Temperature monitoring on flat glass lines

Erhard Nissner discusses successful process optimisation through non-contact temperature measurements.

Temperature measurement is key to the monitoring and optimisation of energy-intensive glass production processes. Careful monitoring of glass temperatures and of production equipment and machinery is the only way to ensure that product quality will meet stringent marketplace requirements. During the various production stages, temperatures are mostly measured without contact, e.g. in the glass melting furnace, in the working tank, in the feeder or in the gob.

LumaSense Technologies has a strong history of designing world class pyrometers with proven performance for flat glass production lines. These customised pyrometers feature narrowband filters that can measure temperature directly at the surface of thin glass, or deeper into a thicker sheet to provide accurate, precise and repeatable results. Complete system designs ensure a smooth installation with flexible optical configurations and multiple interface options.

THE OPPORTUNITY

During the manufacturing process, accurate control of the process temperature and ramp rate is critical to ensuring a quality product. Non-contact infrared measurement systems have been well established for use on the float glass production line. However, a full understanding about the importance of the pyrometer parameters is needed to select the correct instruments for the relevant process steps.

Pyrometers selected for temperature measurements in the float bath and to measure the cooling profile in the annealing lehr require a narrow band spectral response to ensure that only the surface of the glass is measured. Additionally, care must be taken to avoid reflection from heating elements that are installed in the float bath chamber and flame interference in the leading portion of the float bath.

THE SOLUTION

After the glass melting tank, the temperature profile in the next two process steps, the tin bath and annealing lehr is required to be monitored to ensure quality, stress-free product.

The tin bath can be considered as two zones, the hot zone where it is necessary to measure through burning gas flames and the cooling zone, where only the glass surface is measured without burning gas. In the hot zone, it is vitally important to measure at 3.9 µm to measure through the gas burners, which control the viscosity of the glass. For this step, the IMPAC IPE 140/39 pyrometer is the best choice.

After the glass has the correct viscosity, it is transferred to the cold zone in the tin bath, where the surface temperature of the glass is measured with an IMPAC IN 5/5 pyrometer. In both of these zones, the use of site tubes to minimise stray radiation from glow bar heater may be required.

In the annealing lehr, the surface temperature is also measured with the IN 5/5 pyrometer to control the target temperature and speed to relieve thermal stress of the flat glass for further process steps.
PYROMETERS USED
The IMPAC IPE 140/39 pyrometers cover temperature ranges between 20°C and 1800°C and are capable of measuring through flames and combustion gas, without influencing measurements. Moreover, these pyrometers allow for accurate penetrating measurements into glass and reduce emissivity errors.

The IN 5/5 pyrometers are compact-sized instruments, covering temperature ranges between 100°C and 2500°C. Further benefits of operating these pyrometers during flat glass processes are that they provide high accuracy due to digital linearisation of the output and they enable the measurement of small spot sizes with a minimum of 1.1mm.

USER BENEFITS
LumaSense Technologies offers a complete temperature monitoring solution for flat glass production lines, with full accessories to speed installation. Furthermore, this solution enables closed loop control of heating elements, to improve accuracy and stability.

The company’s improved monitoring of cooling rate enables flat glass manufacturers to produce stress-free products.

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