Float and automotive linescanning

Tom McDougall* explains why the industry favours infrared linescanning for temperature measurement.

In the early days, glass surface temperatures were read by focusing a single infrared thermometer on the moving glass surface – effective, but limited by the fact that the temperature data it collected related only to the longitudinal ‘strip’ defined by the thermometer’s field of view.

The next step was to deploy multiple arrays of radiation thermometers to provide additional temperature measurements at selected positions across the whole width of the product – a workable but costly option that still fell short of full, ‘edge-to-edge’ temperature profiling.

This was not achieved until the arrival in the 1980s of the infrared linescanner – a development of the non-contact radiation thermometer that uses a rotating mirror to scan the instrument’s field of view through a pre-defined angle.

If the product is moving – in float or automotive glass production, for example – a two-dimensional matrix of temperature data is built up as it passes through the scanner’s field of view. This data can be sampled up to 1,000 times per scan by the PC-based unit that processes the temperature data, achieving a spatial resolution equivalent to having 1,000 infrared radiation thermometers mounted in a row across the width of the product.

Float glass

Manufacturers in this field were quick to appreciate the benefits of linescanning and, today, the method is almost an industry standard around the world, often in the form of Land Instruments International’s Landscan system.

The ‘bottom line’ benefit is an enhanced yield from lines processing thick ribbon, or where there are regular changes in the ribbon profile with respect to thickness, width or both. Best results are achieved when the line scanner is integrated with the lehr heating control system, which typically achieves pay-back of capital expenditure well inside the first year.

Process operators have access to thermally and dimensionally accurate displays of unprecedented quality, resolution and accuracy encompassing thermal profile, width and centre-line sidewalk; and they are alerted to ribbon breaks immediately by on-screen pop-up messages.

As well as being a ready source of customer information, the database facility can be used for trending studies and QA purposes; and process development staff can use the option of a separate zone model to work, for example, on improvements to edge yield.

Typical Landscan installations for float glass use a sensor head at the exit of each of the three zones, but additional sensor heads at the lehr gap and RET positions are often also specified.

Automotive glass

Similarly, the justification for introducing an infrared line-scanning system is usually yield enhancement, which is achieved through more consistent product temperature distributions before forming to final shape.

One particularly useful feature of the Landscan signal processor is the ‘subtracted map’ facility, which gives immediate images illustrating the difference between the latest batch and the reference batch.

For most automotive applications the Landscan sensor head is mounted above the process centre line, after the exit from the heating section and immediately before the shaping dies.

Windscreen/windshield product speed is normally medium to fast, which calls for scan rates between 25 and 50Hz. Side windows move much more quickly and scanning is thus at 50 to100Hz to maintain good scan coverage at the faster production speeds.

Low-emissivity coated windscreens and side windows require a different approach whereby the sensor is mounted beneath the process line such that it scans the uncoated underside of the product.

The below-line position demands exceptionally precise alignment and optics capable of focussing on small target get spot diameters with very low levels of optic aberration, because sighting is normally between closely spaced support rollers.

Latest development

These and many other requirements are catered for by Land’s new LANDSCAN PRO LSP5 series of glass-specific infrared linescanners, which are faster, smaller and lighter than ever before - and cost less to purchase and operate.

Scan speed is factory preset at 20Hz for float glass and 50Hz for other applications, but this can be increased up to 100Hz if users need more data in order to study process temperature trends in great detail, or satisfy the increasing demand from customers - especially in the automotive industry - for comprehensive QA documentation.

(see page 12 for more information on the LANDSCAN PRO range.)*

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