Infrared Heat for Automotive Manufacturing

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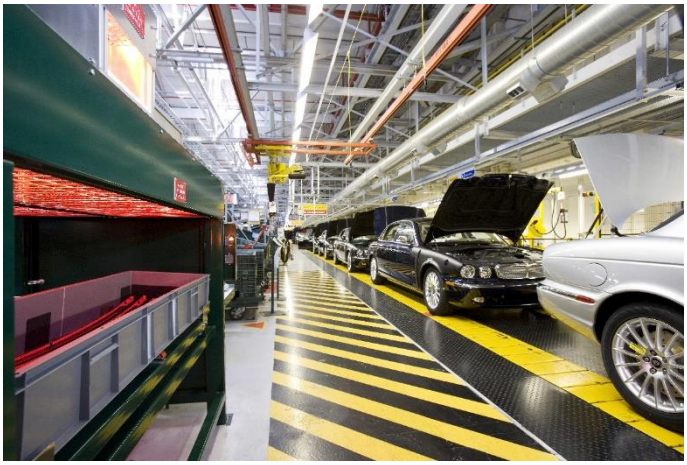
Infrared heating is a widely used heating source in the production of car and motor vehicle components. Its origins in this industry go back to the 1950s and since then infrared technologies has made great strides. For example, the installation of modern infrared systems can eliminate production bottlenecks, speed up production and save costs. This has been demonstrated for many heat processing steps at Jaguar in Great Britain.

See in our application examples how Infrared systems solve the challenges at Jaguar:

- Infrared helps to facilitate perfect adhesion of spoilers
- Comfortably retro-fitted IR systems for the fitting of sound-deadening pads
- Carbon emitters dry chip-protection coating

Infrared helps spoilers stick to Jaguar XJ



A pyrometer-controlled, custom-built infrared oven is helping to ensure perfect adhesion of a rear spoiler fitted to the new Jaguar XJ during production. At the same time, a smaller associated oven is being used to facilitate the fixing of two rear boot badges.

The rear spoilers are supplied to the production line complete with an integral adhesive strip. The adhesive manufacturer recommends that the strip is heated prior to fitting, so that the adhesive can flow. Having already used infrared systems to assist in the fitting of various components on the S-Type, notably in the fitting of aluminum trims, Jaguar engineers decided to ask Excelitas to design a pre-heating system for this particular application.

As a result, a 37.8 kW fast response medium wave oven was installed at the spoiler fitting point on the production line. This is floor-standing unit, which is connected to a gravity-fed roller conveyor. The top of the oven contains the heater cassette with its 12 emitters, which are arranged so that only one emitter leg is used, effectively doubling the emitter lifetime. The spoilers are supplied to the production line in boxes of six and three boxes at a time are located on the inclined roller conveyor. The contents of approximately 2½ boxes are heated by the infrared cassette, which is inclined to match the angle of the conveyor to ensure uniform heating. An optical pyrometer monitors the temperature of the sixth moulding in the first box, to ensure that pre-heated spoilers are always available, even if only one box is loaded. Green and red lights indicate when the mouldings are inside/outside the required temperature range of 30ºC ±5ºC.

When the spoilers are outside the specified temperature limits, a light curtain is activated and if an operator then tries to remove a spoiler, an audible alarm will sound until reset with a control panel key. The smaller, 1 kW badge-heating oven is located on top of the main oven. It can accept two badges at a time and PTFE blocks are included to locate these. It is operated by a simple pushbutton on the associated control panel and a red light indicates when the heating is on. Typically, heat is applied for 4 – 6 seconds, after which a green light indicates that the badges can be removed and fitted to the vehicle on the line.

Since installation, it has been found that the pre-heat system allows perfect adhesion of the spoilers and badges and that the two operations can be easily carried out to meet the speed of the production line.

Energy-efficient IR Heating system proves a winner with the Jaguar F-TYPE

A custom-built, fast response medium wave (FRMW) infrared heating system from Excelitas is helping in the production line fitting of sound-deadening pads to the Jaguar F-TYPE at Jaguar Land Rover's manufacturing site at Castle Bromwich.

With a top speed of 200mph and acceleration from 0-60 mph in 3.5 seconds, it is important that there is minimum transmission of noise from the F-TYPE's supercharged engine into the passenger compartment. To prevent this, highly efficient sound deadening panels are fitted to the car. However, while still retaining their excellent noise-damping properties, the panels can become slightly brittle when cold and to facilitate their handling during manual location on the production line, Jaguar engineers decided to contact Excelitas to see if a simple infra-red heating system could help.

Following successful tests carried out at Excelitas' Neston Applications Centre, a compact 12 kW medium wave infrared oven was installed at the pad fitting location on the production line. This is contained within a 1.6m aluminium framework, which features two heated zones, each equipped with three, 2kW fast response medium wave emitters with integral gold reflectors for maximum efficiency. Each of the two heated zones also has a sliding drawer to accept five pads of two different sizes. When the drawers are loaded, with the pads between locating pins, they are shut by the operator and heating commences immediately, initiated either by a limit switch on the drawer or by a push button on the associated control panel. The pads are initially heated to the required temperature, as measured by pyrometers, for 25-30 seconds, at 60-70% power and are then held at temperature at 8-10% power. When the drawer is opened the heating stops and the top pads can be removed for fitting to the car.

The new oven has proved extremely easy to operate and its compact size has allowed it to be comfortably fitted within the limited line side space available.

Carbon Infrared emitters provide cure for anti-chip protection

By using Carbon Infrared emitters from Excelitas, Land Rover has been able to achieve the required cure of a PVC sealant and anti-chip coating applied to Freelander vehicles within the time constraints dictated by the assembly line speed. The new system has also proved more energy-efficient than competitive techniques and provides a better working environment. Unlike the other models in Land Rover's range, the Freelander's anti-chip protection in the sill area is in the form of a sprayed-on PVC sealant compound. When the line tracking system identifies an approaching Freelander, the spray system that applies the PVC compound is activated and, at the same time, the tracking system connects with a PLC for the infrared curing equipment, to ensure that the required pre-curing will take place. This pre-curing is essential, as any softness in the anti-chip coating could lead to it being damaged during further production operations carried out before the vehicle is painted with primer.

Since the available time for curing is only 60 seconds, it was originally thought that the pre-curing would be best achieved by short-wave infrared, which can be switched on and off virtually instantaneously. However, trials using short-wave Infrared had proved inconclusive and the required cure had not been achieved within 60 seconds. Consequently, Excelitas carried out trials using carbon fiber element medium wave infrared emitters. These combine the responsiveness of short-wave with the energy-efficiency and curing effectiveness of medium-wave, so that a good cure could be achieved in under 40 seconds.

As a result, Excelitas pre-curing systems were installed. Each system consists of four cassettes, each containing 16 1kW carbon emitters. There are two cassettes on each side of the line, fitted at 20° to the vertical to allow full infrared radiation of the sill area. To ensure maximum energy efficiency, they are programmed to cascade into operation in banks of eight emitters. Since installation, the system has continued to perform efficiently and reliably. The PVC anti-chip coating is cured sufficiently to prevent any damage before the primer is applied and the use of carbon medium wave infrared emitters has allowed an energy saving of around 35% compared with the short-wave alternative.

Drying paint on bodywork is only one of the innumerable applications of infrared technology in the manufacture of motor vehicles. From the manufacture of driving mirrors to the forming of carpets or the welding of windscreen wiper fluid cylinders – on the long road from the manufacture of individual components to the production of complete vehicles, there is scarcely a component which does not come into contact with infrared at least once. Infrared heat is used in more than 200 different processes in the automotive industry. Infrared heat helps to remove crease from fabric and leather seats and forming dash boards – infrared emitters help automotive manufacturers and suppliers to produce competitively. The advantage of Noblelight infrared heat is its flexibility to adjust to the highly specialized processes used in car making.