Infrared Heat for the Manufacturing of Automotive Interiors

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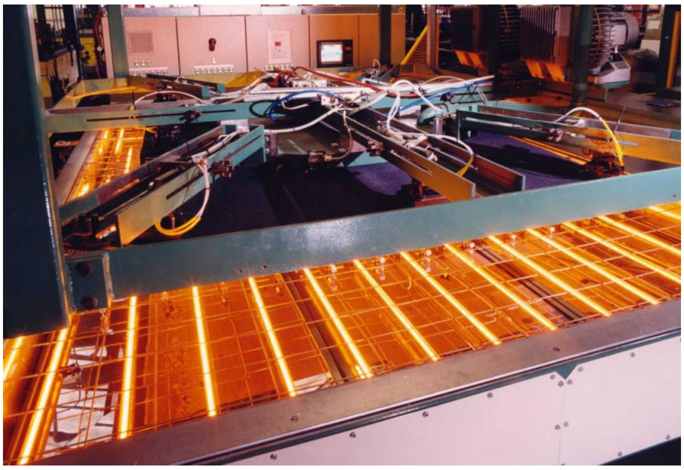
IR and UV Technology optimize automotive interior part production Infrared heat improves many process steps such as deburring, forming, laminating, and drying or activating adhesives and coatings. Precisely matched infrared systems improve quality and save energy. UV light curing of inks and coatings on interior components such as switches, handles and trim pieces improves durability and aesthetics.

Many steps in the production and finishing of automotive interior parts are time-consuming and energy intensive. And in the end, the car owner demands good quality at a reasonable price.

Modern infrared technology optimizes industrial manufacturing processes:

- **Reducing Energy Costs**
- **Increasing Production Rate**
- **Improving Quality**
- **Ensuring Sustainability**

Infrared system improves the quality of carpet blank molding



A Noblelight infrared heating system from Excelitas is helping Collins and Aikman to improve the quality of carpet blank molding at their Newcastle-under-Lyme factory.

Collins and Aikman mold carpet blanks to produce in-vehicle fitted carpets for a wide range of motor car manufacturers. To ensure that molding is carried out at optimum efficiency, it is necessary that the blanks, which are pre-cut to the required shape, are heated before they are located in the molding machines. This is normally achieved by medium wave infrared systems, which are fitted in the production line before the molding machines.

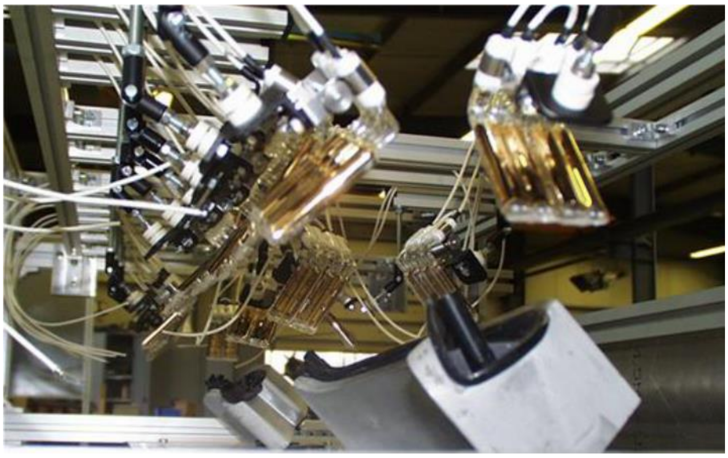
Collins and Aikman use a variety of carpet blanks with a range of carpet backings, carpet types and pile densities. When a new molding line was required to manufacture a range of carpets for a Honda, it was decided to investigate the possibilities of improving the pre-heating process, to cater for the differences in the blanks and to achieve more precise control of the heating profile over the area of the carpet.

Trials were carried out by Excelitas at their UK Test Center and, as a result, a full-scale infrared system, using carbon emitters was installed at the Newcastle factory.

The new system uses sixty, 2kW carbon emitters, which are arranged to provide 15 individually controllable zones. Each zone is connected to a thyristor, so that the power in each zone can be individually set. The complete system is monitored by its own pyrometer and is further enhanced by the use of low thermal mass carbon fiber emitters, which have an extremely fast response time of around one second.

Since installation, the new system has allowed Collins and Aikman to significantly improve the quality of the carpet blank moldings, as it is now possible to apply the pre-heat selectively and in the precise amount to the various areas of a carpet blank. This ensures that the flexibility and rigidity can be varied in a programmed manner at selected areas of a carpet blank, so that the subsequent molding operation is optimized. In addition, the fast response of the carbon emitters has brought significant energy savings, as the emitters are powered exactly as required.

Infrared emitters for the efficient deburring of glove compartments and door handles



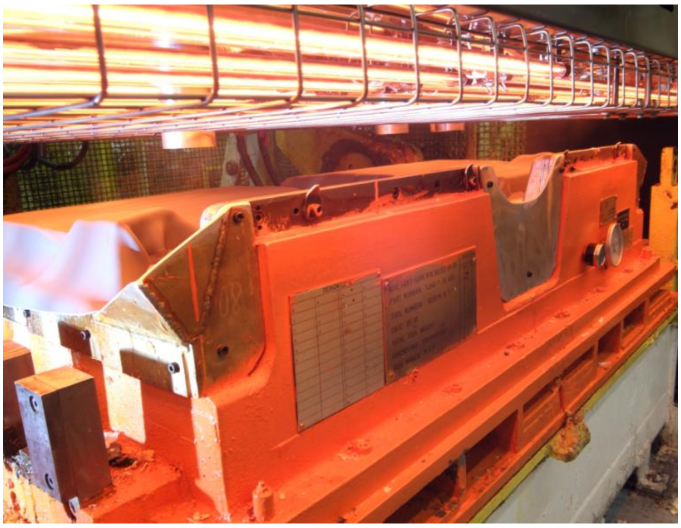
The company Hahn from Sontra designed in co-operation with Excelitas an infrared system using small short-wave infrared emitters. Due to the three-dimensional arrangement and a fast energy transfer, the deburring of the products takes place so reproducibly that the process could be automated. The method is used successfully in door handles and glove compartments.

The cycle time for the deburring of internal car parts made of plastic is approximately 40 seconds, including part handling. This is made even more difficult if lacquered cladding parts, trim panels or glove boxes for right and left-hand drive vehicles are to be manufactured in the same plant. In order to remove these burrs, various methods were considered more closely. Mechanically, by grinding or milling, or thermally with a hot-air drier or a Bunsen burner. All these methods were carried out manually and the results were very different in quality, depending on the skill of the worker. The mechanical methods could have been automated by means of mechanical grinding or milling, but an intensive cleaning would have been necessary afterwards to remove the resulting chips. A hot air nozzle system proved to be very complicated in the production process and the process would have been very slow.

Therefore, Excelitas developed a Noblelight infrared system using small short-wave surface emitters. These emitters can be arranged well on the edges of three-dimensional products, are very controllable and transfer relatively much energy in a short time to limited areas. A total power of 10,400W was installed, the radiators are located about 20mm away from the product edge. The deburring of the products takes place within 5 seconds and is reproducible in such a way that the process could be automated. To make a better decision, the Hahn company computed the total energy requirement for each deburring cycle, once with a hot-air drier and once with infrared emitters. According to this calculation, 42.5 watt-hours for hot air compared to 8.7 watt-hours for infrared emitters.

Hahn has analyzed the entire process intensively and CEO Rainer Stück is particularly convinced by the energy efficiency: "We have found that, according to our calculations, the infrared system already amortizes within half a year!"

Infrared Heat for Automotive Interior Parts



By installing a carbon infrared system to pre-heat acoustic soundproofing sheets prior to molding, Faurecia has significantly reduced production cycle times and virtually eliminated maintenance costs and machine down-time on one of its major molding machines.

An essential part of the molding process is the pre-heating of the PE-EVA (polyethylene ethylene vinyl acetate) sheet.

This heat was previously delivered by medium wave infrared foil heaters, which were proving expensive to maintain. Moreover, the slowness of the heating operation, which also involved pre-heating the blanks with large hot water radiators, was starting to create a production bottleneck.

Initial on-site trials immediately established that carbon infrared emitters could eliminate the need for pre-heating, as they provided a 16% increase in heat-up rates. Consequently, it was possible to dispense with the hot water radiators and associated stands and create valuable new floor space. It also proved possible to retrofit the new carbon infrared system using many of the existing electrical supply connections of the old system, as well as the existing control panel and pyrometer.

In operation, the blank sheets are now heated in the mold, without any pre-heat. The emitters are switched on when the sheet is dropped into the mold and switched off by the pyrometer, on achieving a pre-set temperature. Switch on/switch off times are less than one second. Since installation, it has been found that cycle times have been reduced by 20 seconds and there are energy savings of 9kW/hour because of the elimination of the pre-heating alone. Furthermore, maintenance costs and duties have been cut dramatically, as the twin tube emitters are proving much more durable than the original foil heaters and any infrequent change-over involves minimum downtime.

Infrared emitters optimize vacuum laminating

Car doors, center consoles and dashboards are made of plastic carrier parts that are clad with foil. This is usually done by vacuum laminating, a process in which an adhesive is applied to the foil or the carrier part.

3CON develops and manufactures innovative tools and machines to produce car interior parts, such as door panels, instrument panels and many other components.

As an internationally operating, technology trend-setting company, 3CON supplies products to all well-known OEM and tier 1 automotive suppliers.
3CON was the first manufacturer of vacuum laminating machines for automotive applications to use Noblelight infrared emitters from Excelitas to heat TPO and PVC foils. Compared to conventional fused silica emitters, Noblelight infrared emitters offer enormous advantages. They heat up the foils faster, reduce cycle times and at the same time save energy, which represents a technological quantum leap for this kind of application.

Long-term series of tests to determine the optimal radiation wavelength were carried out before the fast response medium wave infrared emitters were ready for use. The tests involved in particular PVC and TPO foils and their through-heating behavior. One aim was to find the optimal wavelength that enables uniform and extremely fast penetration of the infrared radiation into the materials. Excelitas manufactures Noblelight infrared emitters that precisely meet the customer's requirements. Moreover, the emitter control unit developed by 3CON allows the emitter wavelengths to be exactly adjusted to the requirements of the materials. In addition to advantages for the process, this results in a reduction of heating times, or cycle times, by about five seconds. What is more, the fast response medium wave IR emitters used save space and energy compared to the fused silica emitters used hitherto. Standby control as in the case of fused silica emitters, that require permanent preheating to about 30%, is not necessary. Infrared emitters are switched on only when heat is actually required. This avoids unnecessary heating of the machine's periphery, which results in substantial savings of energy. Also, the bottom heating element no longer needs to be moved out, as was necessary hitherto to avoid possible overheating, because IR emitters are cold immediately after switch-off due to their low mass. Accordingly, the additional standby position, that requires about 6 square meters of space, is not needed when using fast response medium wave infrared emitters.

Infrared Heat Helps Bentley Make the Headliners

Two purpose-designed infrared heating systems are helping to ensure a perfect fit and increase longevity of the headliner interior leather trim on Bentley Continental's 4-door and 2-door models.

Headliners are interior trims, which are fitted in the upper front section of the passenger compartment. The trim of Bentley consists of three components: a substructure/fabric, an adhesive and the leather-facing piece.

Bentley recently introduced a new adhesive, which allows a 5-fold increase in the bond strength of the two materials being joined. However, the properties of the new adhesive require that it be heated to an activation temperature of 65°C if the takt time was to be maintained.

It was soon discovered that heating and joining with a standard convection oven there could often be slight movement between the substructure fabric and the leather, which was not acceptable to Bentley's strict quality control regime. To solve the movement problem and realize the benefits of the new adhesive, Bentley contacted JSK Ultrasonics, of Milton Keynes, who devised the total trim handling system, incorporating fast response, medium wave infrared emitters from Excelitas.

In operation, the substructure fabric is first sprayed with the adhesive and then located exactly in place on the pre-cut leather trim in a vacuum press. A vacuum of 7inHg is then applied to ensure that this alignment is maintained. The infrared system in its handling frame is then moved into position over the vacuum press membrane, which is heated to 85°C. Some of the heat is lost in the membrane but a temperature of 65ºC is reached on the bond line (between the substrate and leather) after a PID controlled cycle time of around 3 minutes, when the heating frame is lifted and the vacuum removed. The completed headline assembly is then fitted to the vehicle.

In practice, two adhesive activation systems have been supplied. One features fifteen 5kW, fast response medium wave emitters and serves the 4-door model, while a 108kW system is split into two 54kW units and serves the 2-door model.