Introduction
A company specialised in high-technologies, IRIS is a subsidiary of the Wisetec Group, a group leader in the design and production of customised automation solutions based on high-technologies. With more than 130 employees the company has developed over thirty years a long term partnership with major international industrial companies as a key components supplier (for high speed trains, metros, nuclear power station, continuous production processes… etc) in the area of electronic design and software development has well as an exceptional know-how in the most innovative vision technologies. This success is due to a 40 people Research & Development team and an ISO 9001 industrial organisation totally devoted to customer satisfaction.

Evolution 12 : New optical system for sidewall inspection
Non-inspected areas have always been a nightmare for glassmakers. A reliable inspection of bottles an jars without rotation and at high speed con only be ensured by multiplying the number of views of the container, and therefore the number of sensors. Thanks to a twelve camera optical system, Evolution 12 sidewall inspection machine provides twelve views of the same item covering the full body from the neck to the heel over 360° (see figures 1, 2, and 3).

Case of a Beer Bottle

![Fault: Stuck plunger in the neck](image)

*Fig. 1 Looking at a beer bottle*
Case of a Wine Bottle

Fig. 2 Looking at a wine bottle

Fault: Blister in the shoulder area

6 angle of viewing: 360 degrees

Fig. 3 6 cameras at the same height give 360° inspection

All cameras are in a fixed position.
No mechanical, no optical adjustment
The cameras are installed on both sides of the main conveyor and are looking at the container from six directions. At each shooting angle a first camera inspects the upper part of the item (neck and shoulder) while a second one inspects the lower part (body and heel) (See figure 4). Two wide light sources are both facing a set of six cameras.

![View of a bottle with one camera only](image1)

![Same bottle seen with IRIS cameras system](image2)

**Fig. 4** Better resolution with two cameras makes defect detection easier – see the stuck plunger in the neck

**Higher resolution and faster job change**

This optical system presents the advantage of a greater detection potential with more than 1200 pixels resolution per bottle view. It also optimises the contrast of transparent faults such as tears, soft blisters or flies located on the mould seam. Such an increase in the number of sensors is only made possible by the fact that there’s no optical or mechanical adjustment of the cameras themselves. The setting of the machine is totally driven by PC with a user-friendly windows software interface; up to hundreds of settings can be stored in the memory of the Man Machine Interface PC, allowing not only quicker job changes but also a much higher repeatability of adjustments.
Innovative light sources

One of the main features that explains the significant improvement in the detection of very low-contrast defects is the new light source system imagined by the IRIS development team. The sidewall light sources as well as the finish light source (see figure 5) are completely computer driven, and their intensity is therefore adjustable to the size, shape and glass colour of the container to be inspected. The same light source has already been successfully used to detect faults in dark green champagne bottles as well as in very white flint jars or in amber pharmaceutical containers, and this just by changing the intensity of the light beams received by the cameras.

![New light source for the finish inspection](image)

Fig. 5 new light source for the finish inspection

Full inspection capacity even at high speed

Both real time and applicative software developed by the IRIS engineers as well as the multi Pentium parallel architecture designed by the IRIS hardware team make it possible to process in real time the large amount of information coming simultaneously from 12 cameras even at a very high line conveyor speed. This is the reason why there are no software limitations to activate all the fault detection algorithms even if the production line speed varies. The theoretical maximum speed of the processing is 650 BPM. In this case the limitation is not a matter of software inspection speed but more a problem of stability and handling of the containers on the line conveyor at very high speed.
Evolution 5: Base and finish inspection

Evolution 5 is a five station equipment designed to carry out various inspection such as control if the base or the finish of glass containers, bottles and jars, regardless of their shape and colour (see figure 6).

![Evolution 5](image)

**Fig. 6** Evolution 5 for base, base stress and finish inspection with mould number reader.

The Evolution 5 inspection concept benefits of the same innovations as Evolution 12 sidewall inspection machine. The characteristics of the various light sources for stress, base and finish inspection both photometric and geometric are computer driven. This is particularly efficient for the detection of faults in the finish such as overpressed, internal wire edge, line over finish (LOF, even very thin ones) and unfilled finish.
As far as base inspection is concerned a special processing software makes it possible to inspect embossed or engraved areas (see figure 7) and differentiate a defect from a heavy mould seam.

![Fig. 7: Tears in the base](image)

**Automation for more precision**

Automation of the optical adjustment and positioning of the Evolution 5 cameras is made thanks to a micro-motor servo system connected to the PC. Again this ensures both a very quick job change and a better repeatability of the adjustment for the same type of production by reducing the influence of human factor. The setting of the equipment is strictly the same from one run to another and doesn’t skills or experience of the person doing the adjustment.

**Remote maintenance**

All the date concerning the optical settings are stored in the Man Machine Interface PC and can to be transmitted from one machine to another via a network connection (see figure 8).

![Fig. 8: User friendly interface for fault recognition](image)
The windows interface software allows the multi PC connection not only between the machine themselves but also with a stand-alone PC for remote maintenance. This can be done from one plant to another or be performed from a remote technical centre ensuring a 24 hours a day customer service. Remote maintenance allows online technical assistance as well as real time transmission of alarms to a monitoring PC. In case of software improvements, a software updating can also be performed from a remote technical centre (see figure 9).

![Fig. 9 machines on line](image)

**Conclusion**

The glass container industry is beginning to benefit from up-to-date technology that has been developed for application in other fields. This is particularly true for the automated inspection area and the latest developments from IRIS with the Evolution 12 and Evolution 5 using high technology vision systems and specific software, opens up new concepts in automatic glass hollow ware inspection that enables manufacturers to take another step in the right direction towards quality assurance.

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