INTRODUCTION
Encirc, a leading glass manufacturer, has implemented AMETEK Land’s real-time, in-furnace thermal imaging Near Infrared Borescope (NIR-B) to optimise furnace operations and introduce reductions in emissions at its Elton plant in Cheshire, UK.

ABOUT ENCIRC
Encirc is unique. From the manufacturing of container glass, to modern filling facilities, to warehousing and logistics, Encirc is the only company to offer customers a complete supply-chain service. It is based at two sites. One in Derrylin, Ireland, and the other in Elton, Cheshire, UK.

THE CHALLENGE
Encirc was looking for an innovative temperature measurement solution at its glass production plant to replace an existing CCTV system. The company required high-quality images for operators to monitor batch line/flow and improve set up of its 20 under-port, dual-impulse regenerative burners.

Prior to the uptake of a solution, it would typically take Encirc at least four hours to produce a thermal optical profile of a cross-fired container furnace, due to its 20 to 30-minute reversal time. The extended time frame, in addition to significant risk of human error due to the measurement position and limited resources to complete the profile meant temperature profiles often were only taken when it was absolutely necessary, such as quality problem.

INNOVATIVE INFRARED THERMAL IMAGING HAS OPTIMISED FURNACE OPERATION AT ENCIRC

AMETEK Land, in collaboration with Simpson Combustion and Energy and Encirc, won the Innovative Solution category at the annual Glass Focus Awards, held by industry body British Glass in 2017.
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NIR-B GLASS
Near Infrared Process Imaging
For the Glass Industry
1000 - 1800 °C / 1832 - 3272 °F

THE SOLUTION

Thermal imaging was becoming widely accepted by glass manufacturers as a way to extend asset life and optimise their furnace operations. Encirc recognised this and in 2014 installed AMETEK Land’s Near Infrared Borescope (NIR-B) in-furnace thermal imaging system on both furnaces at the Elton plant.

The NIR-B continuously takes over 300,000 optical pyrometer temperature measurements and then generates an extremely high-definition image based on them. With its thermal imaging capabilities, the NIR-B measures critical point temperatures in the crown and breastwalls, providing high quality temperature data to operators.

The NIR-B system offers the ability to measure optical profiles continuously and to specifically obtain all points at the end of the firing cycle.

Even if the system is not recording continuously and a quality issue is highlighted from a cold-end inspection, there is an opportunity to assess the temperature profile at the next reversal (and the following one) to check for differences and points of concern. That ability allows the problem to be addressed within an hour, compared with four hours, or more realistically 24 hours before a manual thermal profile is initiated.

NIR-B Glass thermal images showing 2014 (Left) and 2016 (Right) temperature profiles at end of firing right to left.
EXTENSIVE STUDY
In 2016, AMETEK Land began working with a consulting firm, Simpson Combustion and Energy, to undertake an extensive study and identify the impact of effective temperature measurement on optimising furnace operations for Encirc. That study involved Simpson Combustion and Energy taking port flue gas measurements using AMETEK Land’s Lancom analysers and then analysing that data simultaneously with in-furnace thermal images generated by the NIR-B.

By comparing that information with data from 2014, the study determined that specific regenerators now had restrictions (cold temperatures), with overheating in clear ports indicating higher-than-design port volume flow. Port fuel distribution now was governed by where there was available air for combustion.

The NIR-B showed that the hot spot had moved significantly from its original ideal position, and, in addition, there appeared to be excessive metal-line cooling. The metal-line cooling was turned down slowly to reduce energy consumption as well as reducing refractory wear as part of an asset protection program. When the Encirc team reviewed thermal imaging data with port flue gas measurements, there was a clear indication of a significant restriction in one of the ports, with most of the flue gases going to other ports. Encirc addressed regenerator flow with an external cleaning. It then gave the team the flexibility to start moving fuel to get the hot spot closer to where it needed to be. That resulted in a record pull rate with lower specific energy on an asset that was then approaching a major repair.

Alongside this, images generated by the NIR-B are also a valuable tool for Encirc in supporting customer visits, by clearly demonstrating how product quality is optimised and how emission reductions may be achieved in the future. The clear thermal images of the furnaces

NIR-B Glass thermal images showing 2014 (Left) and 2016 (Right) temperature profiles at end of firing left to right.
NIR-B Glass negative thermal images show cooling. End of firing left to right (Left) and End of Firing right to left (Right).

generated by the NIR-B are projected onto screens in the control room at Encirc plant, providing an extra attraction for Encirc’s award-winning Vidrala Academy

**CONCLUSION**

The extensive study carried out to assess the impact of the NIR-B Glass for Encirc has revealed some very impressive results. The NIR-B’s data was used to improve response times and to identify and then troubleshoot furnace operations, improving yield and achieving higher pull and lower specific energy. So far, a record pull rate has been achieved. That should result in increased asset life. Additionally, the NIR-B helps provide technical support during customer visits and can potentially reduce emissions.

SEE OUR RELATED LITERATURE FOR THE NIR BORESCOPE GLASS:

Encirc Elton plant control room showing NIR-B Glass live thermal images.