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Short-wave infrared curing: a proven path to energy cost savings in industry

Industry is stepping up efforts to cut energy consumption and energy-related costs. Curing is an energy-intensive process accounting for a major proportion of energy costs in many industries. Infrared curing offers considerable cost savings in this critical area.

The industrial sector is the dominant global consumer of energy. The sector uses more delivered energy than any other end-use sector, consuming about 54% of the world's total delivered energy.*

Energy consumption is a major cost for industry, which is actively seeking energy cost savings. The automotive industry has spearheaded this trend and has put energy costs under the microscope. Many studies have shown that up to 70% of automotive assembly plant energy is consumed in the paint shop.

Infrared curing, or more specifically short-wave infrared curing, offers substantial savings for industry in paint lines and many other applications. The benefits stem not only from the characteristics of the technology itself, but also from how it is optimized in heaters to obtain maximum effect and efficiency, and achieve maximized energy cost savings.

* U.S. Energy Information Administration | International Energy Outlook 2016

Why choose IR curing?

IR (infrared radiation) provides the greatest heat transfer of all forms of electro-magnetic radiation. IR is divided up into short-wave, medium-wave and long-wave IR radiation. Heating using short-wave-radiation provides much greater intensity than heating with long-wave radiation. Short-wave IR has thus been adopted in different types of industrial heating processes.

Short-wave IR heating saves energy in industry because of short curing times and minimal heat loss—the lamp reaches full power within a second and cools down just as fast.

Only the target area is heated, not the surroundings, which minimizes energy losses and shortens drying times. However, there is no loss in the quality of the end finish.

Heat losses to the air are minimal, as energy is transferred immediately to penetrate deep into the paint—medium-wave, long wave and hot air curing primarily cures the surface. Using short-wave IR curing, the paint cures from the inside out without retaining solvents and moisture that can cause quality problems.

Solutions from IRT Industrial Curing

All IRT dryers use short-wave IR technology. This, together with IRT Freeform reflectors, provides the most effective heat transfer for industrial curing processes.

The short-wave range is 0.76-2 μm (approx. 1176°C-3538°C). Our equipment is in the center of this span to ensure maximum possible shortwave energy within the shortwave range; 1.2 μm , 2176°C. By peaking in the short-wave range in combination with highly flexible intelligent software, IRT secures versatile heating transfer advantages for all industry requirements.

IRT's experience in infrared technology for automotive and industrial curing dates back to 1967. IRT heaters have two main parts—the lamp and the reflector. The company was the first to use a combination of an infrared lamp and gold-coated reflector in curing.

Every aspect of our systems, from fans to gold-coated Freeform reflectors, is designed to ensure high performance and low energy consumption over a long service life. A fan keeps the lamps cool and increases their working life up to more than 20,000 operating hours.

Asymmetric Freeform reflectors were introduced in 2009—a unique design that delivers more even heat distribution in high-precision curing. This gives our lamps unsurpassed drying capacity. Freeform reflectors provide more even heat distribution and a larger curing area than conventional reflectors, which reduces power consumption, increases productivity and raises the quality of the drying result.

IRT remains the only company to use 24-carat gold-coated reflectors behind short-wave lamps in curing processes.

IRT short-wave IR technology can be configured into electric installations, a comparatively clean form of energy, providing industry with a versatile tool, that wastes no energy in achieving the best possible results.

As the 24-carat gold-coated reflectors are very effective and energy-efficient—reflecting up to 98% of shortwave radiation—they have become a highly successful and effective drying solution.

The level of precision control is also extremely high. All energy is used, but it is also used precisely under close control for optimized high-quality results. Heating begins instantly at the exact requested moment. The exact requested temperature is reached within the predetermined time and pre-programmed heating curves are followed exactly. The technology works with the same precision at any power setting. The heating process ends when the requested output result is reached.

Combined with the advanced and user-friendly technology of IRT dryers, short-wave IR ensures short curing times on large curing areas with even heat distribution while reducing energy consumption.

Applications in industry

Our short-wave IR solutions for curing, heating and drying are used in industrial finishing, adhesives, and moisture and temperature control. You can find them in 1000's of applications in automotive manufacturing, aerospace, a wide range of dry and wet paint lines, wind turbine production, the wood and paper industries and many others.

Infrared heat is an effective and proven solution in applications such as:

- curing and drying paint on most materials, including paper, steel, wood and plastics
- heating pipes
- drying paper and glue
- preheating surfaces to enhance subsequent processing

In painting applications, no other equipment improves paint finishing production times as dramatically as IRT dryers. IRT is a cost-effective and proven technology, which ensures 100% dry products before handling.

IRT technology also monitors other parts of the process to shut down the system if there is a stop elsewhere. IRT technology ensures a solution that will waste no energy or overheat parts.

Comparison with competing technologies

Short-wave IR heating needs less space than many other IR techniques or gas ovens. In comparison with the traditional hot air oven, the IRT oven is much smaller, releasing space that can be used to increase production.

A convection oven sometimes lacks in efficiency; IRT's short-wave infrared solutions can boost and even replace traditional drying, reducing energy consumption, production time, while increasing curing speed with instant start-up and shut-off.

As they peak in the short-wave range, our short-wave infrared dryers can secure a range of advantages that are not achievable with gas emitters:

- instant full power and fast power off
- works with the same precision at any power setting
- short-wave IR can be configured into electric installations
- low maintenance >20,000 working hours/lamp

About IRT industrial curing

Focusing on the needs of industry, IRT Industrial Curing provides customized heat transfer solutions for customers' critical processes. We develop, manufacture and supply custom-made IR heating technology solutions configured from our proven standard IR heating systems.

To ensure safety, our products are certified for use in any part of the world.

We maintain up-to-date compliance with all European and US standards and have been ISO certified since 1998. We are the only provider of heat transfer solutions who has comprehensive worldwide certification for product safety.

For project examples involving our short-wave infrared solutions go to:
www.hedson.com/industrial-solutions

Conclusions

- 1 Industry—the world's biggest consumer of energy—is intensifying efforts to cut energy costs.
- 2 Short-wave infrared heating provides the most energy-efficient curing method for many applications in industry.
- 3 IRT Industrial curing offers customized solutions for industry based on proven products that harness the full benefits of short-wave infrared heating.

