

# Statistical process control to measure glass thickness

Tiama's Pascal Leroux\* highlights how a processing device offers glassmakers the opportunity to access all thickness measurement data for each container. Overleaf, Consol Glass's Christian Jakob reports how the device has helped with soft internal blisters detection.

The glass packaging market demands a constant increase in article complexity, driven by multinationals promoting their distinctive-styled branded food, beverages and cosmetic containers. Packaging matters almost as much as the content so companies invest in both the aesthetic and functional aspects of their bottles or jars, as a way to convey a premium experience to the final consumer.

Glass manufactures are challenging each other with creative ideas to offer customised article portfolios. But environmental concerns have grown, as have productivity concerns, therefore glassmakers struggle to manufacture lighter-weight articles.

When producing non-round and lightweight containers a key criterion to master is the glass thickness, but it does not end there. Tiama can now provide access to all thickness measurement data for each single container, allowing for better Statistical Process Control (SPC) and for gains in productivity.

## Measurement capability

During its 55 years of development, Tiama has assisted glassmakers in their search for productivity gains and efficient glass thickness measuring systems, in order to reduce the weight of the container while guaranteeing the mechanical strength.

This contribution has led to a number of inventions which have in turn, broadened the limitations of these existing systems and allowed for fresh prospects in the search for optimisation to be developed.

Tiama's Universal Thickness Measurement (UTM) device offers a wide range of glass thickness measurements available to the industry. A processing

unit hosts up to four levels of controls which can be applied to the following choice of probes:

- LBT - 20mm wide-band measurement. The thin wall measurement area can be increased to a 60mm wide inspection when using three probes.
- LED - Compact triangulation measurement working with new white LED suitable for most colours of glass.
- CHROMA - Chromatic probes with the widest possible appliance (shapes including non-round, colours).

UTM performs six simultaneous measurements: thickness (mini, maxi. & average); ovality; glass distribution ratio and large blisters detection.

UTM is designed to be installed on all Tiama rotating machines MX4, M, CHECK+, and C0 as well as on most of the carousel machines available on the market. However, when associated with a Tiama MX4, all the measurement results for each container can be accessed to conduct a complete process follow-up through SPC.

## Higher productivity

SPC can help monitor process behaviour.

It uses sampling and statistical methods to monitor the quality of an ongoing process. A graphical display provides a basis for deciding whether the variation in the output of a process is due to common causes or due to out-of-the-ordinary assignable reasons.

Whenever assignable causes are identified, a decision can be made to adjust the process to bring the output back to acceptable quality levels.

This continuous anticipation and early detection are powerful tools for



▲ Universal Thickness Measurement with three LBT probes in Wadeville, South Africa.

productivity improvement.

Today, thanks to its sensors, the Tiama MX4 is capable of collecting all the available measures, namely ovality, gauging, airtightness, leaner, dimensional and thickness and of associating them directly with the mould number of each single container. All these precious data are then forwarded to the supervising systems such as the Tiama IQ scan for immediate process drift prevention.

The SPC method is the first step to improve overall quality, efficiency and profitability. Quality control and plant managers can evaluate current production samples, to find how to transform them into improved production line efficiency.

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## Customer case study: Consol Glass

*Christian Jakob works in the Engineering Department at Consol Glass in South Africa. He reports how the UTM device associated to the Tiama product range has helped with soft internal blisters detection.*

### Can you tell us about yourself and your role at Consol?

I commenced my career in Consol Glass in 2001 at our Clayville plant as a shift mechanic working on inspection equipment. From there I progressed to dayshift, then to the electrical department and gained experience throughout the whole plant.

Afterwards I became a shift manager and from there to line management. For the last six years I have worked in the group quality department at H/O.

My work in the quality department was to give assistance to our customer on the technical side such as customer interfacing, line audits, technical advice on equipment and ware handling, audit our factories with regards to inspection equipment (establish a standard across the Consol group) and to evaluate new inspection equipment. I am currently in the engineering department working on projects but still have a line to the quality department regarding customer interaction and line audits.

### What does Consol Glass do?

Consol Glass specialises in making glass containers for the food and beverage industries inclusive of the beer, alcoholic fruit beverage, wine, fruit juice, soft drinks, mineral water and spirits markets.

Consol owns operations in Nigeria and Kenya with a new greenfield operation under construction in Ethiopia due for launch in 2018.

Consol is the largest glass producer in Africa. Our vision is to be the first choice for container glass supply to all customers across the African continent by offering glass solutions to our customers on a reliable basis at competitive prices and to be the supplier and pack of choice across Africa.

### Consol recently bought some UTM systems equipped with LBT (Large Band Thickness), can you explain what the issue was?

We had a problem detecting a soft internal blister, which was located in the heel base area on one of our beer bottles which we manufacture. Blisters came in various positions and sizes on the bottle – they don't only come in one position and in one size.

Some blisters created thin glass where others created more of a shadow with the glass still being well within spec.

This was not the only problem, the blister created a thin membrane on the inside of the bottle which makes it even more difficult to detect.

These bottles were manufactured on production lines where the current inspection was the MCAL & MULTI 3 combined with the Check + version 5.

### Why did you choose Tiama?

As these bottles were running in our plant where the majority of inspection equipment was manufactured by Tiama, we contacted Tiama for assistance.

We sent a range of soft internal blisters together with some good bottles to Tiama in France.

Together with the Tiama team on its testing line we challenged/trailed the MCAL 4 HD (+ the dynamic zones and masking) and the UTM – LBT system to see whether it would be possible to detect and reject the soft internal blisters while not losing any good bottles in the process.

Together with the MCAL 4 HD, and the LBT we further trailed the HCI (Heel Camera Inspection) which we set-up to inspect for Vertical and Horizontal defects in two different zones.

We had some good results in France hence we decided to upgrade our current inspection in South Africa.

### Can you describe more precisely what this MCAL4, LBT & HCI association has brought?

The MCAL as a HD system sees the softer defects much more intensive/clear which enables us to identify the defect easier. The bottle which had this specific defect also had a huge amount of embossing, which creates a bigger problem having maximum inspection detection.

The MCAL 4 comes with a dynamic zone function which in this case enabled us to be able to inspect the bottle in between the embossing, and with the masking function enabled us to increase the sensitivity in the embossing and the surrounding areas.

The LBT laser system enabled us to inspect a broad band of 20mm instead of a single dot 1/10thmm.

This not only made it easier for us to



▲ Christian Jakob, Engineer,  
Consol Glass.

set-up (very user friendly) it also allows us to inspect a much wider band (more coverage) of the glass bottle.

This led us to set-up three LBT heads on the beer bottle enabling us to cover/inspect +- 45% of the bottles body.

The HCI system unfolds the image of the bottle, which in this case covered an area of +- 35mm from the heel up. This inspection defects through transmission so it was easy to set-up and detect the blister in the heel.

We have two zones with two different algorithms activated in each zone.

The one zone looks for vertical defects and the other for horizontal defects. In this way we can detect the shadow that the blister creates and reject it.

### What are the next steps?

Consol has ordered and installed new equipment/conversion kits as well as the LBT and HCI systems for most of our production lines as we think it will enhance our inspection capability and protects our customer requirements better than before.

We have and more so now are working closer together with Tiama when we find or see a defect which we or our customers deem as not acceptable to find a solution in detecting the defect and reject it. ■

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