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Temperature Control in Batch Furnace Applications

Application Story

Application

Batch Furnace Applications

Challenge

To achieve consistently high quality within same and multiple batches of products, being processed in large industrial oven and furnace applications.

Solution

Use dual loop controllers with gain scheduling control functionality for advanced temperature precision and accuracy.

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Temperature Control in Batch Furnace Applications

In a batch furnace application, an industrial oven or furnace is used to bake a coating or substrate on to the product. Often, due to the size of the product batch or large product size an industrial oven or furnace with a number of temperature control zones is required.

Batch Furnace Fusion Application for Glass Lenses

Example – As part of the manufacturing of eye glass lenses a batch furnace fusion process is used to apply an anti-reflective coating. This is an incredibly thin layer that is applied to the glass that prevents reflections from the front and back surface of the glass.

In this process the industrial oven is split into 4 zones for the purpose of temperature control. Each zone requires its own control loop to ensure an even temperature is achieved throughout the oven. This is essential for product quality.

Traditionally a master controller was used as a programmer to set the temperature profile for the process application; in this example the ***master*** would then talk to 3 further controllers (***Slaves***), one for each of the zones. Each PID controller would be tuned at a setpoint in the middle of the operating range.

Why Use a Dual Loop Temperature Controller?

There are now products available that bring greater functionality to batch furnace process, improving control and quality. In the above example two dual loop controllers could be used, immediately making a significant reduction on cost. Cost is not the only factor though; the temperature control and quality can also be significantly improved.
By using a controller such as the new Pro-EC44 from West Control Solutions, **gain scheduling** can be introduced to the process.

What is Gain Scheduling?

Gain scheduling is used for applications that have a wide setpoint range or where thermal conditions change in the working range e.g a vacuum furnace changing from atmospheric pressure to vacuum. With gain scheduling you are able to tune for multiple set-points during the process allowing you to effectively tune for the different ranges throughout the process

Typical Batch Furnace Applications

- **Coatings for metal substrates such as alloy wheels to protect against abrasion**
- **Scratch resistance and anti-reflective (anti-glare) coatings for glass lenses**
- **Glazing on ceramics such as tile finishes to prevent wear and corrosion**

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This results in much greater precision with the temperature control, improved performance and thus better product quality. With a controller such as Pro-EC44 you can tune up to 5 PID sets automatically called within defined temperature bands allowing for a wide range of setpoint variation or changes in conditions.

Batch Furnace Data Monitoring and Analysis

To effectively monitor a batch furnace application, data about the whole process, including each of the temperature zones must be able to be quickly and easily understood. It is worth considering that users generally find graphical representations of data quicker to digest and understand rather than having to read text descriptions to determine the process status.

In the example above, the introduction of the Pro-EC44 brought further benefits. Its innovative text/ graphic display screen is designed to provide users with important process information in one place, meaning 2 loops (2 temperature control zones) can be monitored at a glance, on one screen.

The dual temperature controller, further supports data monitoring for a batch furnace application with its color change green/red backlight ensuring easily recognizable alarms. This helps to increase response times to process issues allowing faster corrective action.

Data Logging of Temperature Control

For many batch furnace applications it is not only important to monitor temperature control data, but there is also the requirement to log data. An audit trail and/ or proof of batch control is increasingly important to meet industry standards.

Temperature Control Functionality

- **Profiling**
- **Master / Slave Communications**
- **Gain Scheduling**
- **Data Logging**

This is especially true if your company manufactures parts or components that require a **quality control system** which documents historic data for your sellers.

In our glass lens example above the organisation wanted to log the temperature data for their own internal quality monitoring process. The Pro-EC44 was able to save costs through its in-built data logger. The ability to download data log files locally via the front USB port in addition to using the communication tools proved an unexpected advantage in the day-to-day running of the process.

To find out more about how moving to a dual loop controller would benefit your batch furnace application please request a call back from a member of our highly experienced, technical sales team.

West Control Solutions is a global specialist in temperature and process control instrumentation. Through its four leading product brands, CAL, West, PMA and Partlow, it has been supplying the industrial and scientific industries with reliable, easy-to-use temperature control equipment for over 100 years. For more information on the temperature control product range from West Control Solutions please visit **www.West-CS.co.uk**.

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