Press release
Infrared heat for composites

Kleinostheim, Mai 2011

Efficient Infrared Heat for State-of-the-Art Composites

Infrared emitters help to shorten process times

Aeroplanes and motor cars need to be lighter to save fuel but at the same time they need to convey their passengers in total safety. The blades of wind power turbines need to be light but also very strong. Infrared heat can help to meet these requirements.
Fibre-reinforced plastics are modern composite materials. They consist of plastics such as polyphenyl sulphide (PPS), polyether-ether-keton (PEEK) or epoxy resins (EP), in which carbon or glass fibres are embedded.
These fibres make the components strong and rigid and the plastic matrix can absorb energy. Many highly stressed components in the automotive sector, such as steering rods, which are subjected to high torsion forces, or elements for side impact protection are made from such composites.
Infrared systems are used in the manufacture of such modern components because they heat these materials rapidly and homogenously and so shorten the processes.

Composites are all different, depending on their eventual application. Short fibre duroplasts for large bodywork parts, long fibre thermoplastics for highly stressed structural components, woven rovings for wind vanes – all of these need to be made as cost-efficiently as possible.
In the manufacture of composite materials various heating processes are required, such as for the curing of duroplastic plastics. Thermoplastics are melted by heat before fusing or heated before forming or deformation. Fibre content or orientation have significant influence on thermal conductivity, so that homogenous heating of composite materials is not a simple matter.

Infrared Emitters Heat Rapidly and Homogenously.
To date, the necessary heating processes have been carried out with conventional warm air ovens. In contrast, infrared technology offers significant benefits.
Infrared emitters have very short response time, often within seconds, which makes heat controllable and helps to ensure that energy is used correctly. As the heat source needs to be switched on only when needed, this saves energy.

Infrared systems are relatively compact heating units, which can heat large components on a conveyor belt, without the need for a very large oven for the complete part.
Infrared radiation can be precisely matched to the product and process and modern numerical methods such as ray tracing and computational fluid dynamics can also help to heat large surfaces homogenously.

Composite Welding with Infrared Heat
A British company uses tanks of glass fibre-reinforced polypropylene for water treatment. The cylindrical water tank is made in two halves, which are then joined together by short-wave infrared radiation. The glass fibres ensure that the tanks are as robust as possible, as, in use, they have to withstand an internal pressure of around 10 bar. However, conventional plastic welding using contact heating is very difficult as the glass fibres in the plastic are exposed by melting the surfaces and can damage the hot contact plates.
In contrast, infrared emitters transfer heat in a contact-free manner and generate the heat directly in the material. As a result, the material cannot get caught in the heat source. In practice, a module with six, short wave infrared emitters heats the ends of the prepared cylinder halves. The module is then automatically retracted and the halves with the soft, heated ends are pressed together and welded.
Tests have demonstrated that this joint withstands very high pressures up to 28 bar without breaking. Also, because of the contact-free heating, there is no need for continuous cleaning of the heat source. The total process is very energy-efficient as the infrared emitter is switched on only when heat is needed.

Energy Efficiency By Exact Matching
Infrared heating technology offers many possibilities for optimising energy usage in industrial processes:

- High heat transfer capacity
- Contact-free heat transfer
- High efficiency
- Efficient energy transfer by using the optimal wavelength
- Localised energy input by matching the heating to the shape of the product to be heated
- Time focused energy input because of the rapid response times.

Infrared heat is always used when heating processes need to meet specific requirements in terms of place, time and quality.

Heraeus Noblelight GmbH with its headquarters in Hanau and with subsidiaries in the USA, Great Britain, France, China and Australia, is one of the technology- and market-leaders in the production of specialist light sources. In 2009, Heraeus Noblelight had an annual turnover of 71.6 Million € and employed 707 people worldwide. The organisation develops, manufactures and markets infrared and ultraviolet emitters for applications in industrial manufacture, environmental protection, medicine and cosmetics, research, development and analytical measurement techniques

Heraeus
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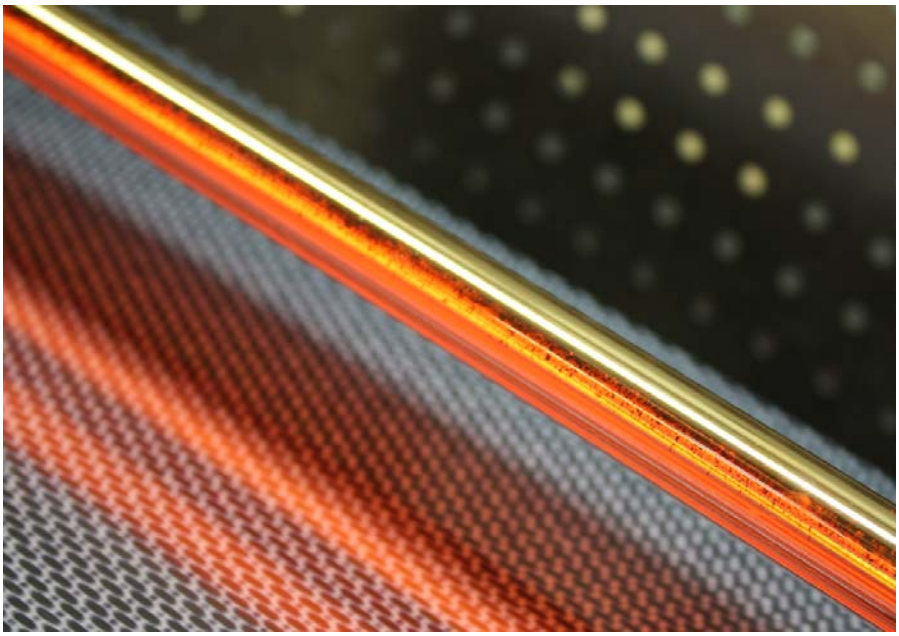

Composites heating is tested in our in-house Applications Centre.

Infrared emitters help in the welding of glass fibre-reinforced pressure tanks.