

The quest for the perfect container for cold-end inspection

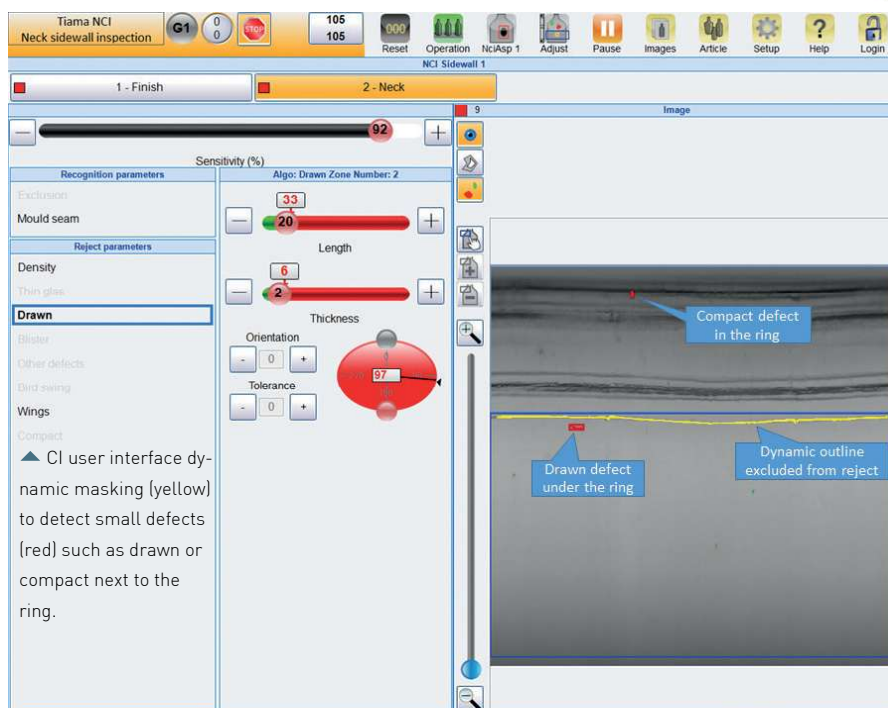
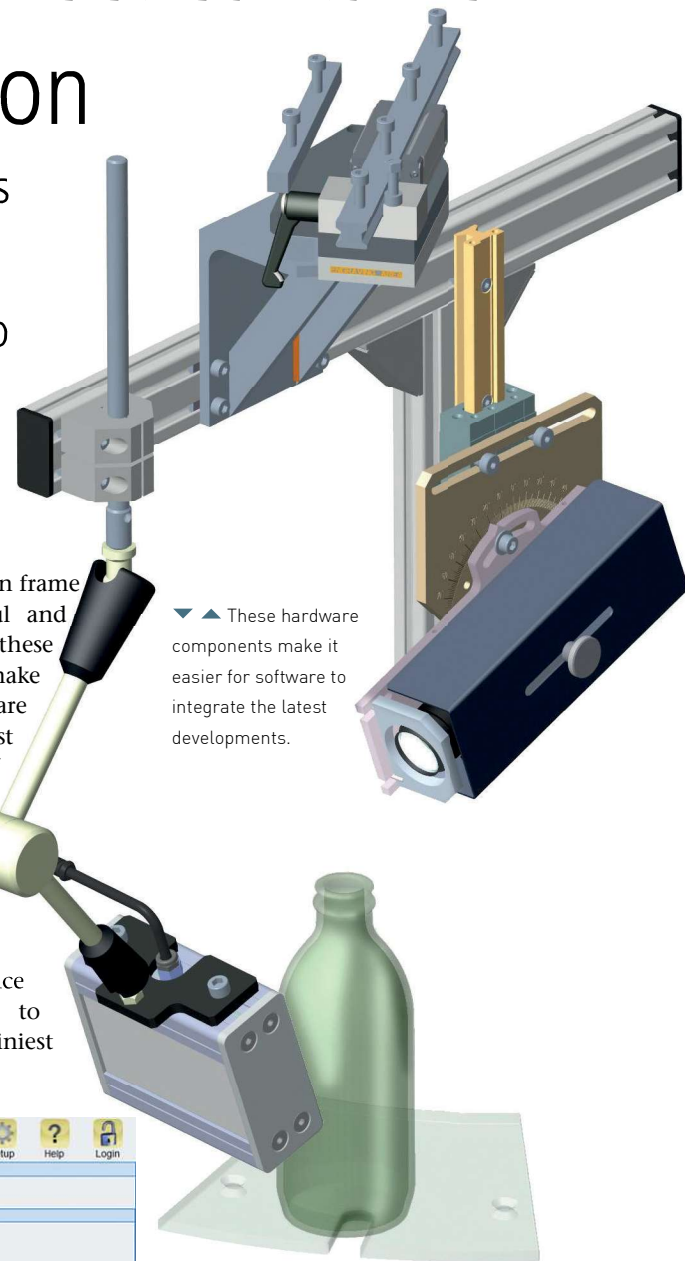
Damien Defenouillère*, explains why Tiamas MX4 carousel machine is the trend leading machine for cold-end inspection on hollow glass and why it needs to be a step ahead to enhance defect recognition.

The time has come to reinvigorate the Neck or Heel Camera Inspection type (NCI/HCI), 10 years after its first release into the market.

But before getting into the substance of this new batch, it might be useful to recall the original aim of the NCI/HCI. The purpose is to detect any possible defect located in those two specific areas. But imaging a defect and getting rid of the shadows generated by the glass itself is extremely strenuous on in-line machines. This is even harder when the diameter is small (in the neck of a container for instance) or when the article shape produces dark areas (push-ups). The objective of the NCI/HCI is to eliminate all these shadows by using line-scan cameras when rotating the container in a carousel machine.

The main hardware evolutions are

the switch to home-made high-performance cameras, Tiamas advanced electronics (Calia 3 CXP board integrated in the main frame computer) and a powerful and sharp LED lighting. All these hardware enhancements make it possible for the software to integrate all the latest developments of Tiamas machines. Therefore, the NCI/HCI inspection is based on the proven MCAL4 software, benefiting from its experience and powerful algorithms to search and identify the tiniest deficiency.



Masking to reveal intruders

The new updated architecture will allow the integration of advanced image processing to learn patterns. Any engraved logo or trademark could be identified and learnt to generate the appropriate mask. Enhanced data treatment will recognise this pattern on the current unrolled image and will relocate the mask to exclude them from the treatment. Therefore, extremely high sensitivity can be applied even in engraved areas. In such perturbed areas, a proficient object recognition makes it possible to detect any intruder in a crowd of potential defects.

Object recognition

In its quest for perfection, the advanced software aim is not anymore limited anymore to a basic 'detect & reject' task. The classifier provides the operator with the power of identifying and categorising the object found. Therefore, the worker has the capability to set different sensibilities and thresholds depending on the quality level target. Effective design, inherited from the MCAL4, can recognise normal objects such as shadows or mould seams from real defects. The remaining detected objects, that do not match the recognition parameters are then compared to all the rejection parameters to classify them. As a result, any pixel out of the acceptable value is tracked and categorised. This tool represents an incalculable worth for the operator eager to reach the highest product quality.

Eliminate the stress

The inspection can also easily be converted to stress analysis, to eliminate any tense container from the production line. To accomplish this task, polarising filters are integrated on the camera lens and on the light source. Consequently, the light generated through the LED light source is perfectly directed. Any tension in the glass inspected will deviate the light from normal direction and will thus generate a light level increase on the camera instead of a normally dark image. This specific function is called NSI/HSI (Neck or Heel Stress Inspection).

High value data provider

Thanks to its advanced tools, this neck and wheel inspection delivers high value data. The defect classification allows to distinguish the different deficiencies and get the proper actions started to eliminate the different root causes.

Furthermore, it can also be used for statistical analysis to reveal the pain points more accurately than just pointing the area. Indeed, once detected, identified and classified, the inspection increments the objects in specific counters.

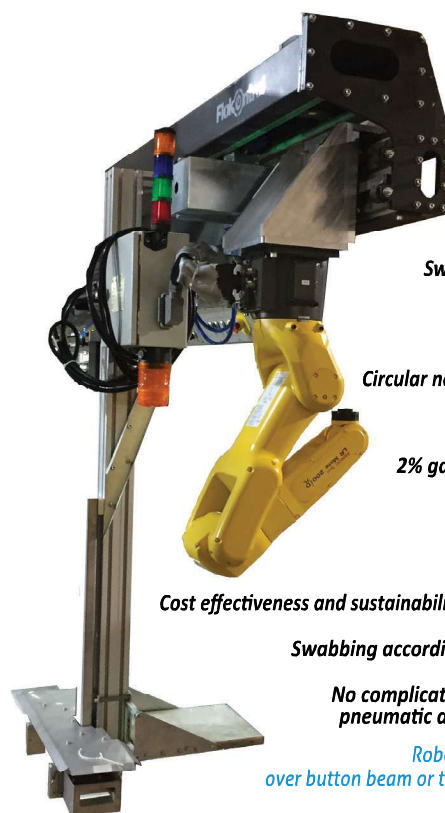
By a simple request, any connected device might collect the number of defects of any kind in any of the inspected areas. This knowledge is a gift for any production manager to carry out the appropriated operations.

YOUniverse, the smart factory concept

An active component of the Tiama YOUniverse data providing philosophy, the Tiama NCI participates to the development of the Smart Factory. The different exchange protocols gather and send high-value data, for every single container inspected.

Fully integrated in the MX4 machine, the data produced by the NCI can be linked to a specific single ID thanks to a Data Matrix Reader, or more simply associated to the original mould through a Mould Number Reader. The information is sent into Tiama Intelligent supervision systems such as Tiama IQ scan or Tiama ECO-system. Instead of releasing a binary verdict, Tiama intelligent systems make it possible to follow production drifts and react with immediate actions at the hot end even before the real defect appears. Therefore, glassmakers can prevent any container rejection and consequently improve their pack-to-melt ratio. This closer regulation loop improves the global production line efficiency. ■

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