CERAMIC TILE MANUFACTURING

In Brief

An Energy Saver audit helped Australia's only major ceramic tile manufacturer, National Ceramic Industries Australia (NCIA), to identify numerous energy saving opportunities, establish the true benefit of some already known opportunities, and compare some alternative approaches for recovering waste heat from their kilns. Implementing the audit recommendations will save NCIA $1,132,000 a year on electricity and natural gas costs, with a payback period of 1.7 years. Some of the opportunities require minimal or no capital expenditure.

Results

- Electricity savings of 757 MWh per annum.
- Gas savings of 133,000 GJ per annum.
- Potential ongoing annual cost savings of $1,132,000 from efficiency improvements with a 1.7 year payback.
- Potential ongoing annual reductions in carbon emissions of 9,524 tonnes.

The Whole Story

A discussion with Andrew Clarke from BCW Carbon and Energy led NCIA to the Office of Environment and Heritage's (OEH) Energy Saver program. From the outset, the company's Plant Manager, Craig Oliver saw the benefits of an Energy Saver audit.

'We knew that energy prices were going up, and we knew that we had opportunities to reduce our energy consumption, but we didn't have the resources and expertise to be able to investigate our energy use in detail. We weren't sure how to go forward, so when Andrew approached us and explained the energy audit concept, we realised that it was the right approach for our business."

The tile factory has been in operation since 2004. Even at that recent time, ceramic tile factories were still being built with relatively little heat recovery installed. In the intervening ten years, energy efficiency has become more important and higher profile.

With natural gas prices rising, and gas being the largest part of their energy cost, NCIA were keen to investigate ways to reduce their natural gas use. NCIA were aware of some heat recovery retro-fit options available from kiln manufacturers and engineering companies in Italy, but they didn't have the background or resources to do a detailed evaluation. The energy audit enabled comparison of a range of different approaches to using the available waste heat.

Analysis of the factory's electricity use on a half hourly basis provided a clear picture of how some operational changes could save a significant amount of money each year.

Some of the key opportunities evaluated in the energy audit include…

Electricity savings:

Redesigned ambient air cooling system for cooling of tiles before printing, reducing the quantity of cooling air required and therefore the electricity consumption.

Replacing damper control of air flow from a fan with variable speed drive control.

Improving electrical switching to minimise unnecessary operation of process equipment and lighting.

Changing operating patterns for part of the process that does not operate continuously.

Natural Gas savings:

Recovering waste heat from kilns to provide preheated air to the spray drier and horizontal driers

Recovering waste heat from the kilns to preheat the combustion air

Reducing heat loss from the kiln by improving insulation

The evaluation of the heat recovery opportunities required detailed investigation of the various flows of hot air from different sections of the kiln. The investigation included flow profiling and temperature measurement using a pitot tube and thermocouple, to work out what parts of the hot air from the kiln's cooling section were suitable for efficient transport to the the other end of the factory. Pros and cons of the alternative options were outlined, as there were multiple possible configurations for using the waste heat sources.

Often there are simple, low cost opportunities for saving energy, but as Craig Oliver said, "Some of the ideas are not technically difficult, but you have to know where to look to find them. Some of the more complex opportunities have significant potential for savings, but we don't have the in-house engineering expertise to effectively evaluate them." The Energy Audit process allowed NCIA to move from being unsure how to start understanding their energy potential, to having a good basis for decisions on implementation of improvement opportunities.