

# Latest advances in hot end tableware inspection

Esben Korre describes the latest developments from JLI vision for tableware inspection at the hot end.

JLI vision has been developing tableware inspection systems for the last 20 years. The company's second generation Hot End Tableware Inspector was delivered in 2012 for tumbler production. Now, the software has been optimised to handle stemware.

## HOT END INSPECTION BENEFITS

The benefit of vision systems at the hot end is instant production feedback to the operators. It is not necessary to wait for reports from the cold end and the production of faulty tableware in series can be avoided.

The operators watch the display to gain information related to each tool in the forming process. Their focus is therefore directed to the tools giving trouble. Broken or fallen

tableware can be pushed out to avoid problems in the Lehr.

At job changes, the system will help production up to much faster standards and save considerable production time and energy. Rejecting defective tableware at the hot end reduces the likelihood of defects reaching the customer.

## SYSTEM OVERVIEW

The system consists of a light box and two high resolution cameras, mounted in water-cooled enclosures. One camera inspects the rim area and the other covers the entire glass to measure dimensions and surface defects. A list of detectable defects is provided here: Spikes; pips/lump edge; thick/thin rim; drag edge; crack; surface; rim slope; diameter rim; height; lean; profile; stem shape; cup-

stem joint; cords; distribution; and mould rings

The accuracy is 0.1mm and handling capacity equates to 200 pieces/minute.

## DYNAMIC LIGHT BOX

To enhance the rim area and to detect mould rings, a variety of back light patterns are necessary. In a conventional design, up to five light boxes would be needed, making it impossible to install the equipment in the constrained space at the hot end.

The dynamic light box generates different lighting patterns to enhance defects and improve measurements of the tumblers and stemware. The different patterns are applied to each glass as it moves by on the conveyor. The dynamic light box technology minimises the space and hardware required to take multiple images with different lighting.

Stripes in different directions are used to detect optical faults in the glass. Masking of the glass silhouette obtains a measurement accuracy of 0.1mm and special structured lighting is used to detect small defects in the rim area. The dynamic patterns are stored together with the setup for a specific model of tableware. Using this technology, there is never a need to mechanically adjust the light box.

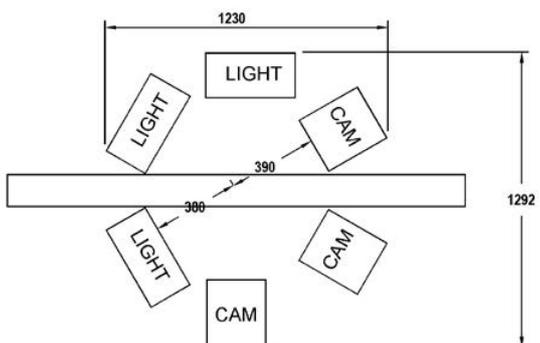
The latest inspection is added by including an extra exposure and a light box pattern to enhance the defect type.

## DEDICATED STEMWARE ALGORITHMS

For stemware inspection, special algorithms and lighting patterns have been developed to measure stem shape (bent or distorted) and also to check the cup-stem joint. These features have the same high accuracy as the dimensional and surface defect measurements.

## ENVIRONMENT

To protect the equipment at the hot end, specially heat treated glass and IR reflective coatings are used.



Triple system footprint.



**LUBITECH ENTERPRISES**

A LEADING PROVIDER OF END-TO-END SOLUTIONS FOR GLASS MANUFACTURING INDUSTRY



## Services We offer

- Turnkey projects
- Furnace Design, Construction and Consulting Services
- Furnace equipments and Control Systems
- Hot and cold repairs, Steel Fabrication and Erection
- Design, Audit and Training in operations of Forehearths
- All types of Bonded Refractories: Silica, Mullite, and basic bricks including Chimney Blocks, Silica Crown Insulations
- Hollow Glass Thickness Sensor, Flat Glass Thickness Sensor, Pattern Glass Thickness Sensor, Tube Control System

Ready stock of Fused Silica Bricks and LUBISOL Si-Seal kit for urgent requirements

OUR WORLDWIDE BUSINESS PARTNERS



Lubitech Enterprises

233, Mastermind IV, Royal Palms, Aarey Colony, Goregaon (E), Mumbai 400 065.

T/F: +91 22 28790325, E: lubitechservices@yahoo.co.in

Website: www.lubitechenterprises.com

Several layers of glass are spaced and cold air is blown between the layers. The cabinets are heat-protected by shields and cooled by water. The design is proven and has now been running flawlessly for three years.

**MAINTENANCE**

The system requires very little maintenance. The front glasses need occasional cleaning. This is achieved by replacing the front protective glass with a clean front. The replaced glass can then be cleaned when it has cooled down.

**REMOTE ASSISTANCE**

Because the systems are connected to the internet, they can be operated remotely and JLI can help the operators to set up and use the system.

**CONFIGURATION**

The system comes in three configurations: Single, double and triple view. The single system inspects in one view, while the triple system covers the whole glass from three angles, providing full inspection.

A single system will do all the process monitoring the operators need for optimising production. A dual or a triple system inspects to a level comparable to cold end equipment. However, customers still need to inspect the base at the cold end and faults that develop in the lehr.

The equipment can also be placed at the cold end. It does not rely on infrared radiation - it works just as well on cold as on hot glass – a great benefit when demonstrating the equipment.

If the focus shifts from process monitoring to full-scale inspection, a single system can be easily upgraded to a double or triple system. ■



Image with inspection diagnostics.



Hot End Tableware Inspector monitor and striped dynamic light box.

**ABOUT THE AUTHOR:**  
Esben Korre is Senior vision engineer at JLI vision

**FURTHER INFORMATION:**  
JLI vision a/s, Søborg, Denmark  
tel: +45 3966 0809  
email: jli@jli.dk  
web: www.jlivision.com

Johnson Matthey  
Advanced Glass Technologies

Advanced Glass Materials & Conductive Inks  
Supplier of glass enamels, conductive pastes,  
precious metal inks and technical glass materials;  
for glass, ceramic and metal substrates.

www.glassmatthey.com