VIDEO SYSTEMS: AI-based Glass Container optical colour inspection

Video Systems puts artificial vision and intelligence in quality and process control at the service of manufacturing. The experience and know-how gained, particularly in the steel and glass markets, have led to the setting up of dedicated, specialized divisions. Video Systems proposes an artificial intelligence approach for the optimization of standard glass container inspection methods.

QUALITY CONTROL SYSTEMS

Glass container inspection processes have been characterized for decades by human manpower and optical inspection technology. The ability to identify many types of defects has increased thanks to innovations on electronic and optical devices, but some types have no real solution.

Today, systems also give good performance with regards to the identification of small defects, but this ability is sometimes affected by the phenomena of increased false positives. Maximization of production and optimal defects identification is the desired condition of glass manufacturers and the desired goal for green production. Being able to optimize production will have the effect of reducing pollution per tons of products delivered to the market.

COLOUR IMAGE ANALYSIS

Video Systems has adapted colour image analysis to new studies, technologies, and market feedback, observing an important reduction of false positives phenomena and an increased ability of their Imago line systems which identifies specific defects difficult to detect otherwise.

Technology in quality control systems is growing very fast. Quality control in the hollow glass production market is a key point because the final products (bottles, tableware, containers) are made for high quality demand markets such as pharmaceutical, food and beverage markets.

Recycled glass

All non-conforming containers are removed from the production chain and used as recycled glass (cullet). At the end of the line, the products are finally packed and palletized for subsequent delivery to final customers.

AUTOMATED QUALITY CONTROL SYSTEMS

Automated quality control systems, introduced into production lines in the past years, have proved to be more reliable and quicker in the control tasks than the most experienced employees. The purpose of every hollow glass manufacturer is to produce more containers with the best quality at the lowest cost. Industry connected to quality control systems, works constantly to increase the capability of inspection with two main goals:

1. increasing the capability of the system to identify defects; and
2. reducing the false positives on container inspection.

Video Systems' Imago line products today, are all powered with AI and, in particular, the solutions are deep-learning engine-based, dedicated to various defects on containers.

SIDEWALL QUALITY CONTROL

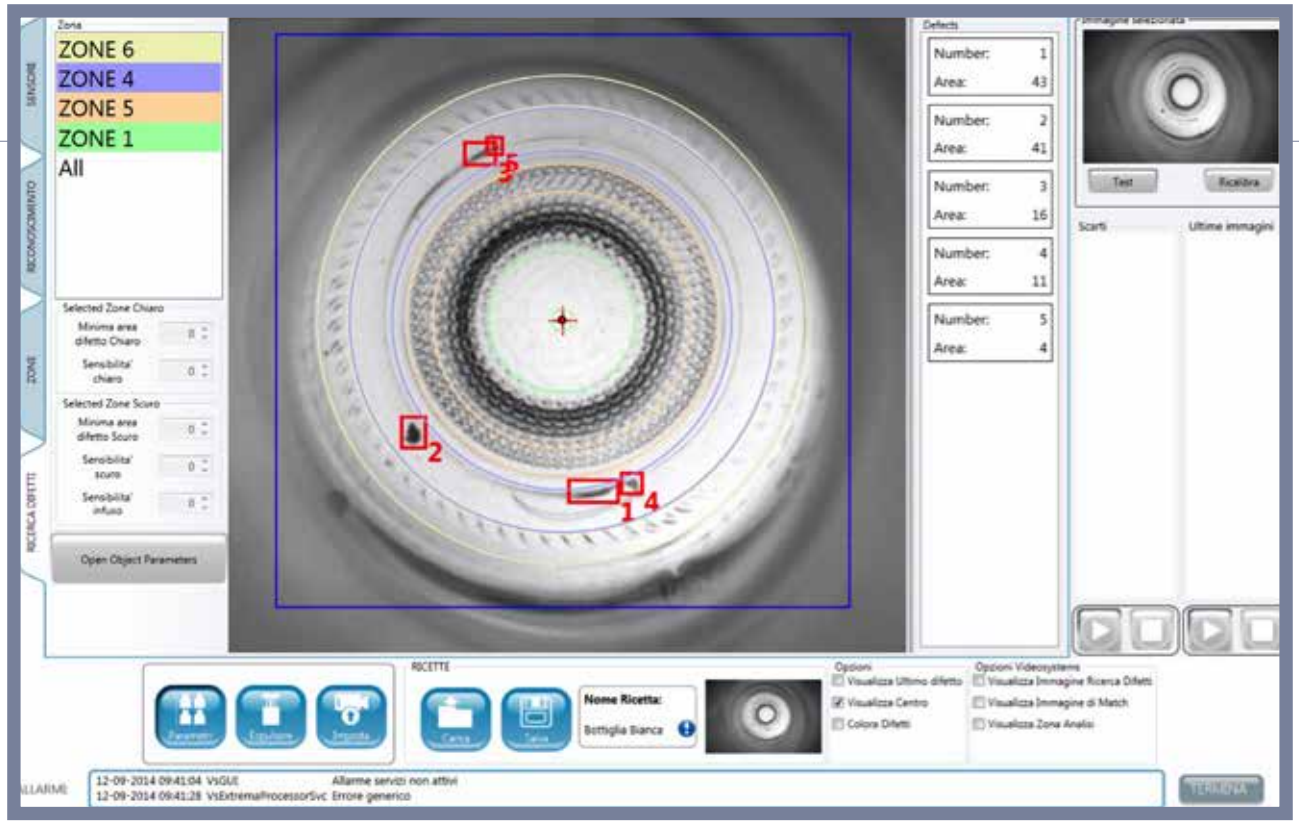
In stone identification, the use of Artificial Intelligence technology decreases false positives significantly. Simultaneously, this approach reduces machine set up time thanks to the lower parameters and self-tailoring system. Video Systems' Imago Omnia sidewall machine thanks to dell-learning, is able to bring a false positive effect down to 0.2 per cent.

IDENTIFYING REAL STRESS DEFECTS

The AI engine has the ability to identify real stress defects instead of reflections on container surfaces, which usually represent a problematic aspect on high density containers such as Champagne bottles.

LINEA SYSTEM-SHOULDER AND FINISH CRACKS

Linea system is a contactless solution for shoulder and finish cracks in standard carousel



machines. Thanks to its deep-learning engines the only operation necessary is to select the ROI of analysis and other parameters, for example the minimum size of defect, with no need to set up the light emitter and receiver. The system performs a 99.8 per cent capability of defect identification with a 0.1 per cent of false positive effect on about 20 different bottle shaped formats.

CONCLUSIONS AND OUTCOMES

The quality control of articles is an increasingly important requirement for hollow glass producers due to the rising demand for quality by the final market for such products.

For many years the glass inspection task has been performed by handwork without the reliability and speed required by current production cycles.

Nowadays almost all production lines provide automated systems for the quality control of glass containers. These systems use vision systems that can analyse bottles and identify defective ones. They use classic algorithms to detect defects and therefore need to set a high number of parameters. Some of these methods also need the defective sample in order to prepare the recipe for analysis.

Video Systems' approach is focused on the AI based solution having the capability to manage colour images to propose simple and fast setup machines that can produce very low-level false positives. In the last few years, Video Systems has been working on new tailor-made solutions that apply robotics, AI and machine vision technologies to supply future solutions to market research that is supported by EU in APICUS and ZDMP H2020 projects and the InterQ H2020 project. ■