Infrared Heat for Coatings

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Every coating process is different, but all processes share the common requirements of the highest possible quality and the fastest possible drying of the coating. With standard heat sources this is often no longer possible. In the drying of coatings, it has already been proven, that infrared radiation can penetrate to the required depth in the coating system and to dry the coating film from inside outwards. Skin or blister formation on the surface is prevented and drying of the coating is speeded up. The result is a brilliant surface quality that meets specification. Infrared energy, which is matched precisely with the product and coating, is quickly converted into heat, water or other solvents are evaporated, while the material and the local environment remain cool.

See in our application examples how Infrared systems solve the challenges of drying and curing of coatings:

- **Infrared Booster Speeds Up Powder Coating and Improves Quality**
- **Carbon Infrared Oven Improves Quality by Powder Coating Screws**
- **Infrared Heat Reduces Curing Time Re-Painted Aircraft Assemblies by over 75%**
- **Infrared System Helps Improve Airbag Manufacture**
- **Drying Non-Slip Coating on Paper Mats**

Excelitas Infrared Booster speeds up powder coating and improves quality

A retrofitted, infrared booster oven from Excelitas has allowed South Staffs Industries Ltd (SSI) to increase throughput and improve quality on the powder-coating line at their Tipton LPG gas cylinder re-qualification factory.

SSI repairs, refurbishes and requalifies low pressure propane and butane cylinders and ammonia, nitrogen and refrigerant gas cylinders to British Standards. Refurbishment of LPG cylinders, which typically takes place after 15 years in service, includes making cylinders gas-safe before processing, hydraulic testing, removal of old paint, shotblasting, zinc coating, powder coating and curing, screen printing, valve fitting and testing and weighing cylinders for tare weight.

Powder coating is carried out to restore the color scheme of the original cylinder manufacturer and, historically, the coating has been gelled and cured in a gas-radiant oven, which emits long wave infrared. However, this oven could prove inefficient.

SSI contacted leading infrared experts Excelitas, who carried out preliminary investigations on the existing gas radiant system, using a Datapaq oven tracker. These established that the

maximum temperature achieved after 405 seconds was 170°C, a temperature which could fail to achieve full curing of the powder.

After carrying out tests on a range of cylinders at its Neston Applications Centre, Excelitas proposed that an electric, 156kW medium wave infrared booster oven should be retrofitted in front of the existing gas radiant oven. This has four zones to cater for the different size of cylinder. Subsequent Datapaq readings have shown that the booster oven very quickly raises the body temperature of the coated cylinders so that dwell time in the gas radiant oven is substantially reduced, allowing line speeds to be increased by 19%. In addition, optimum curing temperatures can be achieved consistently, leading to quality improvements. As Ryan Cummings, operations director at SSI, comments, “The booster oven has allowed us to significantly increase our powder coating efficiency, with potential for further benefits once other parts of the process are improved.”

Carbon Infrared oven improves quality by powder coating screws

When building houses, halls or other buildings, on many positions you need screws. They are exposed to weather conditions like rain or sun, so they have to be coated to make them resistant against corrosion. A three-zone, carbon infrared medium wave oven from Excelitas is helping SFS Intec to improve the flexibility and quality of its powder coating operations. It has allowed the Leeds-based company to change powder curing from a continuous to a batch operation, so that it can now respond more quickly to customer requirements for corrosion-resistant screws and fasteners. In addition, the new pyrometer-controlled oven requires considerably less space.

SFS Intec is part of a Swiss-owned international group, which is involved in a range of activities, from the manufacture of solar fastenings to hinge systems.

Screw fasteners for the construction industry represent an important product line at SFS Intec. The heads of these screws must be coated to resist corrosion in use and the powder coating was formerly cured using an electrically heated oven, through which the screws were passed continuously on a conveyor belt. However, this was very energy-intensive, as the oven had first to be heated up to temperature and then held at that curing temperature for some time. More importantly, this continuous operation lacked flexibility as it could not respond quickly to changes in colour or to customer demands for fast delivery of limited numbers of screws. To solve both of these problems, SFS Intec contacted Excelitas, who designed, manufactured and installed a carbon infra-red medium wave curing system. This is a three-zone oven with seven 4kW medium wave infra-red emitters in each zone. Medium wave radiation is readily absorbed by powder coatings and allows rapid and efficient curing. In operation, trays of coated screws are now manually loaded into a selected zone and the emitters are switched on. The curing temperature of 180°C is achieved in a matter of seconds, rather than the 30 minutes or so required by the previous system.

All three zones are individually loaded and controlled so that three different batches of screws

can be cured simultaneously, if required. "We very much pride ourselves on the quality of our customer service," says Bob Mrozik, the technical services manager at SFS, "and the new batch processing with the infrared oven now means we have improved this service by being able to respond more quickly to last minute customer requests - and often provide a next-day service. In addition, we have found that the pyrometer control of the product surface temperature, as opposed to merely controlling the oven air temperature, as was previously the case, has given a much more consistent quality cure."

Infrared Heat reduces curing time re-painted aircraft assemblies by over 75%

A new paint finishing line with infrared drying for painted assemblies was recently installed by a leading provider of integrated avionics, engines, systems and service solutions for aircraft manufacturers, airlines, business and general aviation, military space and airport operations. It used to take more than an hour to paint and cure the acrylic paint until lately. It was decided to modernize this line as part of a major investment. As a result, they contacted with Hi Tec Spray, specialized in application and fluid handling equipment and IR specialists Excelitas for drying and curing.

Excelitas set up trials at their test and development facility in Neston, with the customer. The result was a 116-kW medium wave system comprising of three individual 38.5kW heating stations as well as a conveyor system and spray booth, supplied by Hi Tec Spray. Before being painted, assemblies like wheels or brakes, are shot blasted to remove any old paint and are then run through a nondestructive testing zone to confirm that there are no stress fractures.

After that, they are placed on an indexing conveyor ready for painting with a two coat PU system, with the wheel unit being rotated at each station to give even heat distribution and assisting the paint application by the operator.

The different heat Stations are used to preheat the assemblies before the primer coat is applied, which ensures that they are completely dry and allows the primer to flash off before the topcoat is applied. The coated assemblies then pass to the next station where they are heated to the required curing temperature of approx. 110°C for six minutes and then passes into the next zone where they are held at that temperature for a further six minutes. In the last step the assemblies pass through three more indexing stations which allows them to cool down before being offloaded.

The IR system from Excelitas has reduced the original curing times by over 75%, a high-quality finish and paint savings have also been an outcome of this investment.

Infrared system helps improve airbag manufacture

A carbon infrared drying system, from Excelitas, is helping Airbags International to improve the manufacture of side impact airbags and has significantly reduced scrap levels on a coating line. Airbags International is a worldwide leader in automotive safety and manufactures both frontal airbags and inflatable curtains.

Both of these products feature a cushion which is folded in a specific way to make it unfold fast and safely in the event of a vehicle collision. The cushions for airbags are produced from Nylon 66 and an important stage in the finishing process is the silicon coating of the nylon web, after it has been washed and dried and then fixed in a Stenter. This smooth coating ensures that the cushion will unfold without sticking when deployed, at inflation times as fast as 50 thousandths of a second. Its smoothness also prevents any possible damage to facial skin.

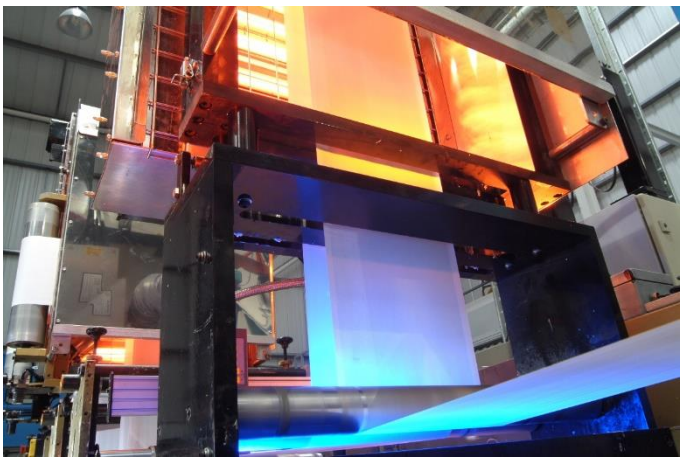
However, as the Nylon 66 fabric is very hydroscopic, this was causing a problem at the coating stage for the heavier cloth used for inflatable curtains. Consequently, Airbags International decided to investigate ways to reduce the cloth's moisture content down to 2% to ensure the correct adhesion, drying and surface finish of the silicon coating and to reduce scrap levels.

On-site trials were carried out using carbon infrared emitters. As a result, a 120kW carbon, medium wave infrared system was installed and this proved so successful that it achieved pay-back in just ten rolls of fabric. In operation, the infrared system is controlled by an optical pyrometer, which measures the surface temperature of the fabric and then transmits a signal to regulate the power of emitters within the infrared module, which is mounted above the fabric web. The cloth is coated with silicone on both sides, but the critical heating operation takes place just before the coating is applied to the bottom side. It is essential that the moisture is removed before this bottom coating is applied, otherwise it will be sealed in, potentially causing damage to the final surface finish.

The infrared module has been retrofitted very easily into the coating line, and the fast response of the carbon emitters also means that there is no damage to the coated fabric in the event of unexpected line stoppage.

Drying non-slip coating on paper mats

A carbon infrared system from Excelitas is helping Orvec International to achieve the quality of non-slip coating required on disposable tray mats to meet the stringent demands of major passenger airlines. Orvec International is a world leader in the design and manufacture of hazard protective workwear and passenger care products. Its range of disposable tray mats can be in paper or crepe, coated and uncoated and printed to a very high standard.



When the Kingston-upon-Hull company recently decided to introduce a new range of non-slip tray mats to meet the specifications of a major airline, a new manufacturing line was set up and the manufacturing technology was adapted to allow an extremely high-quality non-slip coating to be applied. The manufacturers of this new water-based coating advised that it should be dried quickly after application and suggested that the most efficient and effective method of achieving the required drying rates would be infrared radiation. Proving trials established that a carbon infrared system could achieve the required drying at web speeds of up to 70m/min and, as a result, a full-size system was installed at Orvec.

Since installation, the infrared system has proved to be highly energy-efficient and its high-power density, coupled with the suitability of medium wave infrared for water removal, has ensured that the applied coating is dried effectively to give a high-quality finish. The fast response of carbon infrared has also proved important in this application, as the heating can be switched off very rapidly if needs be, so preventing any damage to the web in the event of production line breakdown. Following successful operation of the system over a number of months, Orvec decided to see if line speeds of the drying section could be increased even more, to meet rising customer demand for the non-slip trays. Accordingly, a 7kW carbon infrared was retrofitted and this has allowed a further 30% improvement.