Hot end: Where quality is made

Philippe Spiteri* explores the benefits of Bucher Emhart Glass's Forming Process Monitor System, which is now integrated with the FlexIS Forming Line Control System and features defect detection capability.

In today's global market the glass container industry faces the challenge of improving productivity while reducing costs, with ever increasing quality requirements in the context of harsh environmental issues and pressure from alternative packaging solutions.

The glass container manufacturing industry has maintained a relatively traditional approach resulting in pack rates in the low to mid 90%, with considerable investment in the cold end to sort quality in order to meet customer expectations of zero defects delivered.

To achieve long-term sustainability, however, it is necessary to focus on preventing defects in the hot end, where the quality is made.

Forming Process Monitor System

FlexRadar is a glass container forming process monitor system, using infrared technology to capture the thermal signature of glass containers as they travel on the flight conveyor directly after the IS machine. Those thermal images are a direct representation of the glass distribution within the container, allowing for the identification of glass forming process deviations and quality issues. They also allow for detection and rejection of critical defects in the hot end.

Using two high-resolution infrared cameras positioned at an angle on opposite sides of the conveyor, FlexRadar captures thermal images from each passing container.

Those thermal images are processed to identify cavities producing containers with vertical glass distribution, horizontal glass distribution, or dimensions that stand out from the overall population.

Cavities or sections producing outliers are quickly identified and reported to the hot end operator for corrective action.

In addition to trend analysis and the identification of outlier containers, FlexRadar rejects down ware, stuck ware, freak, leaner, choke neck, stone, blister, birdswing, mould fin, thin neck and thin wall. Rejecting those critical defects at the hot end makes for a smooth transition at the ware transfer and protects the cold end equipment. It reduces the response time to anomalies, and with all information cavity-correlated, allows for root cause analysis enabling the operator to quickly resolve the problem.

Closed-loop

FlexRadar offers benefits as a stand-alone machine. Its real value emerges when integrated with the FlexIS Forming Line Control system.

With FlexIS controlling all settings from the feeder to the stacker, FlexRadar becomes the 'eyes of the machine'.

Based on the container position on the flight conveyor FlexIS automatically adjusts the timing of the push-out to maintain proper container spacing, preventing interference on the conveyor and jams at the ware transfer.

Additionally, long-term tests at Bucher Emhart Glass's research centre show that FlexIS can recognise drift in the forming process based on feedback from FlexRadar and automatically adjust process parameters without operator

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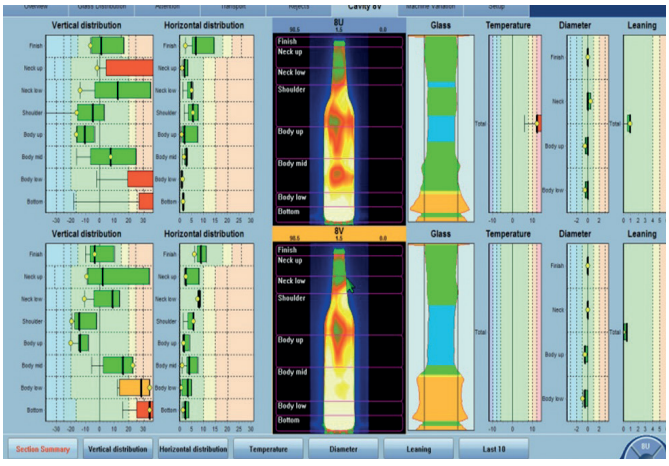
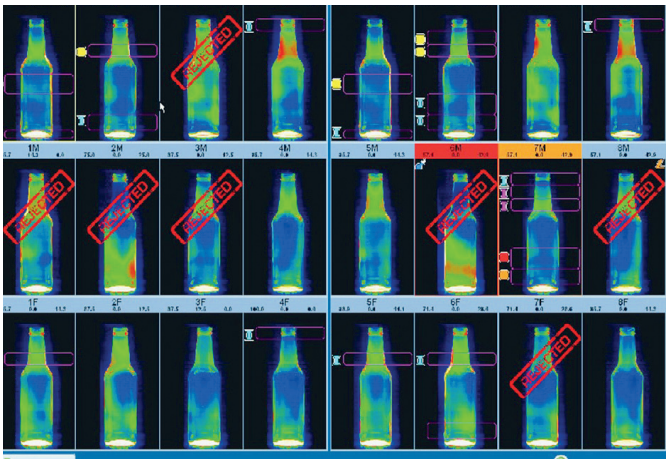
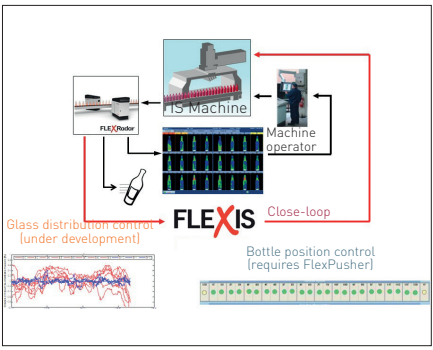


FlexRadar section screen.



FlexRadar overview screen.



▲ FlexRadar operation diagram.

intervention, essentially closing the loop between end-product and forming process. These self-regulating capabilities reduce the demand on the hot-end operator while bringing stability to the process.

System description

FlexRadar is designed for extreme environments by incorporating sealed electronics with solid state cooling and backup air cooling. The user interface panel contains a high-temperature 19" display with touchscreen. Several user interface panels can be located in the control room and at the operator station. FlexRadar also supports ethernet connection to the factory information system for remote monitoring, real-time data gathering, data archive, and integration in production reports. Each gob cut in the hot end is an opportunity to generate revenue.

However, the tedious adjustment of the many parameters involved in transforming each gob into a defect-free container is still dependent on the skill level of bottlemakers.

Bucher Emhart Glass strives to offer solutions for glass container manufacturers to optimise their production through continuous improvement. By reducing dependence on bottlemakers, FlexRadar, combined with closed-loop helps eliminate variations from operator to operator and from shift to shift for a more stable process and a more efficient operation. ■

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