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by Ed Sullivan

Why Infrared Heating Stands Apart

Infrared ovens are said to deliver more precise heat application, greater speed, and superior control over key industrial heat treatment processes.

What manufacturing process today does not require the application of heat at some point? From heating, drying, and curing, to thermoforming, annealing, potting, and more, almost every product created today requires heat at some point.

Heating applications run almost the entire gamut of applications. They include drying of paper pulp, transformers, screen print, powder, paint, concrete blocks, ceramic, fiber, biodegradable waste, polycarbonate sheets, adhesives, packaging, and even pet food. They also encompass preheating plastics; thermoforming plastics; finishing and repairing aircraft parts; annealing metal and plastic products to increase their ductility; potting (encapsulating) electronic components; and preheating corrugated metal. Also in this category are warming and thawing pharmaceuticals; welding and vacuum-forming plastic; textile finishing; and curing.

"Almost everything that is built or sold requires heating somewhere along the line," points out Jesse Stricker, founder of **Intek Corp.**, a manufacturer that specializes in designing and building electric infrared heating elements, along with industrial ovens into which they are placed. "Ultimately the application of heat translates into making a better product—whether that involves strengthening metals and plastics so they are more durable, softening material so it can be properly formed or manipulated, or speeding the curing process to increase production."

Since the amount of infrared energy varies at each wavelength, manufacturers can adjust the wavelength of electric infrared heaters to match the heat requirements of a given substrate in the oven for optimum performance and control. Infrared heating also offers very fast response times, which is beneficial when holding precise temperature uniformity.

The Union, Missouri-based Intek represents the modern trend toward engineering efficient and precise infrared heating systems that are quickly supplanting conventional gas and electric ovens as the go-to choice for this important step in manufacturing.

The company offers everything from custom heating elements, standard and custom industrial ovens (including refurbished ovens), conveyor ovens, and even industrial space heaters. Although Intek can design and build an oven using any heat source (gas, electric and/or convection), the company stands out most in its application of infrared heating elements. For Stricker, this is more than an area of specialization; it is about the benefits and cost savings that infrared heating can deliver to manufacturers.

"Because an infrared heater has no moving parts and radiates so effectively, it consumes far less energy than a conventional oven, which requires a fan and blower," notes Stricker. "Infrared elements can even be retrofitted to conventional gas and electric ovens for further cost-effectiveness. One customer saved close to $100,000 because instead of replacing their entire gas oven, they chose to install electric infrared heating elements designed to fit their application."

According to Stricker, most customers initially look at "standard" ovens, but end up with a solution customized to fit their specific needs. Such was the case for Cooper Standard, headquartered in Novi, Michigan. The company is a major global supplier of systems and components for the automotive industry.

"Today we use the infrared heating after our injection molding press that makes appliqués for automobile exteriors," says Jim Anderson, engineering manager at Cooper Standard's

Every foot in an Intek conveyor oven can be zoned for maximum, continuous process heating efficiency, monitored by a thermocouple in each zone. Photo courtesy of Intek Corp.

Rockford, Tennessee plant. "We used to do our batch annealing in a gas oven, but that was a two-hour process."

Like many other manufacturers, Anderson's plant discovered that infrared surpassed gas and electric convection heating by way of its proven precision, speed, and energy savings. Aside from these advantages of using infrared for industrial process heating, the economic benefits seem to tip the scales even further toward that option.

"We worked with Stricker at Intek to design an oven to meet our product needs, bringing that particular step from hours [using the batch ovens] down to minutes," says Anderson.

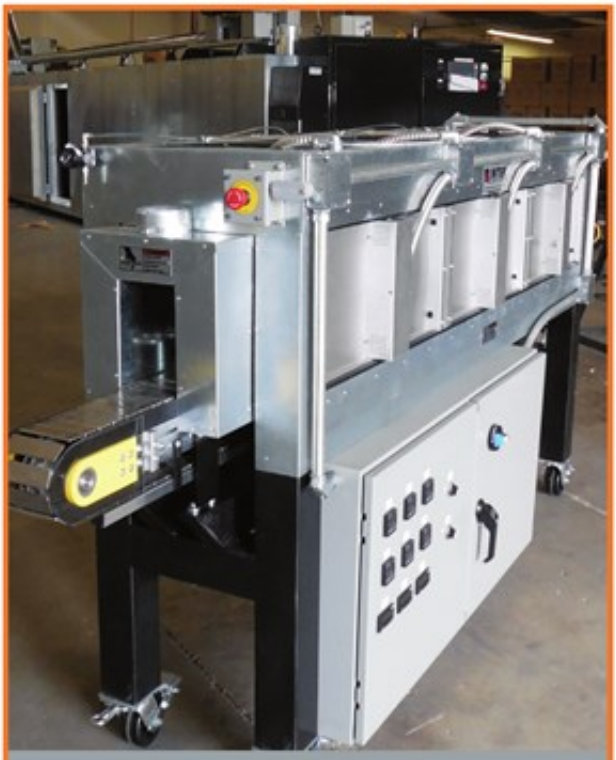
Lower production costs

Given that heating plays such an important role, the switch to infrared ovens can yield substantial savings—from reduced energy bills to reduced floor space requirements—for any manufacturer.

Gas fired ovens generally transfer heat by convection and hence require fans or blowers, with much wasted energy lost in the process. Additional losses stem from the requirement for heating the entire oven, even for small parts. Electric convection consumes even more excessive quantities of energy to produce its heat.

In contrast, electric infrared heating elements transfer energy to the substrate surface area via electromagnetic radiation and, thus, can operate in a vacuum and never come into contact with a part or material—all while generating temperatures approaching 1000 degrees Fahrenheit or more.

"People assume that gas is the cheapest way to heat, but that's not necessarily the case," says Stricker. "When considering cost,



Intek Corp. is engineering efficient and precise infrared heating systems that are supplanting conventional gas and electric ovens as the go-to choice for manufacturers. Photo courtesy of Intek Corp.

it is important to include all costs: equipment purchase price, energy cost, installation cost, floor space required, maintenance cost, et cetera."

On the other hand, electrically-heated infrared elements yield as much as 86 percent of their input as radiant energy that strikes the surface of a product, according to the 2008 edition of the *Heating, Ventilating, and Air-Conditioning Systems and Equipment Handbook*. Some designs may be as high as 95 percent in the form of useable heat, with the balance being lost through the power supply lines.

"Duty cycle also factors into efficiency," continues Stricker. "For instance, if you buy a 70 kW conventional oven and assume, for example, a 10 cents per kilowatt-hour energy consumption, that comes to $7.00 an hour. But consider how often it is actually firing and consuming energy compared to how long product is inside. Whereas, an infrared oven might only need to run at a 40 percent duty cycle, so heating cost would drop to $2.80 per hour in this scenario."

Greater control

Since the amount of infrared energy varies at each wavelength, manufacturers can adjust the wavelength of electric infrared heaters to match the heat requirements of a given substrate in the oven for optimum performance and control. Infrared heating also offers very fast response times, which is beneficial when holding precise temperature uniformity.

"We are finding that one of the main reasons engineers come to us for an infrared solution is that this technology can be customized to provide exacting control for any particular product," says Stricker. "Every foot in a conveyor oven path can be zoned for maximum, continuous process heating efficiency, monitored by a thermocouple in each zone."

More flexibility

If anything sets Stricker and his team of engineers apart, it's their ability to take advantage of one of infrared's most useful characteristics: its adaptability. Whether used in batch ovens, walk-in ovens, or conveyor systems, infrared can apply.

"We made our name through our ability to apply infrared technology to a broad range of industrial applications," Stricker explains. "So a plant manager can come to us, have us check out their gas or electric ovens, then we go back to our plant to design and build an entire oven system, or, as a cost advantage, provide patented modular infrared replacement units for existing ovens which may still just need a performance upgrade. The customer participates in the design and then selects the solution. This can save tons of money."

Electric infrared heater modules—typically in 12-inch x 24-inch, 12-inch x 36-inch, or 12-inch x 48-inch sizes—become structural members of the oven. They can be designed to work individually for small areas, ganged together for larger areas, or even ceiling hung or wall mounted.

"Because almost every process requires heating or drying at some point, we're keeping very busy these days building our patented custom infrared ovens, modular heaters, and elements" says Stricker.

Quite a success story for Intek (intekcorp.com), an operation that started small in 1996.

Ed Sullivan has written about high technologies, healthcare, finance, and real estate for over 25 years.