Setting new standards for container inspection

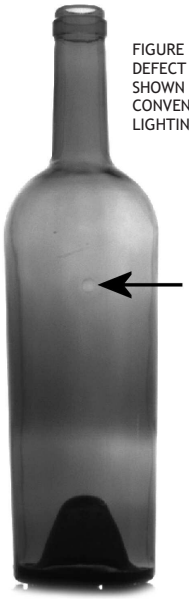

FIGURE 2: DEFECT SHOWN WITH CONVENTIONAL LIGHTING

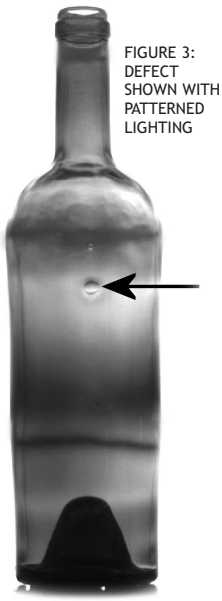

FIGURE 3: DEFECT SHOWN WITH PATTERNED LIGHTING

CHRISTIAN VON AH EXPLAINS HOW A NEW OPTICS DESIGN LEADS TO BETTER SIDEWALL AND DIMENSIONAL INSPECTION OF GLASS CONTAINERS

It's been said that two heads are better than one and that it's always easier to see in the sunlight. Translated into the language of vision inspection, it also can be said that six views of the container are better than two or four, and that better lighting equals better inspection.

These two concepts are the design foundation of the Emhart Glass Veritas iC Sidewall/Dimensional Inspection System. Introduced in 2003, the Veritas iC is a growing member of the Veritas Series inspection systems for glass container inspection, which provide glassmakers with technology solutions designed to help them meet the increasingly tough inspection requirements necessary to maintain glass as the pre-eminent packaging material.

WRAPAROUND LIGHTING

The Veritas iC starts with a wrap-around lighting design that allows each of the system's six cameras to capture clear, high resolution images of the container as it passes through the system's two inspection stations. Positioned at 45° angles to each other, each camera sees 135° of the bottle. With overlapping views, the Veritas iC actually sees more than 360° (see Figure 1).

Wraparound lighting ensures that edge slice, the dark shadow-like image that appears on the less well-lit side of the container, is virtually eliminated. Edge slice, which can obscure large portions of some containers, is a common problem when inspecting non-round containers. Wraparound lighting, combined with overlapping views, reduces this problem, especially with non-round containers, enabling a larger portion of the container to be inspected.

EDGE SLICE

The elimination or significant reduction of edge slice is critical to ensuring complete precise inspection and will reduce false rejects. To illustrate how edge slice, as well as the number of camera views used, affects inspection, consider a 1 mm x 1 mm (1 mm^2) defect that appears in a front-on view (perpendicular to the conveyor). The conventional approach to sidewall inspection is to position two or four cameras at 45° to the conveyor – or at 90° to each other – with a single back light source parallel to the conveyor or single back light sources positioned opposite of each camera.

In the two- or four-view system with conventional back lighting, the 1 mm^2 defect is lost in the edge slice or is much smaller because the defect is on a round surface and is 'compressed' in all views. Using the same example of a 1 mm^2 defect positioned perpendicular to the conveyor, but this time with wraparound lighting and six views, the defect can be seen clearly in its original 1 mm x 1 mm size with cameras 2 and 5 in Figure 1. This results in comprehensive inspection, accurate defect detection and fewer false rejects.

LEAN INSPECTION

The optics design of the Veritas iC also improves the system's ability to accurately measure lean. Lean inspection is performed in one station of the Veritas iC using three views of the container. Most conventional sidewall/dimensional inspection systems use only one or two views of the container to inspect for lean, but with three clear views of the container, the Veritas iC has more measurements of the container with which to calculate lean.

In addition to more measurement data, the Veritas iC uses a powerful algorithm to calculate a three-dimensional image of the container. Using three views and 3D lean

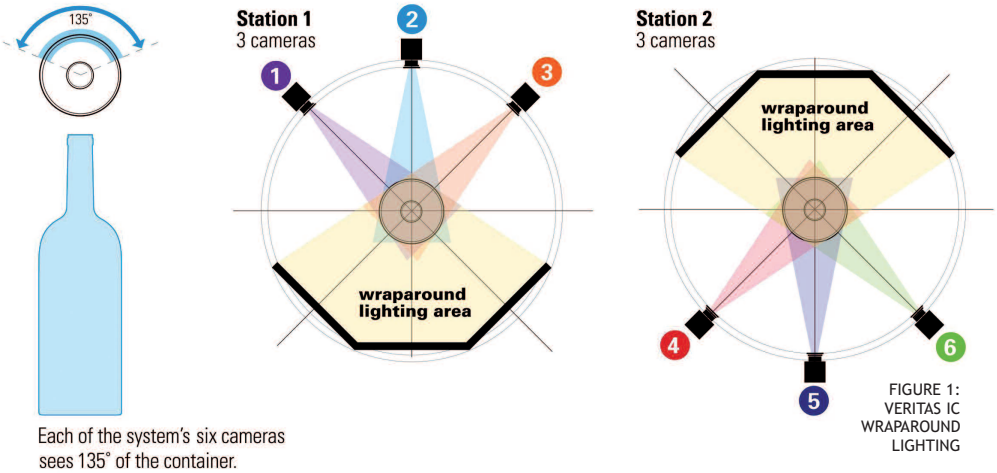

FIGURE 1: VERITAS IC WRAPAROUND LIGHTING

EMHART GLASS' VERITAS IC

calculation, the threshold range necessary to ensure detection of the lean can be set much narrower than the threshold range necessary using two camera views and only one or two sets of image data. This results in more precise lean detection and fewer false rejects.

DETECTING TRANSPARENT DEFECTS

In addition to better sidewall and lean inspection, the Veritas iC also has a significant advantage in transparent defect detection, due to better imaging from better lighting. Patterned lighting, a patented software-controlled feature of the Veritas iC, clearly defines and detects even soft-sided blisters, which are virtually invisible using conventional lighting techniques. The effect of using patterned lighting to detect transparent defects is shown in Figures 2 and 3.

When inspecting for transparent defects, the goal is to find the edges of the defect. With conventional, single-intensity lighting (as shown in Figure 2), these edges are washed out, making them virtually invisible and therefore very difficult to reliably detect the defect. The Veritas iC uses LED array light sources that allows for the intensity, or brightness, of the rows of LEDs to be set at different levels. Using this patterned lighting (shown in Figure 3), the edges of transparent defects are clearly visible and can be detected easily and reliably.

The combination of wrap-around lighting, six-camera views for opaque and transparent defect detection, three camera views for dimensional and stress inspection, better image analysis and patterned lighting combine to provide a comprehensive, accurate sidewall/dimensional inspection solution for glass container manufacturers. ■

ABOUT THE AUTHOR:
Christian von Ah is Cold End Marketing Manager for Emhart Glass Cold End Inspection

FURTHER INFORMATION:
Emhart Glass Manufacturing, Elmira (NY), USA
tel: +1 607 734 3671
fax: +1 607 734 1245
email: christian.vonah@emhartglass.com
web: www.emhartglass.com

WORLDWIDE CONTACTS:
For details of offices and export agents in North and South America, Asia Pacific, Europe, Middle East and Africa, visit www.emhartglass.com/aboutus/worldpresence.asp