IR CURING SHOPTALK

Infrared Equipment Division of IHEA

This column is provided to you by members of the Infrared Equipment Division (IRED) of the Industrial Heating Equipment Association (IHEA). The group includes infrared (IR) curing equipment suppliers from throughout North America. We publish the column three times a year to give you the latest information about IR curing techniques and equipment. Contact information is at the end of the column. Most IR manufacturers offer testing for free or for a fee. Any IRED member can assist you in finding solutions to curing problems and best practices for finishing of coatings. This issue's column was submitted by IRED member Chris Chapman on behalf of Heraeus Noblelight, Buford, Ga.

Gas catalytic IR — The unintended consequences

When customers initially contact an infrared (IR) supplier to talk about powder coating, they usually have a very real need for a solution to a very real problem. The initial idea can come from many different directions, perhaps the need for added capacity, or a step change in the level of quality, which is either demanded by the customer or an internal need to reduce rework and scrap. Occasionally, companies have never powder coated products themselves, but always outsourced and now wish to establish better control over the process and their delivery times. Whatever the need, years of experience building systems has shown that the customer always ends up not only solving the original, well-identified, and quantified problems, but also ends up realizing major gains and advantages in areas that they never, ever predicted.

Starting the discussion

The initial conversation between customers and suppliers about new powder coating ovens usually revolves around cost and ballpark figures. The unsurprising conclusion of these initial discussions is that a conventional convection oven will cure powder on parts with a lower capital outlay. As you would expect, though, there is a big "but" attached to this statement. What usually follows is a conversation about how IR typically requires 50 percent less space, uses 50 percent less energy, and cures powder in a third of the time. Then the discussion normally converges on two indisputable facts: 1. Convection ovens are often a blunt, but effective, tool that is unsophisticated in operation and expensive to run. 2. IR is a sophisticated, precise process that is highly controllable with a higher capital cost, but much lower running costs.

Sometimes, customers are fearful of a technology that they have never used before and unsubstantiated doubts can gain root. However, it is vitally important to remember that IR is not simply a replacement process for powder coating by convection, but a significantly improved process that is capable of delivering much more and can have a big impact across the complete manufacturing system. These unintended consequences are not always envisaged by customers, but are very welcome none the less. The ultimate decision to invest in an IR system is most often made after thorough testing. To illustrate the unintended consequences of IR, let's take a look at a recent installation that demonstrates the wider impact.

A real-world case study

Recently, Metsa Inc., Monterrey, Mexico, a premier manufacturer of domestic propane tanks in North America, approached Heraeus Noblelight with the main goal of increasing production due to US market expansion. Heraeus Noblelight, Buford, Ga., manufactures and supplies natural gas or propane fired industrial catalytic heaters that emit IR heat through a safe, flameless heater technology.

There were three underlying issues that needed to be addressed for Metsa to achieve success. First, their existing powder coating process utilized hand applied powder, cured in batch convection ovens, and could not keep up with demand. Second, it was difficult to achieve a consistent cure on the heavier collars and angular feet of the tanks, which are made from a thicker steel section than the rest of the tank. Third, they had the never-ending drive to reduce operating costs.

The first major decision was to move from an LPG (liquefied petroleum gas) batch powder coating convection oven to an inline continuous flow (0.75 to 1 meter per minute) natural gas catalytic IR system. This move alone would have a significant impact on production volume. This simple change could have been achieved by installing a conventional, relatively low cost, convection oven. However, lack of available space was an issue.

The move to gas catalytic IR not only solved the space problem, but it also allowed the oven to be split into 10 separately controlled zones. Each zone is PLC controlled, enabling stable, vertically programmable output heat distribution in each of the 10 zones. Just think about the infinite number of profiles that can be created, saved in the memory of the PLC control, and recalled and activated within a few minutes. Also, remember the lack of consistent cure on the collars and feet of the tanks? Problem solved! This is one of the features that sets gas catalytic IR apart — It has the ability to precisely control the application of IR heat to the point where it is needed most.

Unintended consequences

The main problems that were initially outlined by Metsa were resolved by installing the natural gas catalytic IR system. Production was increased to meet demand, and a potential quality problem was solved. In addition, several other benefits were achieved after the system had been installed and integrated into the complete manufacturing system at the customer's plant.

- Problem solved: The move from LPG to natural gas reduced unit energy costs. *Unintended consequence:* The new IR system was so efficient that it resulted in an overall 75 percent drop in energy bills, even after taking the increased production into account.

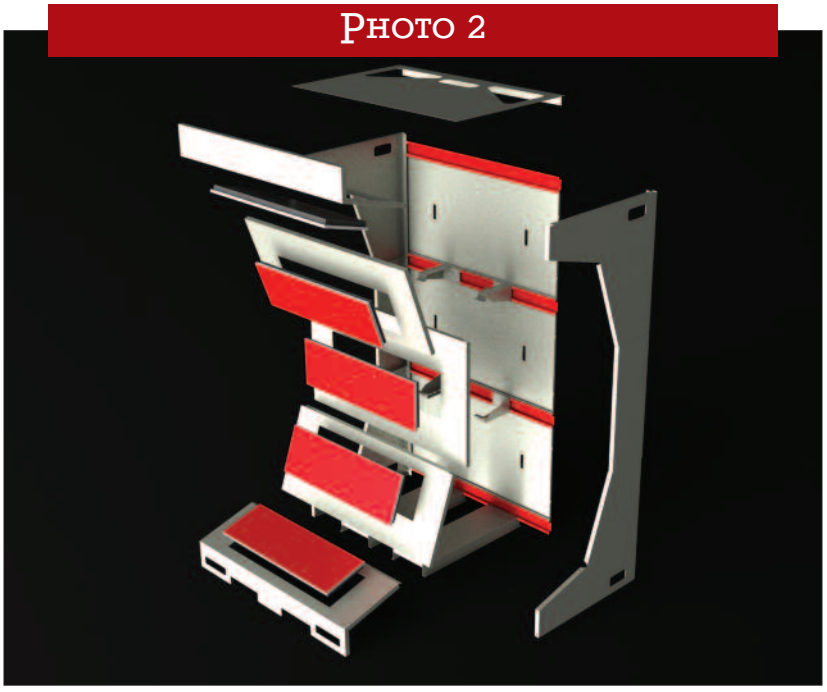
- Problem solved: The increased production output was achieved. *Unintended consequence:* It required no increase in labor overhead.

- Previously unidentified problem solved: Cool down time — Because IR heats the coating, the entire tank does not have to reach the cure temperature. This allows for reduced dwell time in the IR oven and ensures that the tanks cool down much more quickly than the old process.

- Previously unidentified problem solved: Moving tanks outside to cool — The faster cool down means that external fittings can be added to the tank while still on the production line. Previously, the tanks were moved outside as they took so long to cool down. This involved extra handling of the tanks that is no longer required.

PHOTO 1

PHOTO 2



Lessons learned

It is clear that there have been many positive improvements that were not envisaged at the start of this real-world example. Most of us do not like surprises when we have just made major investment decisions, but extra cost savings are always a welcome bonus.

Overall, there are some takeaways our company has learned over the years that are worth sharing. The largest being that IR is not just a "like for like" powder coating oven replacement. IR is a sophisticated replacement option that offers a

Photo 3

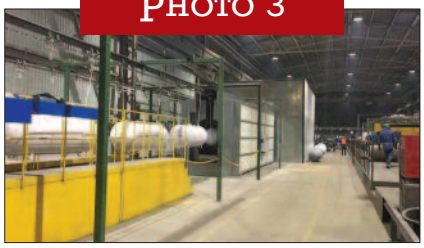


Photo 4

Photo 5

Photo 6

level of precision over a powder curing process that is simply out of the reach of conventional convection ovens, whether they be batch or continuous flow.

In addition, the three main advantages of IR are reduced size, lower operating costs, and increased output. However, there are even more potential unintended savings hidden in this process. For starters, take a close, critical look at your powder coating line to check:

- Current space utilization. Consider what you could achieve if your powder coating oven was half its current size.
- Operating costs. If you could produce the same output for half the cost or double the output for the same cost, what would the overall impact be?
- True cost of quality. Are you reworking parts? If so what percentage? Calculate the cost in terms of labor, materials, time and lost production.

Test and test again

If you think that you could benefit from IR, then carry out some controlled testing. Several suppliers as well as local utilities have test centers worldwide. A good test center will allow you to run detailed tests on your products and help you to quantify the many potential improvements.

Build up a spreadsheet of your current cost model and run some "What if" scenarios. A look at the potential bottom line improvements can be very compelling. Even when you have installed your new line, you will probably find an improvement that you had not thought of previously. There are always positive unintended consequences when installing IR. **PC**

For more information or to submit a question, contact Anne Goyer, executive director of IRED, at 859/356-1575; anne@goyermgt.com; http://www.ihea.org/?page=IRED.

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