

Process control and temperature monitoring in the glassworks

The use of fibre optic pyrometers for taking measurements on furnaces and forehearth is discussed by Erhard Niessner.

Temperature measurement in the glass melting furnace is an essential part of glassmaking, in order to achieve an optimal melting process and to avoid excessive stress on the production equipment. The glass transition temperature in the working end, forehearth and feeder is largely responsible for the viscosity of the glass and it is this viscosity that will eventually determine how the glass is formed in the production of container and flat glass.

Repeatability assured

Accurate temperature measurement is required to ensure consistent quality of the end product, so it is important that any measuring device must have a repeatability of +/-1°C. To achieve constant glass viscosity, continuous temperature control is an absolutely must. The temperature has to be measured at different points along the forehearth, as far as the feeder. When using thermocouples, especially those subjected to immersion in molten glass at continuous high

temperatures, long-term repeatability and longevity of the sensors cannot be guaranteed over extended periods of time. Through immersion in the glass melt, shear forces are present in the forehearth area and these can affect the lifetime of the thermocouple. Indeed, the thermocouple can easily age prematurely, which, in turn, affects the accuracy of measurement. Platinum elements and platinum protective sleeves are very costly to replace.

Alternatively, an optical fibre infrared pyrometer IMPAC IS 50-LO/GL from LumaSense Technologies, an Advanced Energy Company, offers the possibility of an exact temperature measurement where, due to the operating wavelength of the pyrometer, a defined penetration depth into the glass surface is achieved.

prevents the atmosphere within the forehearth from condensing on the optics and keeps them fog-free.

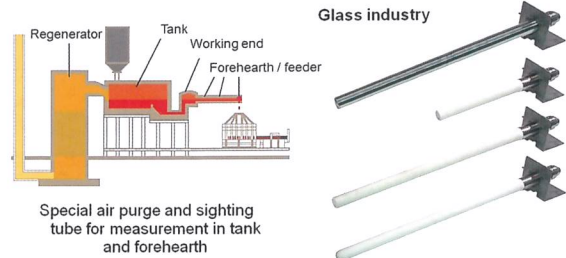
Because the optical fibre pyrometer never touches the molten glass, there is no premature ageing. The output signal of the IS 50-LO/GL digital two wire pyrometer is used by the process controller or PLC to regulate gas flame or electric heat elements in the forehearth.

The ambient temperature at the optics are allowed to a maximum 250°C and the optical fibre to the transmitter can be used in different lengths from 5m to 30m. The maximum operating temperature of the transmitter is 70°C.

Another benefit of the IMPAC IS 50-LO/GL system is that the optic fibre can be changed in-situ if broken or damaged. Also, the use of fibre optics allows measurements at the high ambient temperatures in the melting furnace and forehearth range, without additional water cooling of the measuring area.

In addition to a fixed online system, there is a portable, hand-held measuring pyrometer, the IMPAC IS 8 pro, which operates at the same wavelength as the IS 50-LO/GL device. ●

Industry approved accessories for IS50LO-GL applications



Process schematic and different types of sighting tubes from LumaSense.

Digital two wire solution

LumaSense has a solution using the IMPAC IS 50-LO/GL, a digital two wire pyrometer with selectable range between 600° and 1800°C. This pyrometer combines the high accuracy of digital signal processing with the simple connectivity of two wires. And most importantly for the dedicated application, the IS 50-LO/GL offers high repeatability (0.1% of measured value °C + 1°C).

Emissivity is adjustable at the device and the sub range and response time via service interface. The instrument is equipped with a test function to check the correct connection. All mechanical parts are made of hard-wearing stainless steel and the fibre optic cable is mechanically very stable for use in harsh ambient conditions.

By means of an open sighting tube manufactured from Inconel or aluminum oxide, the glass melt can be measured without contact. Inconel tubes can be used up to 1100°C, aluminum oxide ceramic tubes up to 1800°C and various lengths are available to suit the location/measuring point. Immersion of the sighting tubes in the melt is not required and the measuring tubes are provided with a small amount of compressed air. This



The IS 50-LO/GL fibre optic pyrometer for the measurement of molten glass in forehearth, feeder and gobs.



IMPAC IS 50-LO/GL pyrometer with an Inconel sighting tube in a glass forehearth.

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