

LUMINARY MANUFACTURER SEES THE LIGHT



Catalytic Infrared Pre-Gel Ovens Prove Superior to Gas IR Burners for Quality, Control and Efficiency

Visioneering Corporation, Canada's largest independent fluorescent lighting manufacturer, depends on consistent and high quality powder coated products for their businesses to succeed. They have used infrared burners to gel their powder prior to entering their curing oven for over 15 years, but knew that there had to be a better way.

They found the solution by upgrading to a different form of infrared process heating using the new state of the art gas catalytic infrared heaters in a versatile and efficient Pre-Gel oven. This is their story.



BACKGROUND

Company: Visioneering Corporation of Toronto, Canada

Interviewed: Mr. Steven Anderson -Director of Operations;
Mr. Norman Minhas and Mr. Jay Teles -Paint Line Supervisors

This is a private company founded in 1952.

Facility: 210,000 SF, new Powder Coating Pre-gel and drying oven line installed in November 2011 to replace older finishing line that included high radiant infrared burners.

Web Site: www.viscor.com

Products: Canada's largest independent fluorescent lighting manufacturer.

Parts for Coating: Approximately 10,000 different steel and aluminum parts in a variety of sizes and shapes. Smallest parts are 1 square inch and largest are up to 1,200 square inches and 4 ft. high by 14 ft. long.

Production Flow: The nature of the product demands multiple runs of very small batch sizes throughout each day.

Conveyor Speed: 8-16 ft/minute depending on part loading

Colors: Polyester powder in 3 standard colors with an addition 12 variations.

First Step: Decide that it is Time for a Change

Visioneering had recently made a substantial capital investment in computer aided and robotic production. Their highly accurate metal fabrication processes must also be coupled with the highest quality finish on their end products. Luminaries are lighting fixtures which must not only have pleasing to the eye appearance, but other critical optical properties. The desire to increase production and achieved the highest quality in the industry drove them to seek expert advice for a solution.



Quality, Flexibility and Efficiency

Steven Anderson, Director of Operations of Visioneering Corporation, was well versed in process heating and infrared technologies from his industrial experience. The powder coating finishes for his company's light fixtures must have a high degree of consistency in color, gloss and reflectivity. Stringent industry standards must be met for thousands of parts per day. "The existing curing ovens were the manufacturing bottleneck and there was no way we could turn the heat up any higher to run the line faster as this would create quality issues. Over curing would certainly create problems." He also added that, "We had a much older style of infrared at the beginning of the oven. We knew the technology had some benefits, but it wasn't designed to encompass all the sizes and shapes that we have in our products. We needed to surround the parts with infrared from angular directions so that we could effectively cure the parts from top to bottom."



The Evaluation Process

Second Step – Testing at Oven Supplier

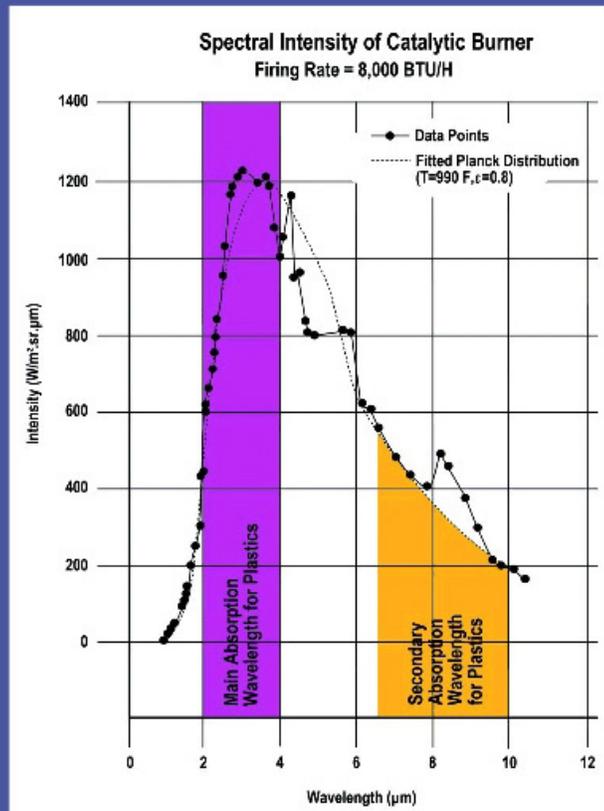
They contacted several potential suppliers including Vulcan Catalytic Systems, an IHEA/IRED member company who was a manufacturer of both heaters and ovens. This infrared equipment manufacturer was well versed in the application of powder coatings with extensive experience having supplied many ovens and complete powder coating lines. Vulcan also provides testing to help evaluate new powder coating applications.

After a preliminary discussion, Anderson brought their own powder and parts to the Vulcan pilot oven test facilities. These parts were coated in the continuous gas catalytic infrared oven and proved the value of the technology. Parts were fitted with thermocouples and various temperature profiles were analyzed.

Anderson stated that, "They were very experienced with IR curing and within 2 to 3 hours of testing I was extremely convinced that this technology will give us the proper gel that we needed in order to have improved efficiency for our process."

HOTTER IS NOT BETTER

- Natural absorbance wavelength for organic substances – water, epoxy, polyester, ABS, Acrylic, is 3-4 microns.
- Maximum energy output from Vulcan's' Catalytic Heater matches these absorbance wavelengths.
- Net result is a diffused, "Soft Heat", as opposed to higher temperature heat sources that emit a wavelength that is shorter, more intense with more convection – inefficient heat source.
- Quickest method to heat "heat sensitive" materials without burning the coating, is to match absorbance with emittance.



Third Step- Oven Design

The next step was a dialogue as to the materials to be coated, the line speed, part loading and part sizes to help design the infrared oven. The overall heat load was determined by the number and weight of the parts to be coated per hour along with the rate at which they are to be cured. The material to be coated is also critical to calculate the heat required as the capacity to absorb heat varies greatly for different materials. For example, aluminum requires 36% more heat than steel to increase the same amount in temperature per pound (Steel 0.165 BTU/lb°F and Aluminum 0.225 BTU/lb°F). The target temperature and dwell time is a function of the powder being used.

The layout of the oven was then determined by using a part window analysis. The infrared heaters are positioned around the part window in this analysis to ensure complete coverage of the largest part. The oven is then designed around the placement of the heaters.



Once the testing was complete and the oven design established, the powder Pre-gel ovens using the gas catalytic infrared heaters were quoted. The Visioneering Pre-Gel oven is 24 ft. long and has 8 zones of control.

The typical zone profile Visioneering uses for different sections of the oven with infrared heater output is as follows:

	Section 1	Section 2	Section 3	Section 4
Top	50%	45%	45%	44%
Bottom	75%	76%	76%	65%

This temperature profile is typical in other Pre-Gel ovens as the higher intensity helps to rapidly start to gel the powder. The settings are then lowered in the following sections to allow the heat to soak into the parts as the gel is completed and curing begun. The top zones also typically need less infrared output as the convective heat rises to provide a boost to the infrared heat. The parts then travel from the last section into the convection oven to complete the powder curing process.

Once the decision was made to proceed with the conversion to powder coating using the gas catalytic infrared oven, the complete specifications were established and purchase was made. The Pre-Gel oven utilized the same footprint size as what it replaced.



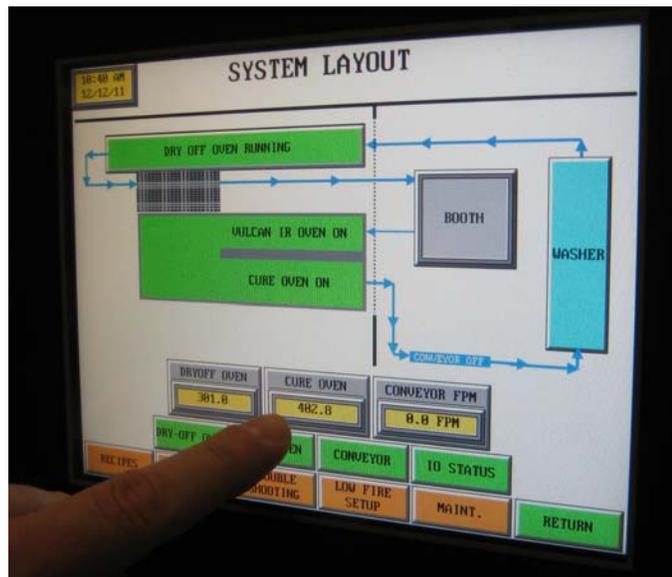
Installation

Visioneering was very pleased with the short amount of time needed and the ease of installation.

The light weight modular sections are a design feature of the oven which allowed for easy shipping and handling during installation. The modular sections were each easily moved into place with pallet jacks. The oven was assembled by moving the right and left sections in place for final assembly around the existing conveyor line.

The Visioneering Pre-Gel oven was installed over one weekend with no down time or loss of production.

The control panel for the Pre-Gel oven was integrated into one control panel with their cure and dry-off ovens using the same interface. This allows them to control their entire system from one location.



Results

Quality

Visioneering is extremely pleased with improvements in quality and attributed the improvements to the fact that the infrared zones are now controllable, provide a soft and continuous energy blanket and are angled to “hit the tops, sides and bottoms of parts to effectively cure the entire part at the same temperature. We set the initial zone at a higher IR setting which gets us a quick gel at the entrance that allows us to keep our coating from getting too hot as it goes through the oven. If we had all zones set the same, we would be cooking our product and it would actually be over cured.”



Anderson continued by saying the new system, “helps us be more precise in our control. This has been extremely beneficial for our color consistency on the same part and for the same parts being run at different times of the day.”

“For lighting, the primary color is white. We have high gloss and flat or matte finishes. A matte finish in one of the most challenging finishes where the oven settings are very crucial to achieve a consistent finish. This type of finish will have its appearance fluctuate with only a few degrees in temperature variation. We need to keep our gloss level under control. Consistent curing is the key to maintaining the desired gloss level, and now we have it. Many of our luminaries utilize indirect reflectors that are precision formed and contoured to provide soft, low-glare, indirect illumination. Maintaining a constant cure provides the desired and consistent reflectivity from our powder coating, and is what gives our product the proper light output. These are stringent industry standards and we have to confidently manufacture thousands of light fixtures for our customers.”

The results are obvious and measurable as, “We now have less than 1 delta E off the scale of what our master settings are. This is the first time we have been able to attain this high level of consistency in 15 years. These are huge, huge quality improvements for us.”

Oven Operation and Operating Costs

The quality improvements are significant as are the resulting efficiency and anticipated operating cost savings.

Visioneering now has the ability to improve quality and double their line speed to up to 16 ft/minute. They also expect their gas bill to be cut by over 30 percent. Anderson stated, “The energy savings are substantial as the new Pre-Gel oven allows us to cure our product at a much faster rate than what our previous ovens were able to do.”

As for the specific benefits, “Part of the decision of going with Vulcan was their design and the other part was the efficiency. The way the Vulcan heaters pulse themselves, we can now modulate the heaters as needed.”

Jay Teles, Paint Line Supervisor added, “Our production bottleneck is no longer the curing process. Our new found flexibility is allowing us to tailor our oven settings for each part based on powder used, part size and thickness where with a little testing we establish a part process recipe. We now also run the curing oven at a lower temperature and we have greatly improved the color consistency.”

Norman Minhas agreed, “The parts now gel and cure better and faster than before. Since the parts gel faster we are able to run the curing oven at a lower temperature.”



Summary

Infrared process heating technology has been around for many years and there are many different types and ways to utilize it. Whereas medium wave gas IR burners work very well for some applications like web drying, they are not the best option for powder gel and curing ovens. Gas catalytic infrared provides the optimum infrared wavelength and controlled output to improve the quality and efficiency of a powder curing process. It provides for a controlled and rapid gel of a powder which allows for a lower temperature cure in a shorter time period. Strategically placed heaters with the ability to modulate at various output settings maximizes control which results in the most constant and highest quality powder coated parts.



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