

Case study

Powder Coater Gets Boost from Infrared

Catalytic infrared oven improves speed, flexibility, and quality

Problem: Progressive Powder Coating in Mentor, OH, powder coats a wide range of products of differing sizes, weights and thicknesses. Because it takes longer to

cure thicker pieces than thinner pieces in a traditional convection oven, Progressive was experiencing some troubling bottlenecks that were slowing down line speed and hampering production.

Solution: By installing a catalytic infrared booster oven between the powder coating booth and the convection oven, Progressive increased line speed, productivity, and energy efficiency. Further, the booster oven added flexibility as some products could now be fully cured in the infrared oven. Product quality also improved because the infrared oven pre-gelled coatings prior to curing in the convection oven.

Product weights at Progressive Powder Coating in Mentor, OH range from under one pound for light items such as bookends and magazine racks to heavy products such as salt spreaders and trailer

“I’ve been in the business for 33 years. Infrared ovens have been around for a long time, but I think they’ve finally hit on something that really works. I endorse it 100%”



John Sikora, General Manager, Progressive Powder Coating



Photo courtesy of Gas Technology Institute

PROGRESSIVE POWDER COATING

CATALYTIC INFRARED OVEN IMPROVES SPEED, FLEXIBILITY, AND QUALITY

Infrared booster oven improvements:

- Minimum line speed up from 4 fpm* to 6 fpm
- Production up more than 50 percent
- Gas usage per piece down 15.5 percent
- Gas usage per pound of product down 6.8 percent
- Line speed never goes below 6 fpm when IR oven operates
- Pre-gel capability improves product quality

*feet per minute



Thick items such as trailer hitches and truck frame components slowed line speed, hampered production, and compromised product quality.

hitches. The range in metal thicknesses means a range in curing times that was causing a production bottleneck as the line had to be slowed for the thicker pieces. All pieces placed on the line after the thick pieces were subject to slower line speeds and heated inefficiently.

To solve the problem, Progressive installed a 40-foot catalytic infrared

booster oven, designed and engineered by Vulcan Catalytic Systems, between the powder coating booth and the convection oven. The booster is used to pre-gel and cure powder coatings before they enter the traditional convection oven. The results have been excellent: line speed increased from 4 feet per minute (fpm) to 6 fpm, production improved more than



Designed and engineered by Vulcan Catalytic Systems, Progressive's 40-foot catalytic infrared booster oven was installed between their powder coating booth and the convection oven.

50 percent, and energy efficiency improved as some pieces can now be completely cured in the infrared oven. Further, because the infrared oven can pre-gel the powder coating before the piece enters the convection oven, less powder is shaken off by the conveyor or blown off by the convection oven turbulence before gel temperature is reached, and product quality improves.

What is natural gas catalytic infrared?

It is a flameless heating technology that produces a uniform, low-intensity heat. Its medium- to long-wavelength energy is readily and evenly absorbed by a wide range of materials, including powder paints. The wavelength of the infrared light determines the temperature the source will receive: The longer the wavelength, the lower the source temperature. Natural gas infrared heating is adjusted by using different wavelengths of light in the infrared spectrum band.

The technology works on a diffusion process in which gas and air meet at a catalyst sandwiched between two layers in counter-diffusion mode. Because heat is transferred by radiation rather than convection or conduction, only the surface of the part and the powder

must be heated rather than the whole part. Since the infrared oven has no blowers or fans like a convection oven, the process uses up to 70% less electricity, and up to one-third less natural gas, depending on product mix. The technology is also environmentally friendly and can help reduce overall emissions.

Convection alone was no cure

Before installation of the infrared booster, Progressive was using a traditional convection oven to cure the powder coats. The curing oven was approximately 128 feet long, with two 60-foot zones and an eight-foot wrap around section. This length is typical for a facility such as Progressive and is required by the wide range in their product mix. Even the long curing length

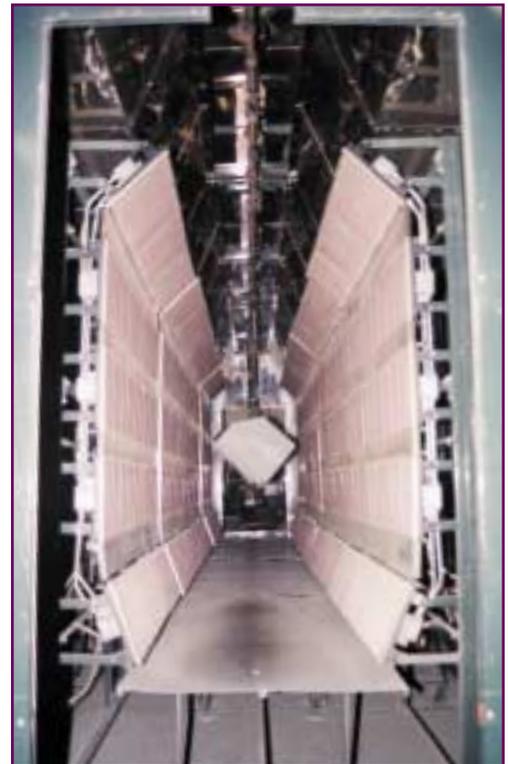
LIGHT-WEIGHT MATERIAL TRIALS

(fully cured)

- **Two-hour trial run through each oven**
- **Line speed held constant at 10 fpm***
- **Piece count held constant at 6.6 pieces per minute**
- **Gas savings 24.4 percent over convection oven**

*feet per minute

A flameless technology, the catalytic infrared oven uses a catalyst to produce a uniform, low-intensity heat. An array of movable catalytic heater panels lines the infrared booster oven installed at Progressive Powder Coating.



of the furnace, however, was inadequate to fully cure the thickest parts at standard speeds. The line had to be slowed down to 4 fpm to fully cure the powder coating.

Under these circumstances, the thinner pieces were actually more costly to run than the thicker. Data collected over a period of time showed that daily gas usage was fairly consistent at 1.8 to 2.4 mcf per hour of operation, regardless of the mix of products that were actually cured that day. The temperature of the convection oven, even if set at lower temperatures, cannot be set below the required curing temperature. Line speed can be increased for the thinner pieces, but must be slowed to adjust to the thickest piece entering the oven.

Further, production flexibility was a big problem. The convection oven needs time for any new temperature to stabilize before it can be used effectively. If thinner pieces are in the oven and there is a change to thicker products, spaces must be left on the conveyor to allow for the temperature in the oven to rise and the thinner products to exit the oven. If this is not done, the thinner pieces can be over cured or burnt and the first few thicker pieces under cured. Either way, product quality suffers.

Booster oven benefits

The natural gas catalytic infrared booster oven has increased flexibility, line speed, and quality, while also decreasing energy



The Gas Pulse Control Panel can save process recipes and recall the heating profile for future use.

consumption. Because thicker pieces can be pre-gelled or partially cured before entering the convection oven, line speed can be held at 6 fpm rather than dropping to 4 fpm for the thicker pieces. Overall production has improved more than 50 percent. Because some pieces can be 100 percent cured in the infrared booster, the convection oven can be throttled back and the energy savings of the infrared exploited. As a result, gas usage is down 15.5 percent per piece and 6.8 percent per pound of product. Additionally, because the booster oven is only 12 feet away

from the powder coating booth, very little loss of powder occurs as a result of conveyor vibrations or other conditions.

Progressive continues to optimize the proportion of infrared heating

versus convection heating that will deliver the highest efficiency and production. Experimentation on thinner products has already resulted in line speeds as high as 12 fpm, and Progressive is looking into additional ways to fully utilize the infrared oven. Progressive Powder Coatings now has the ability and flexibility to explore new opportunities to improve production, energy efficiency, and meet its customers' needs using natural gas catalytic infrared—the new benchmark for infrared heating and powder coat curing.

Thinner pieces can now be cured at line speeds as high as 12 fpm.



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Find out more

Natural gas catalytic infrared is a proven technology that can reduce costs, increase production, and improve product quality in most applications where electric infrared heaters are used. To find out more about natural gas catalytic infrared heaters and what they can do for

your application, call your local Dominion Account Manager, visit our Web site: www.dom.com