Product Individualization for Architectural Glass – Actual Benefit, or 'Nice to Have'?

Benefits from permanent product ID's throughout the glass' life cycle

Laser prints allow for the individual marking of glass by leaving product relevant information like batch processing numbers or serial numbers. This information can also easily be encoded into industry codes (barcodes). Thus, this type of labeling will be a beneficial part of the manufacturing control, following the trend of manufacturing unique panes of toughened safety glass.

The advantage of laser printing as well as the requirements for its integration into the production process will be discussed in the following article.

Ever since people learned how to make glass, they have used it as a construction material. As highly-developed as the architectural concepts are, so are the requirements for glass material in terms of size, shape and attributes. In recent developments, there has been a clear shift in demand from serial products to individualized small series.

Living up to higher standards however, it leads to stricter requirements in the field of manufacturing control and organization. Up until now, it may have been adequate to track only charges of identical panes throughout the process, but today, the traceability of the single pane becomes a necessity.

The majority of glass manufacturers meet this requirement with a "two label system" right after the cutting process, the pane gets a paper label with process ID. This ID is gathered at relevant stages of production, allowing tracking and allocation of the product in the chain of production.

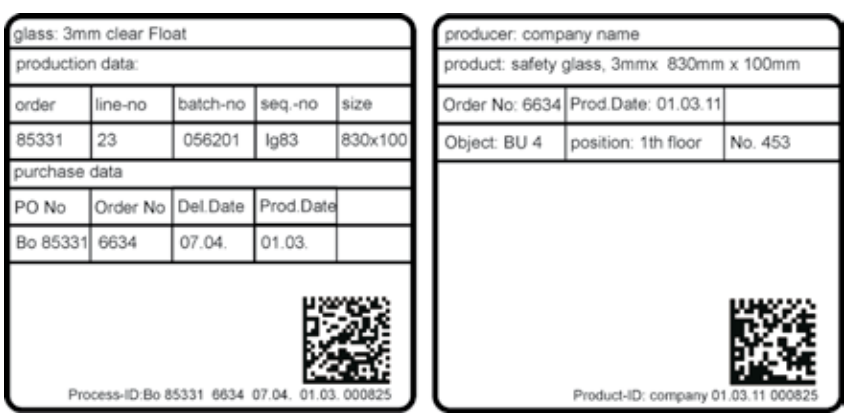

Figure 1: Example for process and product label

Immediately before the tempering process, the paper label is removed manually (as it would burn inside the oven) and later replaced by hand screen prints or transfer labels in order to meet legal requirements for the marking of toughened glass (i.e. European requirement for CE marking).

After the tempering process, the product receives another paper label, this time designated as the product label. At the end of the production process, this product ID is matched with the final quality test data and archived for future access. The product label remains on the pane until its installation.

The **disadvantages of using paper labels** are clear: the manual capture and removal may lead to mistakes in allocating the pane to its production batch. This missing consistency leads to mistaking the pane's identity, impairing the production chain. The main disadvantage lies in the fact that, after removing the label at the stage of installation, the specific data associated with the pane is no longer accessible for further identification or allocation.

Give your Glass its own ID

The new generation of laser prints

The adverse features of the paper label system and missing transparency in product traceability are the reason for alternative solutions which further meet the requirements of EU-Construction Products Directive 305/2011. Until July 2013, all construction products must show a serial ID:

Article 11, par.4:
Manufacturers shall ensure that their construction products bear a type, batch or serial number or any other element allowing their identification, or, where the size or nature of the product does not allow it, that the required information is provided on the packaging or in a document accompanying the construction product.

When looking for an alternative track-and-trace solution, laser-marking methods have proved to be successful for materials like metals. Transferring these technologies for applications on glass material however, is not easily performed because of the specific properties of the glass.

A common type of marking is laser engraving where a laser beam is used to remove parts from the material's surface. However, in contrast to metals, this procedure may result in a reduction of the glass material's mechanical resistance due to the formation of "micro cracks." These "micro cracks" create tension inside the glass which, on the other hand, may increase the risk of breaking. Therefore laser engraving on toughened glass is treated with care.

> "Depending on the type of technology, contrast and chemical add-ons (changing of colors during special processes like tempering process) can be adjusted."

To bypass the risks of laser engraving, an alternative technology has been developed over the last few years: laser transfer printing (UniColor®). Using a transfer medium, it creates a resistant marking on or beneath the glass surface. This process doesn't damage to the glass structure although the markings are highly aesthetic and precise. Depending on the type of technology, contrast and chemical add-ons (changing of colors during special processes like tempering process) can be adjusted.

Industry codes on glass

Laser transfer printing technologies like UniColor® enables the direct marking of irreversible product IDs. Normally they are encoded as a two-dimensional code, known as the data matrix code (DMC). In addition, the ID (could be encoded) must also be readable by the human eye.

Apart from the product ID, required information about legal standards and the name of the manufacturer can also be printed at the same time – applying the hand screen print before the tempering process is not necessary any longer, further reducing steps in production.

Marking and Identification in the production environment

Apart from the question of how to mark glass individually, the question of integration into the production line plays a key role. It mainly depends on the structure of manufacturing processes and the variety of products manufactured. As a result, we could distinguish two main production environments:

1 Production of large quantities of each type in an automated and linked process

The product marking in the first step of production is recommended. This can be implemented during the cutting process (**ES-Guard** Marking System placed on the cutting bridge) as the cutting layout could contain all relevant data (serial ID, code location, code layout) and communicate it to the marking system directly. Cycle times of 1 to 2 seconds per marking process does not affect the process negatively.

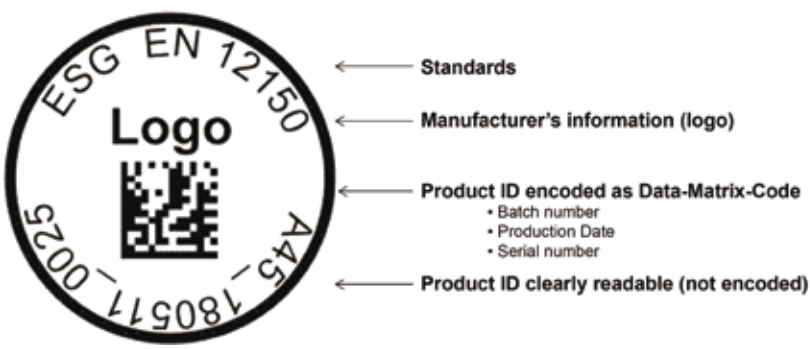

Figure 2: Characteristic marking layout for toughened glass

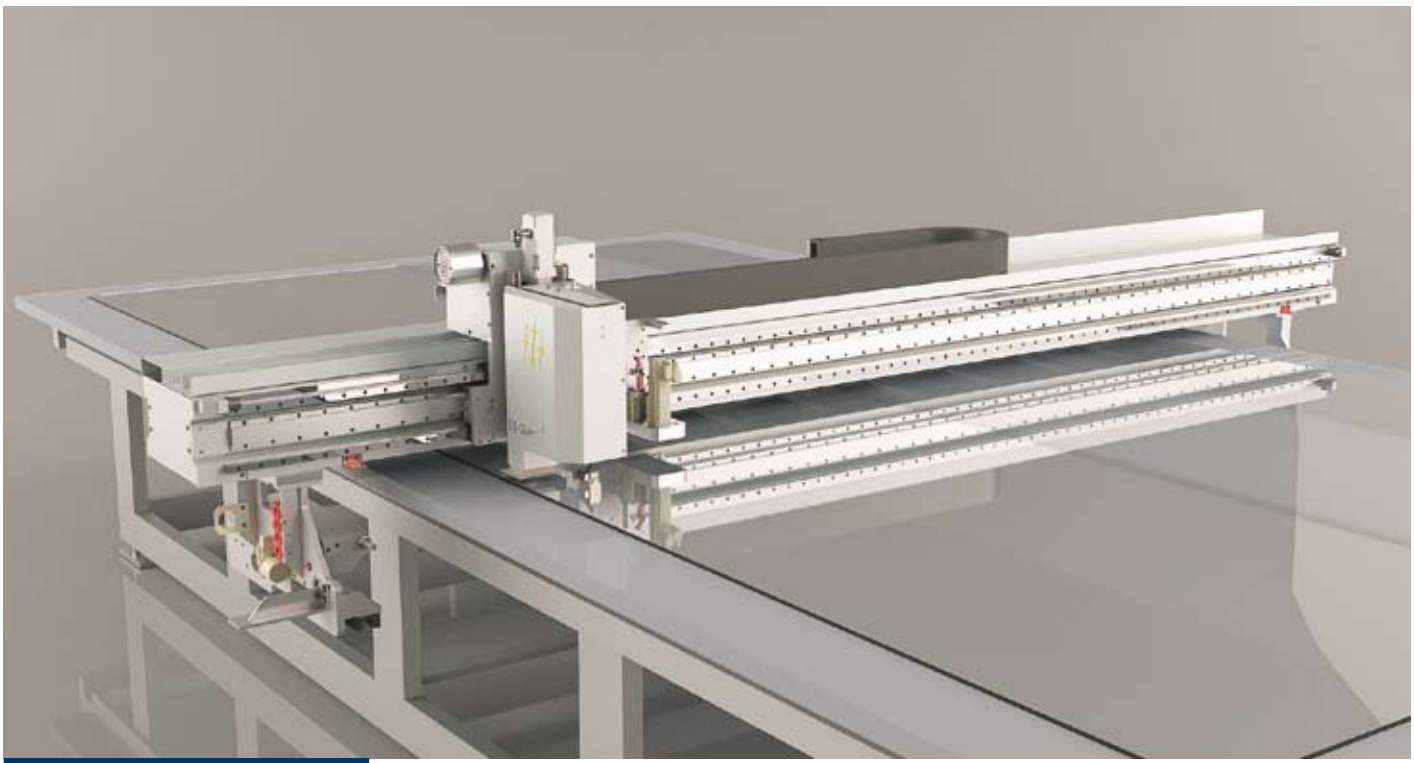

Figure 3: Integrated Marking System

In the following production steps, code readers are able to identify and track every single pane by reference to its ID.

2 Production of small series in a semi or non-automated process

In this environment, the type of implementation described above is not applicable from an economic point of view, as these production processes are characterized by a high level of flexibility and changing steps of production.

Therefore, a flexible way of marking is required. Moveable marking systems (i.e. **ES-Guard**[m]) allow manufacturers to decide, in what place or process of the production the marking process should occur. The marking process itself is then prepared and started manually.

In this type of fabrication, process traceability is not considered as important product traceability.

Overall benefits:

- Serial ID according to (EU) standards, additional product and manufacturer information
- One-to-one relation between production data and product
- Process traceability enables process control and advanced quality management
- Product traceability enables allocation in cases of warranty claims
- Eliminates the need for paper labeling
- Eliminates the need for hand screen print before the toughening process
- Marking properties: maximum mechanical, chemical, and UV stability; forgery-proof, aesthetic
- Long-term cost savings

> “When using glass as a construction material in advanced architectural projects (with lots of individual shapes as well as free forms) it may be helpful to match the single pane with its later position in the facade.”

Figure 4: Portable Marking Station

Using the product identity

Apart from advantages through marking and, thus, individualization of glass panes in the production environment, another benefit to be considered is product traceability. Allocation is a central requirement even after the glass leaves the production process. When using glass as a construction material in advanced architectural projects (with lots of individual shapes as well as free forms) it

may be helpful to match the single pane with its later position in the facade. In this manner, the architectural freedom allows one to create facades with glass of individual shapes and free forms. Apart from its form, an increasing diversity of properties also results in the need for glass to be tracked and allocated. This shall be visualized in the example of a dome. The shape differenciates slightly depending on their place of installation. To recognize this differences on the construction site would require a complex documentation. Using the product ID for matching pane and position, however, could lead to a serious shortening of the construction period what, in fact, is a substancial economic factor. Therefore, it is recommeded to use the product ID for logistics to and on the construction site until its installation in order to optimize all related processes.

Reviewing all given aspects there should be an inspiration of using product IDs in all stages of the product's life cycle. What could turn the legal „must have" to real benefits for all those involved.

boraident GmbH
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