

Taming your industrial furnace

What is the first thing that comes to mind when you think of an 'industrial beast'? Lots of equipment would qualify for the title, but we'd like to nominate the furnaces used in the aluminium industry. Here, **Jez Watson***, explains why temperature is a key operation in the aluminium industry.

The diversity of industrial furnaces used in the aluminium industry is vast and identifying the best control option for each and every one can be challenging.

For example, preheating furnaces can be used for rolling aluminium alloy slabs or forging parts and components. Some of these furnaces have capacities of up to 60,000kg. Each furnace has a forced convection system with individually adapted flow management that ensures all parts placed on the conveyor are heated in a uniform manner.

Some furnaces are heated electrically, while others use natural gas. Regardless of the source, heating takes place through the recirculation of the furnace atmosphere. Accurate heating is a central part of the process and the atmosphere flow must be adapted to the size and shape of the forgings, as well as the speed of the conveyor belt. This is another operation where temperature and pressure control are indispensable.

Different types of furnaces are also used during the manufacturing process in the aluminium industry. For example, annealing furnaces are used in the heat treatment of flat rolled products like aluminium coils, plates or foils. Melting primary aluminium ingots is usually done by using reverb-melting furnaces.

Finally, ageing furnaces can be used for the finishing stage, during which plates, forgings and castings go through heat treatment processes called quenching or precipitation hardening by artificial aging. This ensures the final products have the required mechanical properties. Unless heat levels are carefully controlled, the end products might not be up to standards, which would result in significant losses.

The best control option

Depending on the application and equipment, several methods of temperature control can be employed in aluminium processing. Temperature sensors – typically thermocouples and thermowells - digital proportional integral derivative (PID) controllers, thyristor power controllers, solid state relays, melt pressure bolts, as well as data recorders and loggers usually play an essential role in ensuring the accuracy of the heating process.



Jez Watson,
CD Automation UK

In fact, accuracy and repeatability are two of the most important criteria when it comes to selecting the right control equipment for furnaces. Other popular benchmarks include clear display information that ensures the key process parameters are always at hand, ease of programming and ease of use. Depending on the process, additional product features might also come in handy.

For example, an appropriate alarm system can often save a significant

amount of downtime and money. Heater-break alarms on an extrusion line, for instance, indicate if a heater is failing. This information is crucial as an extruder can sometimes have 20 to 30 zones, each with its own temperature control loop. If one loop fails, the two loops either side may compensate to maintain the temperature. In the short-term this may continue to work, but can cause disproportionate stress and reliability issues later.

More importantly, if the temperature within the extruder falls, material could harden or even solidify, causing thousands of pounds worth of damage. By using accurate temperature control and a dependable alarm system, companies can identify problems early, gain enough time to find the best course of action and avoid unexpected downtime.

The biggest cost driver in the manufacture of liquid aluminium is metal loss during the melting process. Intelligent temperature control solutions play an essential role in ensuring the melting process goes according to plan. It also makes the process and control engineers' life much easier, eliminating at least some of the uncertainties.

Aluminium is used in almost anything you can think of, from beer cans to aerospace parts. However, the boom in supply, the rising price of electricity and the falling commodity prices have meant that aluminium manufacturers need to find new ways of staying competitive. Intelligent temperature control is one of the most straightforward and cost effective ways of doing so. ■

Contact
www.cdautomation.co.uk

*Managing director, Thyristor and control expert CD Automation UK