Inspection accuracy, flexibility and configurability

The introduction of the Veritas series inspection systems, says Tom Beiswenger*, continues a tradition of providing technology solutions that dates back to the birth of high-speed automatic production of glass containers.

On 6 August 1913, inventor Karl E Peiler watched as his paddle needle feeder, together with a Hartford press machine, produced the first automatically pressed jars. The baby food containers were a major accomplishment. The event was a milestone of the early 20th century history of glassmaking that began in 1903 with Michael J Owens' invention of the automatic bottle making machine and culminated in 1924 with Henry Ingle's invention of the first independent section (IS) machine.

According to *Emhart Glass and the Story of Glass Packaging* by John H Edgington and Charles R Hammond, "The jars were cloudy, full of seeds, blisters, crizzles [surface cracks] and lap marks resulting from the primitive and inadequate equipment which was available in Hartford to mix and melt the glass batch."

Most of the defects were large enough to be seen with the human eye, and production speeds were slow enough so that this inspection method was both accurate and reliable.

The invention of automated inspection equipment in the 1940s was another milestone, allowing glassmakers to achieve a cost effective level of quality and production never before possible.

Now Emhart Glass is introducing the Veritas series of quality assurance systems, a comprehensive set of inspection tools that has been developed for glass containers. Instead of re-designing existing technologies, the Veritas series was conceived and designed from a clean sheet of paper.

Veritas includes most inspections currently available to the industry as well as new ones, some of which are available for the first time in an on-line system. Emhart believes that Veritas sets a new standard, incorporating flexible, precise state-of-the-art container handling techniques.

The Veritas series includes three modules that can operate either as stand-alone inspection systems or, when installed together, as a single, comprehensive, integrated inspection system:

◆ The Veritas iM includes a servo-controlled star wheel handler that is capable of performing plug/ring and dip/saddle/height gauging, check detection, optical wall thickness measurement and mould number reading.

◆ The Veritas iB is scheduled to be released this year and includes a belt handler that is capable of performing sealing, surface, base, base stress, plug and dip/saddle/height inspections, as well as mould number reading (base and heel codes, including alphanumeric).

◆ The Veritas iN is scheduled to be released by late 2003/early 2004 and provides non-contact inspection for sidewall, sidewall stress and dimensional defects.

The release of the Veritas iB and iN both consolidate and simplify vision inspection of glass containers.

The Veritas iB consolidates all of the vision inspections currently offered on the Emhart Glass ProScanner 3200, 5200 and 8200 inspection machines and adds some new ones into a compact belt handler in which all mechanical adjustments are motorised and software-controlled, enabling electronic storage of all setup parameters. Setup on a repeat job can be completed in a few minutes. The inspections are capable of extremely accurate defect detection with little or no loss of good ware. In recent testing – both under controlled laboratory conditions and under on-line production – sealing surface inspection was proven to be capable of detecting flange finish defects as small as 0.081mm and knockout defects as small as 0.135mm with a false reject rate of less than 0.03%.

The Veritas iB also offers vision plug inspection and vision dip/saddle/height inspection, machine
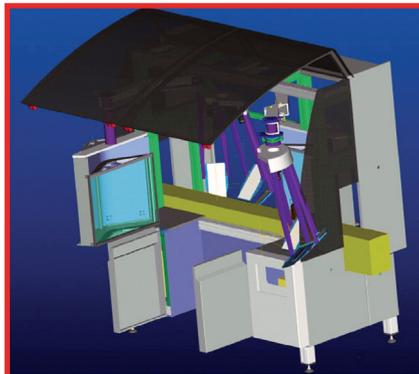
◀▼ *Fig 1. The Emhart Glass Veritas iN was designed using advanced 3D CAD software. The final drawing concept is shown on the left with the finished prototype below.*

vision alternatives to electro-mechanical go/no-go devices. These devices both inspect and provide measurement information at levels of accuracy and speed not possible with mechanical gauges.

Besides providing a comprehensive approach to sidewall and dimensional inspection, the Veritas iN reduces the complexity of this critical inspection. Wherever possible, different inspections are performed within microseconds of each other without interrupting the natural flow of containers through the machine. Rather than using complicated arrangements of precision mirrors, periscopes and fixed directional light sources, the Veritas iN folds the optical path and uses patented software-controlled LED light panels that enable inspection for both transparent and opaque defects. The simplified optical path and multiple use of cameras reduce the opto-mechanical setup and requires no changes with three ranges of ware. Designed in full three-dimensional CAD from the covers down to the wiring blocks with maintenance in mind, it has easy user access to the lights and mirrors (see *Fig 1*). For sidewall

stress, the Veritas iN uses a proprietary polarising configuration that enables the same camera to perform both sidewall aspect inspection and sidewall stress inspection. The use of six fixed-focal length lens/camera modules also permits 360° inspection – at sub-pixel resolution – without any distortion at speeds of up to 600bpm (see *Table I*).

All Veritas series modules use intuitive touchscreen displays that have a common look and feel and are designed to make inspection setup easier. The selection of inspection algorithms is graphical icon-based, making subsequent changes simpler and allowing for a variety of container setups that can be saved and later recalled for job changes. Job changes are also easier, since the software programmable adjustments are automatic. The Veritas user interface also enables easy, secure remote access through the use of widely-available web browsers, including Microsoft Internet Explorer and Netscape Navigator.

Just as Karl Peiler's invention of the paddle needle feeder enabled high speed automatic production of glass containers, the introduction of the Emhart Glass Veritas series inspection systems will, Emhart believes, enable dramatic improvements in the accuracy, flexibility and configurability of glass container inspection. **G**

Table I. Veritas iN Inspection Resolution.		
Camera Focal Length*	**Container Height**	**Pixel Resolution**
16mm	178mm-381mm (7in-15in.)	0.540mm
25mm	114mm-229mm (4.5in-9in.)	0.346mm
50mm	38mm-114mm (1.5in-4.5in.)	0.173mm

* Assumes 12.7mm CCD camera with pixel resolution of 752X582 mounted horizontal side vertically and the object distance (working distance) is 1016mm (40in) away.

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