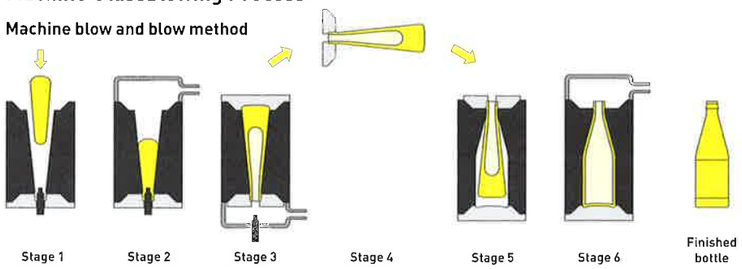
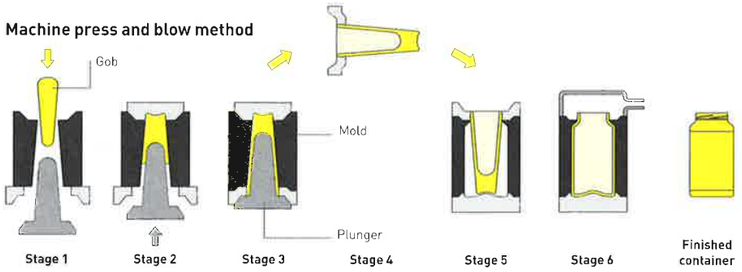
Machine Glassblowing Process

Machine blow and blow method



Machine press and blow method



TECHNICAL DESCRIPTION

The mechanized glassblowing process begins in the mixing department, where the raw materials are mixed together. At this stage they are either coloured with additives, or a decolourant is added to make clear glass. They are fed into the glass-melting furnace with cullet at 1500˚C (2730˚F) where they fuse together to form a homogenous, molten mass. Glass is drawn through the furnace and conditioned (slowly cooled) to its working temperature of approximately 1150˚C (2100˚F). This process takes up to 24 hours.

The conditioned glass flows from the bottom of the forehearth and is cut into 'gobs'. These are fed into a bottle-making machine below. There are 2 different molding methods that are used, either press and blow or blow and blow. The processes are essentially the same, except that the parison (pre-form) is either pressed or blown. The press and blow method is more suited to wide-mouth jars, whereas the blow and blow technique is used for containers with a narrower neck.

In stage 1, the molten glass gob is guided along tracks into a parison mold. In stage 2 of the blow and blow method, a plunger rises and presses a neck into the molten glass, and in stage 3, air is injected through the mold into the formed neck. In the press and blow method, all of this is done by a plunger. In stage 4, the mold opens and a partially formed vessel is released and inverted through 180˚. In stage 5, the bottle is transferred to the second blow mold. In stage 6, air is injected through the neck to blow the vessel into its final shape. The glass cools against the sides of the mold before it opens and releases the part. The vessels are then passed through a 'hot end' surface treatment process to apply an external coating, which helps the glass maintain its strength during its working life. The vessels are fed by conveyor belt through the annealing lehr to remove any stress build-up. A second surface treatment is added at the 'cold end' of the lehr to improve the product's resistance to scratching and scuffing. Every container is then subject to rigorous inspections, including sidewall and base scans, pressure tests, bore tests and the flatness of the sealing surface.

is a much slower process that requires great skill and experience. Each product could take between 5 minutes and 2 hours to blow, depending on the number of stages required.

Labour costs are relatively low for mechanized methods and are relatively higher in studio glass, due to the high level of craftsmanship needed.

ENVIRONMENTAL IMPACTS

Glass is a long-lasting material. It is ideal for packaging that will be refilled, especially for food and beverages, which greatly extends a product's useful life. Successful refilling systems, such as the Finnish drinks bottles and British milk bottles, are refilled tens of times before they need to be recycled.

All scrap glass material can be recycled directly in the manufacturing process. Glass is an ideal material for recycling because it can be melted and remanufactured many times without degradation. Even so, more than 1 million tonnes of container glass still make it to landfill every year in the UK alone.

Glassblowing is energy intensive and so there have been many developments in recent years to reduce energy consumption. Improved furnace design and production techniques reduce energy usage and thus reduce the price of production. The raw ingredients of glass can affect its environmental credentials because they are mainly oxides, which will find their way into the atmosphere during production.

Case Study

Mechanized glassblowing a beer bottle

A 500 ml (0.88 pint) beer bottle can be made using the blow and blow method. The main raw ingredient, silica sand, comprises about 70% of the final product and is piled up inside the factory (**image 1**). The various ingredients are mixed and melted to form molten glass, and after sufficient time in the glass-melting furnace the conditioned glass flows from the bottom of the forehearth and is cut into 'gobs' (**image 2**).

The gobs are fed along tracks to the molds, into which the molten glass settles and the neck is formed. These formed parisons (**image 3**) are then transferred to the blowing mold (**image 4**) in tandem. Robotic arms invert the parisons through 180° as the freshly blown bottles are removed (**image 5**). The split mold closes and the bottles are filled with compressed air, which forces the molten glass onto the surface of the cool mold (**image 6**).

All 16 blowing molds produce bottles continuously all year round (**image 7**) and dispense them on a conveyor belt that transfers the hot glass products (550°C/1022°F) to a gas-fired lehr for annealing. Having left the lehr, the bank of bottles are moved towards testing and inspection areas (**image 8**). The finished bottles leave the production line as a single stream and are fed into an automated packaging machine (**image 9**).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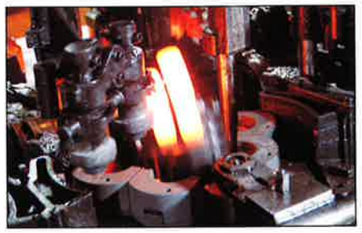
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