Improving cold end control with automated solution

One of the best ways to improve quality and increase productivity is to have more meaningful and timely information about the manufacturing process. Rick Otto* and Jeff Hartung** explain how Emhart Glass’ automated MiniLab system uses this principle to achieve savings in time, labour and costs.

Timely information about the glass container manufacturing process is one of the best ways to increase productivity and percent pack. When the information comes from Emhart Glass’ MiniLab system, this information also can lead to reductions in labour costs, as well as the prevention of costs associated with ware reselection resulting from defects found in the packed ware – either from internal packed ware audits, or worse, packed ware defects causing entire shipments of containers to be returned.

Automated solution

The MiniLab works by automating most cold end quality measurements for bottle dimensions, internal pressure strength and fill-level capacity measurements. The system provides and records absolute measurement data in real time, with accuracy and reproducibility. It can also provide more measurements per dimension than existing manual methods.

The following features differentiate the system from manual measurement methods:

- **Speed** – It can measure 30 bottles in 30 minutes, including flange/knockout/D angle, internal pressure and fill point capacity. This allows one MiniLab to support two production lines, measuring a setout every two hours including retests.
- **Accuracy and reproducibility** – Normal resolution is ± 0.08mm (0.003 in) for finish and body measurements. Lean is ± 0.38mm (0.015 in). Knockout and flange is ± 0.0127mm (0.0005 in).
- **Dual bottle operation without job change** – It can measure two different bottle types without mechanical or electronic job changes. This allows one MiniLab system to support two manufacturing lines.
- **Data available in electronic format** – Measurement results are available to the plant’s information network. If no network is available, Emhart Glass’ Data Collector can store the data.
- **Configurable** – Several configurations are available, from standalone systems for the quality control lab to fully integrated automatic sampling lines.

Calculating potential return

Using an example of a glass plant making non-returnable beer bottles on a production line with 30 moulds, producing 450 bottles per minute, the savings from the use of the MiniLab can total more than $500,000 in a year. This return on investment is possible because the system can dramatically improve the plant quality system. A quality system that uses the pass-fail results of go-no-go checking of container dimensions identifies a problem after the process has gone out of control and is producing rejects. This approach can be described as ‘reaction by reject’. A better approach involves actually measuring these dimensions and correcting issues before an out-of-control condition occurs. This approach can be described as ‘reaction by warning’. However, gathering process information manually requires a considerable amount of time and effort; therefore it is often too late to make process changes before out-of-control conditions develop.

At a production speed of 475 bottles/minute with 30 moulds, there will be 675 bottles from each mould in the lehr at any one time during full production. Assuming a 45-minute lehr time, if an out-of-limit dimension for one mould is detected at the end of the lehr

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and the hot end is immediately notified and corrects the problem, production will lose a minimum of 675 bottles. If this happened three times in one day, a total of 2025 bottles would be lost. If the per bottle cost is $0.12, this would amount to $243/day or $85,050/year.

If this situation was not detected immediately at the end of the lehr and was allowed to continue for 60 minutes, it is possible that out-of-limit bottles would be in the packed ware. Reselection of the containers would be required and costs would increase significantly. The bottle loss costs for one year would be $113,400 and the labour at $20/hour would be an additional $117,187.

The other potential saving is quality control labour. Emhart Glass has researched and recorded several tasks associated with cold end quality control. An itemised time study was conducted for each task. All tasks that the MiniLab can perform also were tabulated. Findings suggested that 16 hours of labour saving per day per line is possible when incorporating the system. Using a labour rate of $30/hour, that equates to yearly savings of approximately $176,400.

**System configurations**

Each MiniLab system consists of different configurations that include Emhart Glass’ ISIS dimensional measurement system and its MLP internal pressure measurement system.

The ISIS dimensional measurement system uses high-resolution cameras and software algorithms to measure bottle profile dimensions and inside neck measurements. Measurement data, including limit specifications, are displayed and available via hard copy printout, electronic file, or via transfer to a remote computer.

The MLP tests bottles according to the ASTM C-147 standard for internal pressure testing of glass containers. A number of key design features facilitate this:

- All non-corrosive metal construction enables many years of operation in a harsh water environment.
- Water and air sensors are incorporated to guarantee that improper pressure levels do not affect pressure testing results.
- High pressure testing capabilities to 62 bar [900 psi] as standard.
- Side loading of bottles separates the conveyor from the corrosive and wet internal water environment.
- Automatic lifting of the bottle to the clamping position reduces the need for manual adjustment.
- Dual bottle capable without job change.
- Pressure curve analysis algorithm discriminates between a proper pressure test or a high-pressure leak.
- Clamp and pressure seal tracking programme monitors the performance of the four clamps.

In addition to providing internal pressure testing, a MiniLab system equipped with the MLP can make capacity measurements every two hours, measuring up to five fill-point positions if necessary.

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