Deltamax: when industrial innovation deals with glass breakage and quality control

Think of auto glass — how much is there in one of today’s cars? Quite a lot so it’s easy to see how the safety of passengers is a major aspect of quality control when we consider the inspection of glass. In this article, Deltamax gives us an idea of its newest product - FROG (Fragment Recognizer On Glass) — used to calculate the fragments of broken glass during test — both with regards to sizes and to the number of pieces.
DELamax and Fragments

Have you ever thought about how the glass lites of your car would break in the case of a big collision? In many pieces of course, but how many? And how big? The number and size of glass fragments are very important as far as safety is concerned. The examination of the quantity and size of fragments, in a given glass product, is necessary in specific glass manufacturing processes in order to meet quality control and security criteria. Delamax Automazione, an Italian company located in Trento, with almost 30 years' experience in industrial automation and machine vision, has created a solution.

FROG: A New System for Glass Inspection

FROG (Fragment Recognizer On Glass) is a rational and user-friendly interface for automatic visual inspection of glass products. It is portable, compact and gives real time results. “How does it work?” you may ask. Chiara Corridori, Delamax Technical Manager explains: “FROG can automatically recognize, count, analyze and classify glass fragments after the break of a glass sheet. Moreover, it can store the images and the results acquired to generate customized reports.” She continues: “The main component of the FROG system is the inspection unit, connected to a PC and to the electrical cabinet: the user can move the system to the desired position and select the type of analysis in the graphic user interface. At the end of the analysis, the system issues a report with the test results, including the image of the glass as acquired by the camera, the number of fragments identified and the size of the biggest one.”

“The advantages of an automatic system for counting fragments compared to a manual one,” continues Ms. Corridori, “are clear: quicker, objective results, there...
is the possibility of customize the inspection parameters and possibility of data storing. Thanks to the use of direct light, FROG is extremely easy to handle and suitable to be used also with printed glass: two features that mark the uniqueness of the product. In addition to the new use, the customers appreciate the solution due the convenient price and for the fact that it does not need an installation.”

RESEARCH AND DEVELOPMENT
FROG was born from Risolvi, acronym of “Ricerca di SOLuzioni di Visione per applicazioni Industriali” (research of vision solutions for
industrial applications), a research project funded by the Trento Province between 2011 and 2015. The project has allowed, implementing prototypes, to innovate GlassInspector. GlassInspector is another system created by Deltamax to recognize and catalogue defects, and to inspect glass sheets, in this case directly on the production line, using camera technology. The scanner for the insulated glass line has been recently renovated and is now even more adaptable with new characteristic and features to meet the most demanding customers. Recently, Deltamax invented an innovative solution for improving systems for the identification and classification of defects. For such systems, both the hardware (illuminator and electronic control cards) and algorithms have been developed. For example, starting from an algorithm conceived by researchers at the University of Munich for highlight the streets in satellite images; Deltamax has implemented a new algorithm able to identify scratches in flat glass surfaces images as if they were streets. Scratches and streets in fact share the same geometric characteristics: length, thinness, and more. The Risolvi research project has been carried out in collaboration with the TeV group from the Fondazione Bruno Kessler (Fbk) research centre in Trento. The collaboration has been very successful as it involved the transfer of know-how on Image Processing algorithms as well as software architecture System. Consequently, Deltamax has now employed a scientist from Fbk. Furthermore, together with Fbk, a new type of architecture software has been designed and implemented (DVS – Deltamax Vision System), which provides new applications with flexibility, expandability and ease in configuration. This enables computer scientists to reduce developing time and system installers to modify the parameters in order to adjust the system to new needs without modifying the code.

PLANS FOR THE FUTURE

The response of the industry has, over the past years, been positive, and Deltamax is now looking to go further. New markets and new products are on the agenda of the company that is starting a new research project for the development of solutions related to the glass industry.
**GlassInspector**: commonly called scanner, carries out defects detection on double glazing line, searching for faults like bubbles, scratches, fingerprints, dust, black dots, etc. Moreover, measures the degree of transparency of the glass, adapting automatically and instantly the control, even on dark glasses. GlassInspector easily adapt to the production line requiring limited maintenance, high flexibility and it completely integrated in the line. Since the first installation in 2007, more than 100 system were installed worldwide on various IG lines.

**GlassInspector EVO**: it’s the EVOlution of the GlassInspector, capable to check the whole glass plate finding defects like chips on edge, very useful for some field of production like automotive and household appliances glass. Other developments have been made on the ability to detect defects and distinguish between them, organizing everything into different classes with storage for statistics and report production. GlassInspector EVO uses also comparison method to perform control of shape or screenprinting, taking into account the tolerances set by the user. The interface with other machines on the production line increase the automation of the quality control process: automatic rejection of non-compliant pieces or stop of the line when repetitive defects are found are two typical examples.

**GlassInspector OPT**: real innovation of 2016, this system aim to found defects (both marked or non-marked) on regular or jumbo plate, making a map with their gravity and position on the sheet. Thanks to the interfacing with the most common software for cutting table, GlassInspector OPT allows the optimization of the cutting process, reducing significantly the overall quantity of rejected glass.