► Breakthrough in the inspection of embossed bottles

SYSCONA Kontrollsysteme GmbH has made quite a name for itself as an expert in providing inspection solutions for the packaging sector. Specifically, the company has many years of experience in bottle inspection and series component inspection. SYSCONA has now achieved a breakthrough in the accurate identification of bottles using a newly developed optical system plus the unique object classification software tool 'Manto', which is part of the Common Vision Blox vision application suite from STEMMER IMAGING.

The increasing variety and number of different re-usable bottles (made of transparent materials) has increased the complexity when they are inspected and sorted. Modern logistical concepts are based on a step-by-step sorting process for un-mixed bottles which demands identification of individual bottles, even within crates of empties. Until now, bottles could only be roughly assigned to a particular class on the basis of a number of rudimentary features such as bottle height, diameter, colour or labelling.

A typical situation in a crate of empty bottles

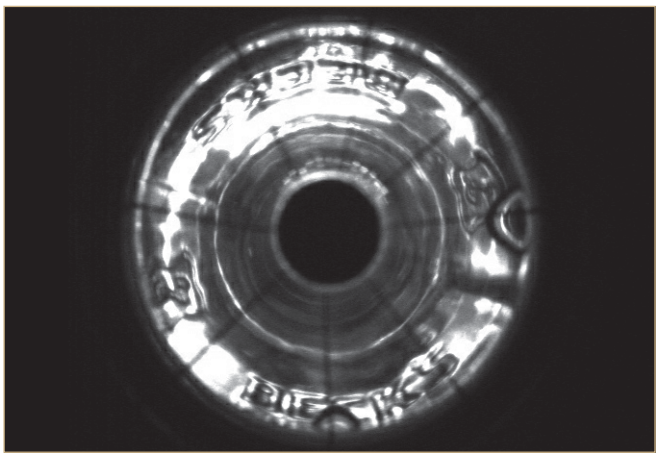
The new system from SYSCONA provides very significant improvements in this area, enabling accurate differentiation between individual bottles, even within mixed crates of empties. This is achieved by using specific bottle features such as areas of relief on the bottles or code marks. Bottles often differ in their appearance purely as a result of embossed details on the neck or shoulder areas. This embossing must be detected accurately and reliably if bottles are to be identified correctly. However, the view of bottles within a crate is very restricted.

To meet this challenge, SYSCONA use the very latest 'hypertelecentric' lenses. Using these specially designed lenses, embossing can be fully detected, even on the steep neck part of the bottle and the recorded images used for subsequent analysis. This is done precisely at the moment of concentric positioning of each bottle under the lens. One lens is used for each row of bottles in a crate to detect the bottle type.

Another feature of the SYSCONA solution (patent pending) is its ultra-compact high-power LED illumination that is located concentrically around the front of each lens. Using this type of illumination, the transparent bottle material can be efficiently flooded with light such that embossing features appear in strong contrast.

Each bottle is recorded as close to its central axis as possible, using a specially designed trigger solution. This allows extremely fast image evaluation tools to be used to detect any relief or embossing on the bottle. While the lens 'opens-up' the view of each bottle, CVB Manto - a software tool which is part of STEMMER IMAGING's Common Vision Blox image processing library, analyses the "multi-dimensional" image information and classifies the image structures. The embossing is then "read" in a manner of speaking and each specific type of bottle is accurately assigned to a separate class. The advanced nature of the software is such that even interference on the bottles or incompletely detected markings does not generally impair the classification.

To achieve the best possible system configuration and for fine adjustment of the entire image processing procedure, including illumination, lenses, cameras and software, SYSCONA placed its trust in the unrivalled know-how and experience of the STEMMER IMAGING Group.



Using one hypertelecentric lens for each row of bottles, embossing can now be fully detected and analysed, even on the steep neck section, and this happens precisely when each bottle is positioned concentrically under the lens to achieve optimum image results.

► Detection rate of over 98%

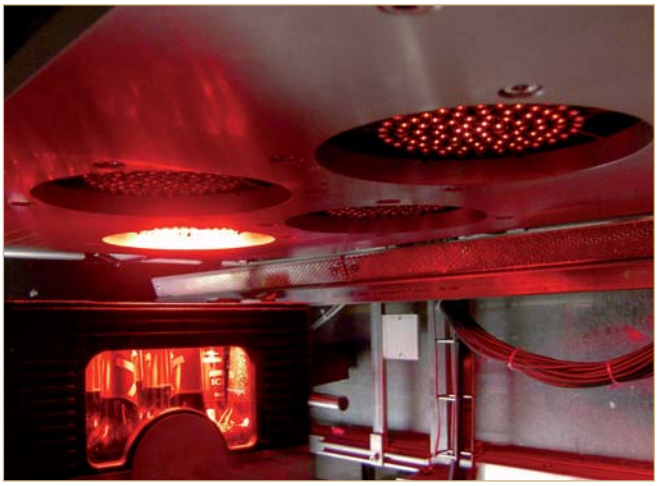
The system that resulted from this partnership has already proven its performance and capability: "The benefits of accurate bottle identification quickly became apparent from its very first use in daily operation," says a very satisfied Prof. Kurt Spiegelmacher, head of technology at SYSCONA Kontrollsysteme GmbH. "Despite the multitude of potentially interfering factors that arise every day in crates of empties, a detection rate of over 98% was achieved using this new system." According to Spiegelmacher, this value is obtained even at fast processing rates of up to 5000 crates an hour.

Using CVB Manto's ability to 'learn', this value can easily be increased still further. For all kinds of sorting tasks the SYSCONA system opens up a whole range of potential applications for the categorisation and logistical routing of empty goods.

"The detection accuracy figures for previous technologies were considerably lower than those achieved by this system, plus, they were sometimes unable to differentiate between large numbers of individual bottle types," continued Spiegelmacher. "Accurate sorting in crate-handling environments is now achievable with high levels of precision. The system also supports modern step-by-step 'in-crate' sorting - even enabling this type of operation where it was previously impossible."

The solution developed by SYSCONA with the close partnership of the STEMMER IMAGING Group also offers the possibility of further adaptation, allowing the imaging to be adjusted in real time, in order to manage different bottle properties and environmental conditions. Illumination sources can be controlled by a programmable configuration system or by using sensor information such that the best possible images are obtained for analysis, even when the bottles are of different colours. Whether bottles are made of brown, green or clear glass, adding different illumination modules or by individually accessing LED matrix sectors or LED groups with different colour emission values, the SYSCONA inspection system always delivers optimum image quality and the greatest possible levels of identification accuracy.

The solution presented here represents a breakthrough in sorting process technology used for returned empty goods and paves the way for creative bottle designs that were hindered by the limitations imposed by previous detection technologies.



Using a patented ultra-compact, high-performance LED illumination system, embossing on bottles is visible with a strong image contrast.

► FACTS

Application area:	Beverage industry
Task:	Inspection of embossed bottles
Hardware:	■ Illumination, optics, camera and acquisition from STEMMER IMAGING
Software:	■ Common Vision Blox tool Manto (STEMMER IMAGING)

► OUR PARTNER SYSCONA

SYSCONA Kontrollsysteme GmbH (www.syscona.de) is a key global supplier to many leading drinks and foodstuff companies. A wide range of production and filling plants - particularly those used by breweries and soft drinks manufacturers - have placed their trust in the cutting-edge technology supplied by SYSCONA, whose headquarters are in Freudenberg Niederndorf, near Siegen in Germany.

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