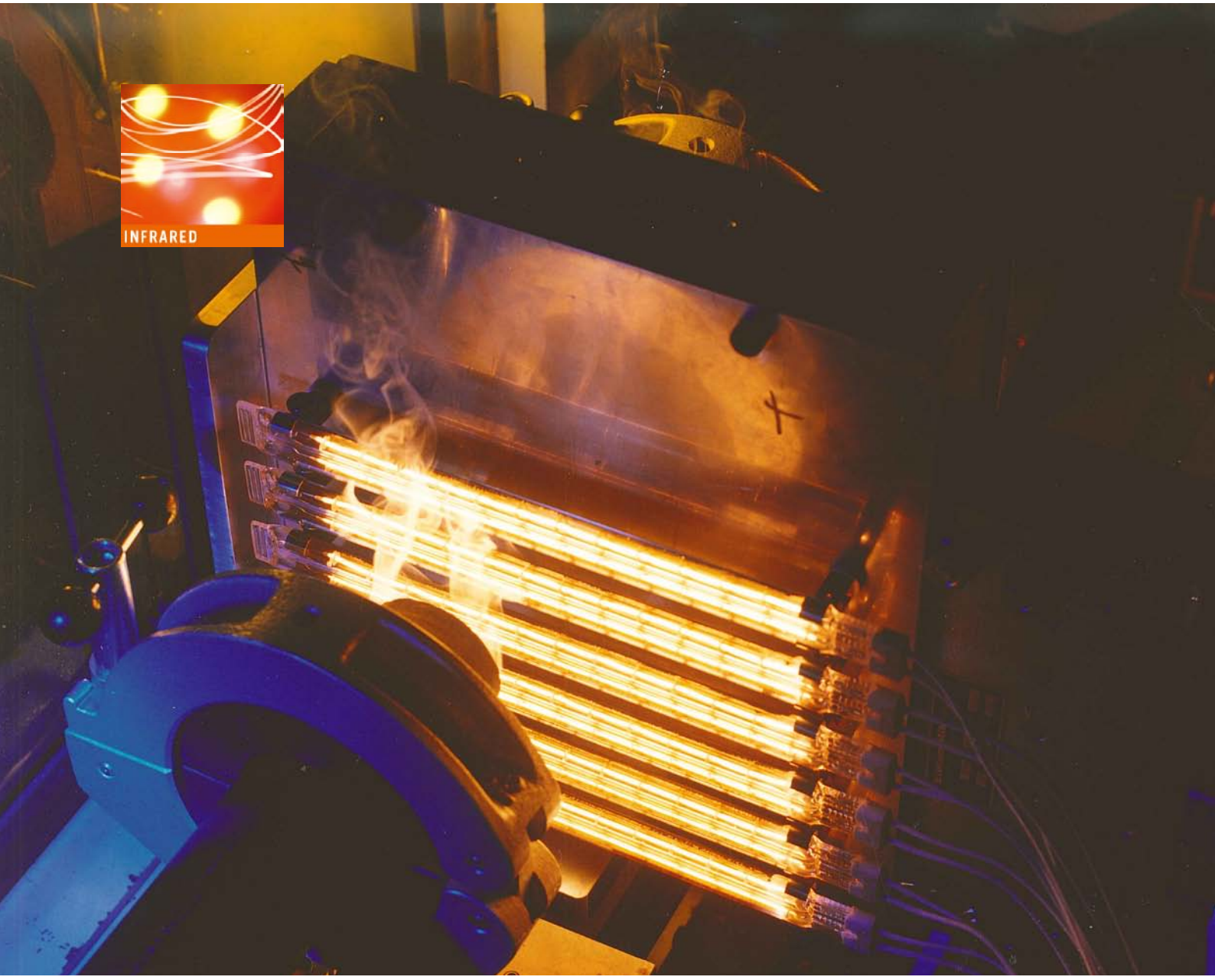
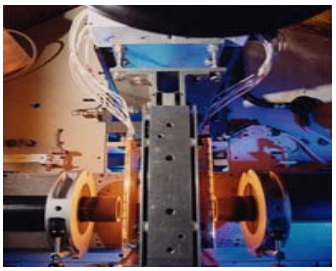
Heraeus

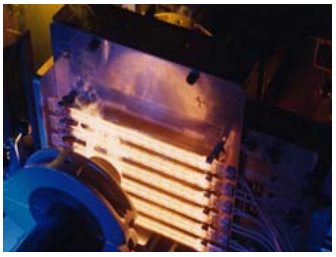


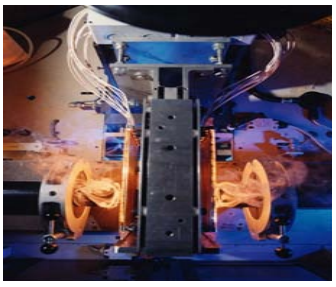
Infrared Systems for Plastic Welding

Targeted heat for efficient processing

Technical Information







Heating for plastics

Infrared radiation is transferred without contact and generates heat directly within the product. Consequently, it is superior to conventional methods such as heating by means of contact plates. In addition, unlike contact plate welding, there is no hot plastic left on the heating source. So plastic parts can be welded together in a way which is reproducible every time, without smell, in a matter of seconds. There is no need for time-consuming cleaning procedures. In seconds, infrared radiation can be targeted to melt the mating surfaces of a product, which then are joined by simply pressing them together.

Short wave infrared emitters react in matters of seconds so that they can be easily controlled. They transfer heat quickly and at high efficiency.
As well as short wave emitters, Heraeus Noblelight offers carbon infrared emitters at a spectrum which is particularly well matched to the absorption properties of plastics. All Heraeus emitters are matched to the relevant process in their shape, size and spectrum. As a result, complicated heating processes can be replicated to allow automation.

Application fields

Description	Material	Final product application	IR-parameter
Welding of honeycomb elements in larger units	Plastic	Insulating on material for walls and floors	Medium wave emitter
			Heating time ca. 7 sec
			Temperature 140°C
Welding of thick-walled plastic components	Polypropylene	Swimming bath filters	Omega infrared emitter
			Fitted with 180° gold reflector
			Contact free heating
Welding of PVC profiles	PVC	Door mats	Short wave app. 10 sec up to the softening point 140°C
Welding of two half shells into one hollow body	Polyamide		For semi-transparent material: heating 40 sec up to 250°C
			For black material: heating app. 12 sec up to 250°C
Targeted melting of surface, prior to forming of panels	Thermoplastics HDPE	Transport boxes for bulk deliveries	Short wave infrared lamps
			Cycle times from 15 to 45 sec

Infrared Heaters Weld Transport Box

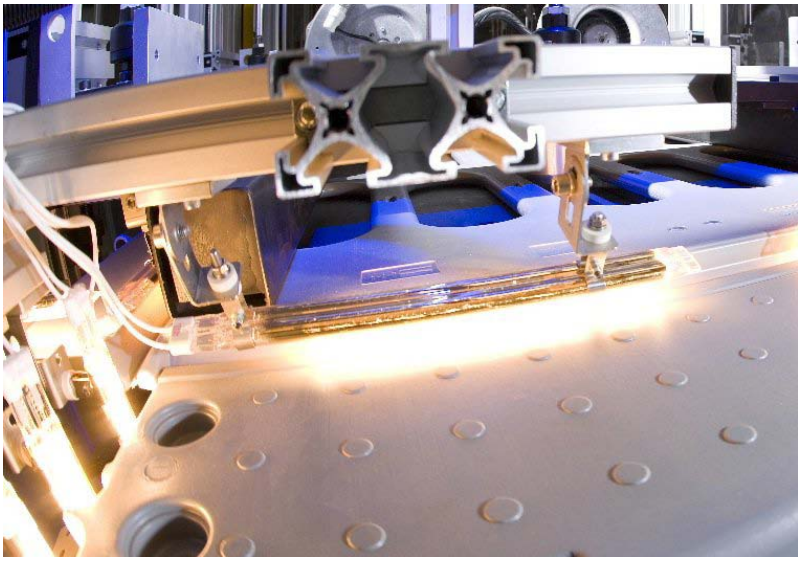
Complex wheeled trolleys are produced from injection moulded plastic panels quickly and in an automated process within a special purpose machine, manufactured by Robot Units of Winsford. Infrared emitters transmit heat without contact to suit the programmed production processes. This protects the material, improves the quality of the end product and so reduces final costs.
Flat, blow moulded panels from thermoplastic HDPE (high density polyethylene) are supplied basically as unfolded boxes, together with all the integral fixing lugs and holes and slots which would be used in subsequent assembly operations. The formed panels eventually form the rear section of a new lightweight, wheeled trolley intended for bulk deliveries to supermarkets and for transporting linen around hospitals.
The lugs and slots, together with various mating faces, are used to weld the box together. However, their location is such that they are of different thicknesses and geometry. They are also of different shades.
Tests demonstrated that the weld achieved using short wave infrared emitters was stronger than the parent material itself and that there was no burning of the HDPE.
An array of short wave infrared emitters, of different lengths and power ratings, was fitted in the forming station. When the flat moulding arrives at the forming station it is first clamped before the individual short wave emitters are fired up in a programmed sequence to comply with the geometry, thickness and colour of the plastic panel. The flat panel is then folded by the pneumatic tooling and the selected, softened faces and connection points are welded together. Cold air is blasted into the station and the box is removed from the machine.
Infrared radiation is transferred without contact and generates heat directly within the product. Unlike contact plate welding, there is no hot plastic left on the heating source. So plastic parts can be welded together in a way which is reproducible every time, without smell, in a matter of seconds. There is no need for time-consuming cleaning procedures. In seconds, infrared radiation can be targeted to melt the mating surfaces of a product, which then are joined by simply pressing them together.

Features

- infrared emitters are being used to weld HDPE panels during their forming into a box construction
- lugs and slots of different thicknesses, geometries, shades and mating faces are used to weld the box together

Technical Data

infrared system	short wave infrared emitters
time	response time of seconds so that they can easily be controlled
	cycle times between 15 to 45 seconds



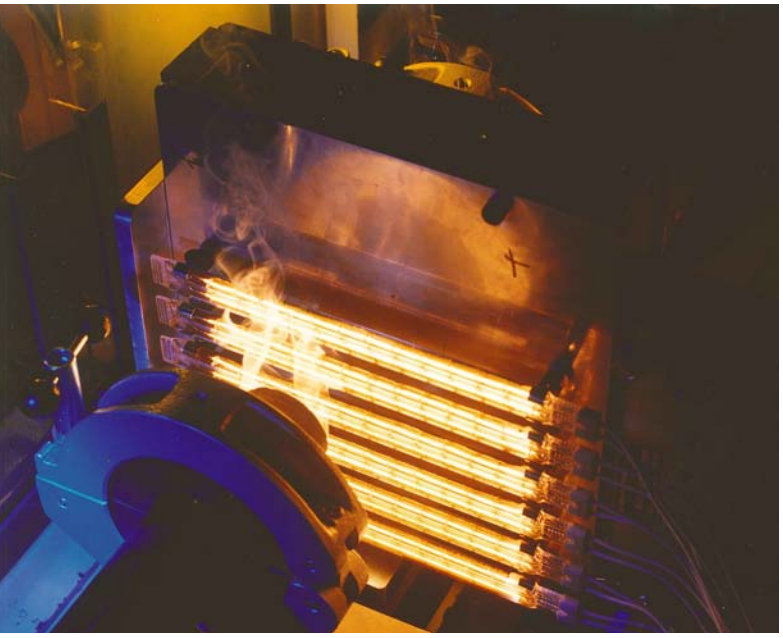
Infrared Successfully Tested for Plastic Welding

High power short wave infrared emitters from Heraeus Noblelight are being used in an adapted rig at The Welding Institute, in Cambridge, to demonstrate and prove the benefits of infrared non-contact welding of plastics over competitive techniques.

The rig at the TWI is currently investigating infrared butt welding of plastic pipe but it can be adapted to suit a range of products and plastic materials. Specifically, it consists of two banks of six short wave 1.5kW emitters clamped and spring-loaded on either side of a movable platten to give a total installed power of 18kW. This equates to less than 2kW for a hot plate system, as the power is required for only one tenth of the operating cycle. The movable platten is advanced to its working position between the butt ends of the pipe to be welded and the power is switched on. The platten is then retracted and the power switched off, while the two butt ends of the pipe, whose facing circumferences are now softened, are brought together under pressure to effect the weld.

It has been found that weld times of around 5 seconds can be achieved and that the technique is probably applicable to most polymeric materials in use. It offers a number of significant advantages over competitive techniques such as hot plate, vibration and friction welding and plastics gluing. Being a non-contact method, it suffers none of the disadvantages of hot plate methods, such as plastic adhesion to the heating surface, which necessitates frequent tool cleaning. It is also capable of handling large surface area products, as it is a simple operation to add more emitters to a heating bank. In addition infrared heaters can be custom-built to match the geometry of the product to be welded.

The newly developed, high power short wave emitter is also proving more efficient and effective than infrared emitters previously considered for welding applications. Its high power density, developed at a lower operating temperature, means that it can transfer energy much more efficiently than halogen emitters, while its lower mass filament makes it much more responsive than ceramic emitters. Energy efficiency is also another advantage it enjoys over other techniques, as power is used only during the short times that the system is working.



Features

- welding of plastic pipes
- contact free
- power only switched on when necessary

Technical Data

infrared system	short wave emitters
total installed power	18 kW (9 kW x 2)
	power and size matched to product and process

Infrared Heat Welds Pressure Tanks

Infrared welding, employing high power, short wave infrared emitters from Heraeus Noblelight, is helping to produce cylindrical pressure tanks with a glass-filled polypropylene cylinder body. The cylindrical housing is produced in two mouldings, which are joined together in such a fashion that the complete assembly is able to withstand internal operating pressures of around 10 bar.
Typical hot plate welding methods would be unsuitable in this application, as the melt temperatures involved (210°C to 250°C) would expose the short glass fibres in the p olypropylene, which would then abrade the PTFE coating of the hot plates, causing accelerated wear and hence frequent and costly replacement.
The heart of the new machine is an arrangement of four banks of six, high power short wave infrared on either side of a movable platten. In operation, two bottom cylinder halves, each of 140mm diameter, are loaded into the machine and then two matching top cylinder halves are located in position directly above the bottom halves. The movable platten is advanced to its working position between the butt ends of the opposing cylinders and the power is switched on. The melt temperature is achieved in around 40 seconds, the platten is withdrawn, the power is switched off, and the butt ends are brought together under pressure to effect the weld. Under bursting tests at pressures of around 28 bar, it has been found the cylinder body has been destroyed well before the welded joint.
Infrared welding can be used with most polymeric materials and is increasingly being accepted as being complementary to conventional plastics welding techniques. Being a non-contact method, it does not promote plastic adhesion to the heating surface, which can necessitate frequent tool cleaning. It is also very energy-efficient, as power is used only during the short times that the system is working. Typically, the installed power is drawn, on average, for only one-tenth of the operating cycle. Infrared is also capable of handling large surface area components, as it is a simple operation to add more emitters to a heating bank.

Features

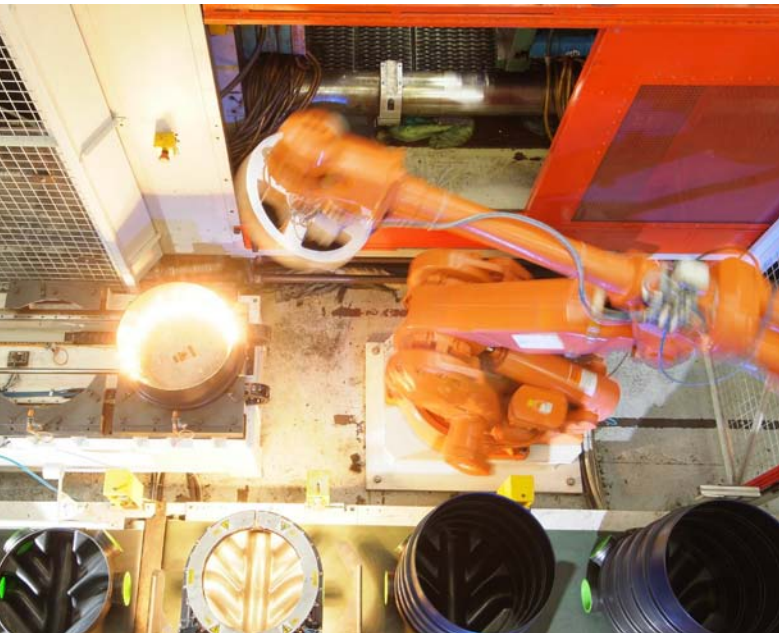
- short wave emitters are heating plastic components
- contact free heating avoids frequent tool cleaning
- very energy efficient, the heaters need only to be switched on, when the heat is needed

Technical Data

total installed power	six short wave emitters of 1.6 kW per module
	four movable plattens
time	melting achieved in 40 seconds

Infrared Helps Automatic Plastic Welding

An infrared welding system using special-purpose infrared emitters from Heraeus Noblelight has helped Hepworth Drainage to improve the quality of an inspection chamber assembly production process, while eliminating any environmental problems associated with a hot melt adhesive technique that was formerly used. Hepworth Drainage is one of the largest manufacturers of drainage systems. One of its major product lines is a polypropylene inspection chamber, which provides access to inspect below ground drainage systems from the surface. This product consists of a base unit offering multiple connections to clay or plastic drainage systems. The addition of two or four raising pieces creates the required depth of inspection chamber. An important step in the manufacturing process is the joining of the raising pieces, first to the base unit of the inspection chamber and then to each other as required.
This was formerly done using a hot melt adhesive. Modern environmental protection requirements and, not least, the requirement for cost-saving, led the British company to investigate potentially more efficient solutions. A complex automated process with a robot which brings the various component tubes into an infrared welding cell and welds them together, now takes only 22 seconds. As a result, the production cycle times for plastic inspection chambers at Hepworth have been significantly reduced and the quality of the components significantly increased. Moreover, the new heating process is environmentally-friendly as, in contrast to the previous hot melt adhesive system, there is very little fume production.
These process improvements have also been made possible because quartz glass emitters can be shaped to match the product three-dimensionally. Consequently, the heat is generated only where it is required. In addition, infrared emitters need to be switched on whenever the heat is actually needed, so that energy is saved.



Features

- welding of plastic pipes with a base unit
- contact free heating
- energy efficient
- time saving

Technical Data

infrared system	small custom-designed, short wave emitters
	distributed around the product surface
total installed power	each delivering 15 W/mm
time	cycle times of around 22 seconds

Omega Infrared Emitters Weld Filter Container

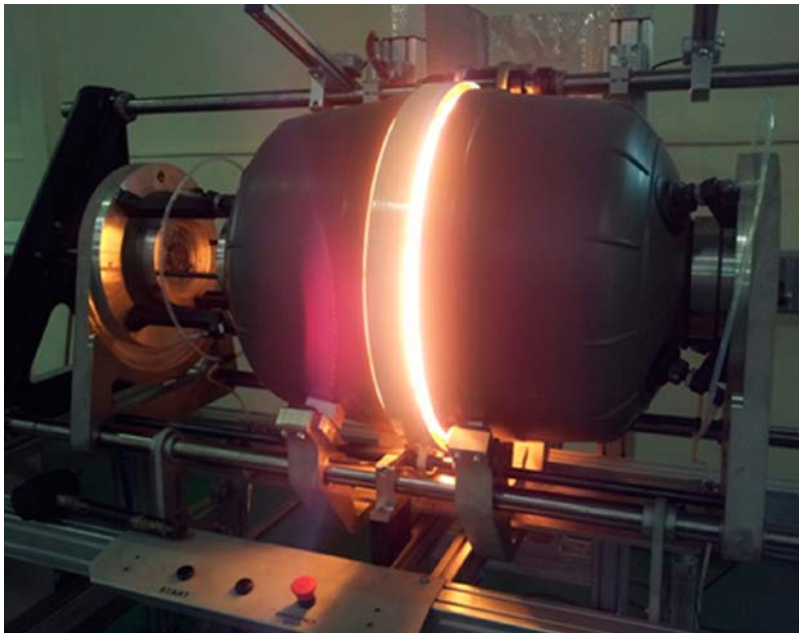
Housings for swimming bath filters are relatively large and thick-walled and must be pressure-resistant. They are injection-molded in two halves in polypropylene (PP) and the two halves are welded together. For one company in South East Asia, the welding together of these large and thick-walled plastic components presented a real challenge, as the filter housing, when in its operating position, was clearly visible so that the welding seam had to be optically perfect.
The company formerly used a welding system with resistance heating elements in an aluminum block with a Teflon coating. The heating elements were pneumatically swiveled in and out of position. However, the PP, which flows easily when melted, tended to stick on the heating element, so that quality and speed of production could no longer meet the increased production requirements. Consequently, a more efficient solution was sought, in order to save energy. Omega infrared emitters from Heraeus provided this solution.
For his customer in South East Asia, Dr Uwe Egen of IPCW (International Plastic Welding Consultancy) in Kassel, designed and built a system, which contains one of the largest Omega infrared emitters ever manufactured. This special emitter has the shape of a Greek letter omega, a diameter of 61 cm and is fitted with a 180° gold reflector, so that the heat can be totally targeted to where it is needed.
Two of the ring-shaped emitters project their heat radiation onto the edges of the half shells. They sit in a swivel device and are swiveled away after they have melted the plastic edge. The two halves can then be joined together.
An intelligent control system, which was fitted in the existing control cabinet, helps to maintain an intensity/time profile. Combined with the correct welding pressure, this ensures an optimum welded joint.
“The infrared system has replaced the contact heating elements, so that now we have much shorter cycle times,” says Dr Egen. “However the main advantage of the infrared technology for me is that the two halves can be precisely centered. Infrared heats without contact, so there is no longer any possibility of contact surfaces sticking together and then shifting out of position.”

Features

- welding of filter units made of PP
- contact free heating
- parts can be precisely centered without sticking togehter and shifting out of positions

Technical Data

infrared system	omega infrared emitters
	diameter of 61cm
	180° gold reflector



The Infrared Process Technology division of Heraeus Noblelight (business segment specialty lighting sources) develops and manufactures infrared emitters and systems for industrial heating processes. For over 50 years we have focused on their specific application requirements. With a wealth of experience encompassing more than 3000 different heating processes, we can match our emitters precisely to meet your needs in terms of spectrum, power, length and shape.

Make use of the intelligence of infrared technology.
In contrast to conventional thermal processes, infrared transmits large amounts of energy in a short time. This heat is used exactly where it is required and only for as long as it is required for a particular process. This offers energy savings of up to 50%.

Profit from the acknowledged Heraeus quality – the proven twin tube design with a unique length of up to 6.5 meters – contoured emitters, which are shaped to match the geometry of your work piece – the new QRC® emitter, with its nano reflector for stable heating processes under aggressive ambient conditions. Convince yourself personally of the efficiency of infra-red emitters for your process in our Application Centers.

Make use of our expertise and experience to optimize your production process and realize real competitive advantage.

08/2014 Printed in Germany

Germany
Heraeus Noblelight GmbH
Reinhard-Heraeus-Ring 7
63801 Kleinostheim
Phone +49 (6181) 35 8545
Telefax +49 (6181) 35 168410
hng-infrared@heraeus.com
www.heraeus-noblelight.de/infrarot

Great Britain
Heraeus Noblelight Ltd
Unit 1 Millennium Court
Clayhill Industrial Estate
Buildwas Road
Neston, Cheshire CH64 3UZ
Phone +44 (151) 353 2710
Telefax +44 (151) 353 2719
ian.bartley@heraeus.com
www.heraeus-noblelight.com/infrared

USA
Heraeus Noblelight LLC
1520C Broadmoor Bvld.
Buford, GA 30518
Phone +1 (678) 835-5764
Telefax +1 (678) 835-5765
info@noblelight.net
www.noblelight.net

China
Heraeus (Shenyang) Noblelight Ltd.
Shanghai Branch
5F, 16th Building
No. 99 Tianzhou Rd.
200233 Shanghai
Phone +86 (21) 5445 2255
Telefax +86 (21) 5445 2410
info.hns@heraeus.com
www.heraeus-noblelight.cn

Reg. No. 39254