total Annual Savings	Capital Costs	Simple Payback
Install VFD Air Compressor	153,343 kWh/yr	\$7,514	\$27,500	3.7 years
Reduce Air Pressure	46,434 kWh/yr	\$3,540	\$0	0.0 years
Fix Compressed Air Leaks	48,878 kWh/yr	\$2,395	\$1,750	1.0 year
Install Pulse-Start MH fixtures	26,420 kWh/yr	\$1,510	\$6,695	4.4 years
Install High Energy Efficiency Ratio HVAC	33,019 kWh/yr	\$2,708	\$5,684	2.1 years
Clean HVAC Condensers	10,642 kWh/yr	\$873	\$490	0.6 years
Install VFD's on Kiln Cars	663,493 kWh/yr	\$32,511	\$25,606	0.8 years
Install Capacitor Banks	0 kWh/yr	\$12,090	\$11,638	1.0 year
Total	982,229 kWh/yr	\$63,141	\$79,363	1.7 years