

Production of large components with functional elements using additively supplemented thermoforming

The process combines the manufacturing techniques of thermoforming and 3D printing to produce large components with integrated functions in a cost-effective manner. The process steps can be organized as required, thus offering a new arena of choices without the restrictions that previously applied.

- Lower forming pressure = more cost-effective tools
- Economic manufacturing of large multifunctional components even in small batches
- Fewer restrictions & more flexibility
- Additional functional integration possible
- Solid connection of surface and element with smooth and high-quality visible surface

Fields of application

Attachment of add-on parts to thermoformed parts, e.g. snap hooks, screw domes, reinforcing elements in the area of covers, facings automotive, trains, aircraft, etc.

Background

Thermoforming is an economic manufacturing process for large plastic components. The procedure provides a wide range of benefits for the production of thin-walled products with high demands on the quality of the surface (e.g. a high production rate). Until now, it has not been possible to incorporate functional elements in this way. For this reason, industries such as the automobile sector are reliant on expensive injection molding for clip-on parts, for example.

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Service

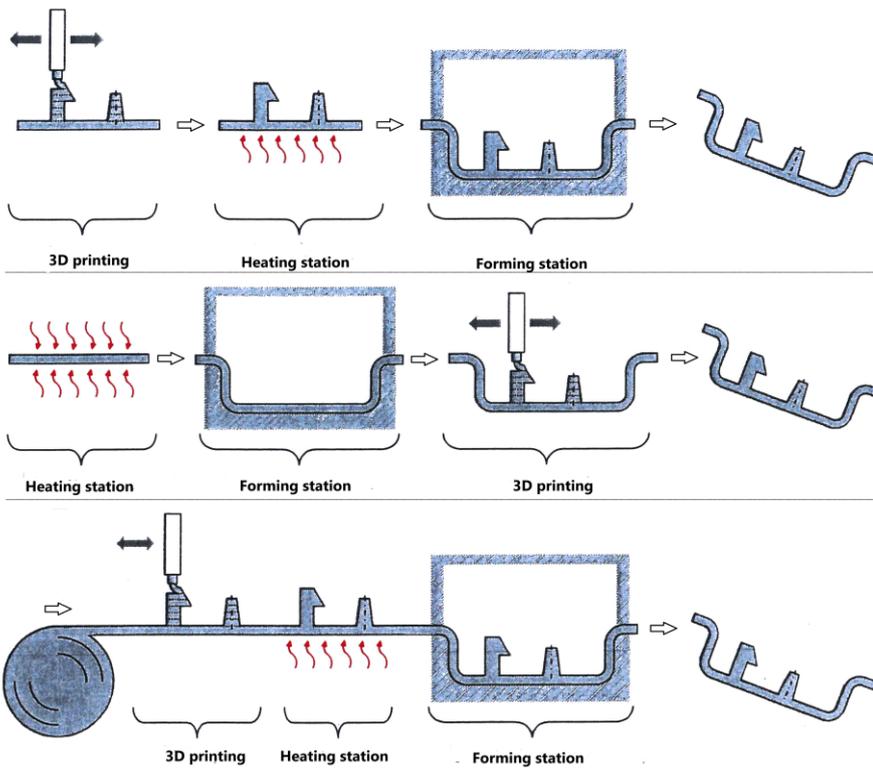
Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Problem

Large plastic components such as coverings are particularly suitable for thermoforming due to their size and surface quality requirements. Until now, in order to equip them with functional characteristics such as snap-fits, a multistage process has been necessary (semi-finished product manufacturing, thermoforming, further processing). As this is usually uneconomical, conventional injection molding is often used instead. It does offer greater freedom in design, but the production rate is not as high and tools are comparably expensive.

Solution

At the University of Stuttgart, a combined procedure integrating 3D printing and thermoforming has now been developed which allows large components with integrated functional elements to be produced at low cost. This technology combines the benefits of both procedures and thus profits from high surface qualities with high freedom of design at the same time. Therefore, for the first time, the economical production of complex surface elements is also possible in low quantities. With the new thermoforming-based production procedure it is possible to variably incorporate functional elements before and after reshaping. Moreover, the sequence of the process steps can be varied which multiplies the potential range of use for the procedure. Functional elements can be applied to the semi-finished product or component in any order using 3D printing. The semi-finished component can then be reshaped using a conventional thermoforming process. Without the restrictions that previously applied, this opens up new possibilities; even in-line 3D printing is thus possible for the processing of rolled goods which holds great potential for savings. Functional elements can be attached to the reverse side without being visible on the front.



Various combination possibilities using 3D printing and thermoforming [Source: University of Stuttgart, IKT].