



WORLD CLASS MANUFACTURER OF STOCK AND CUSTOM BOTTLES SINCE 1966

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THE BLOW MOLDING PROCESS

Blow molding is a method of forming hollow articles out of thermoplastic resin. The basic steps of the operations include:

1. A thermoplastic resin is heated to a molten state
2. The material is then extruded through a die head to form a hollow tube called a parison
3. The molten parison is dropped or placed between two mold halves which close around it. For injection based processes, the parison is converted into a rigid article called a preform. A preform looks like much like a test tube with a bottle neck finish.
4. The parison or preform is then inflated with high pressure air
5. The plastic solidifies as it comes into contact with the chilled blow mold
6. The mold opens and the finished component is ejected

VARIATIONS

There are basically four types of blow molding used in the production of plastic bottles, jugs and jars. These four types are:

1. Extrusion blow molding
2. Injection blow molding
3. Stretch blow molding
4. Reheat & stretch blow molding

EXTRUSION BLOW MOLDING (EBM) is perhaps the simplest type of blow molding. A hot hollow tube of plastic material known as a parison is dropped from an extruder and captured in a water cooled mold. Once the molds are closed, air is injected through the top or the neck, or blow chamber, of the container. A good analogy of this process would be blowing up a balloon inside of a box. When the hot plastic material is inflated and touches the walls of the mold, the material "freezes" and the container now maintains its rigid shape. This process produces a container with a blow chamber and tail scrap attached to the container. The blow chamber and tail must be removed from the container through a secondary process. After removal, the blow chamber and tail are ground into small particles referred to as regrind and are typically blended with virgin resin to manufacture new bottles. Extrusion blow molding allows for a wide variety of container shapes, sizes and neck openings, as well as the production of handle ware. Extrusion blown containers can also have their gram weights adjusted over a fairly wide range by altering the extruder output. Extrusion blow molds are generally much less expensive than injection blow molds and can also be produced in a much shorter period of time.

HDPE, LDPE, PVC, & Polypropylene, are the resins typically processed in the extrusion blow molding process. Progressive's Extrusion blow molding equipment is well suited for containers from ¼-oz to 1-gallon.

INJECTION BLOW MOLDING (IBM) is part injection molding and part blow molding. The first stage of this process is to inject hot plastic material into a sealed cavity where it encircles the blow stem or core rods to create the neck finish and material for the body of the blown part. The resulting intermediary part is referred to as a preform and it establishes the weight of the part. The injected preform is then transferred to the next station of the machine, where it is placed and blown into chilled mold cavities. The mold then transfers to the third and final station where the mold opens and the finished container is ejected from the mold. The ejected part requires no post mold finishing operation. The process also does not generate any scrap as a byproduct of the process. The neck finish has better definition and a tighter dimensional range than an extrusion blow molded bottle. Injection blown containers have a set gram weight that cannot be changed unless a new set of blow stems or core rods are built.

PET, Polypropylene, HDPE, LDPE, & PVC are typically processed in injection blow molded equipment. Due to their complexity, molds tend to be fairly expensive and take considerable time to produce. The process is well suited for smaller non-handled containers between ½-oz and 32-oz with larger annual volumes.



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STRETCH BLOW MOLDING is a blow molding process that produces fairly lightweight containers with very high impact resistance and, in some cases, superior chemical resistance. This is brought about by aligning the molecules of the resin during the stretching process. This process is perhaps best known for producing PET bottles commonly used for water, juice and carbonated beverages. The process can also be utilized to manufacture polypropylene containers but the processing parameters are more stringent and therefore not widely practiced. There are two processes for stretch blow molded containers.

SINGLE STAGE INJECTION STRETCH BLOW MOLDING (ISBM) performs the injection process and blow process within the same machine frame. The process begins by injecting molten resin into a chilled preform mold. Once the preform has solidified, but is still quite warm, it is transferred to the blow station where it is surrounded by a chilled blow mold, stretched, blown and then transferred to the ejection station of the machine. Because the preform is held constant during the entire molding process, the neck finish is oriented to body of the bottle. This feature is useful for bottles using a dispensing closure and requiring an oriented neck finish. This process is used for high volume production runs of items such as wide mouth peanut butter jars, narrow neck water bottles, liquor bottles and has a large capital expense associated with the preform and blow mold. Progressive's equipment is suited for containers from 4-oz to 1-gallon with neck finishes from 22mm to 120mm in diameter.

REHEAT AND STRETCH BLOW MOLDING (RHB) is the other stretch blow molding process. In this process, the preform is injection molded in a separate machine. The preform is then loaded into a separate blowing machine where the preform is reheated, transferred to the molding station, stretched, blown into a chilled mold to form the container and then ejected from the machine. The preform can be reheated and blown the same day or it can be reheated and blown into a container 6 months after it was made. The advantage of this process are that long preform runs can support multiple machines or locations and once the costly preform mold exists, it is relatively inexpensive and quick to build blow molds. Typically a preform can be blown into a variety of container shapes making the process versatile and cost effective.

The RHB process is principally focused on PET. While the process cannot produce an integral handle, there are some secondary operations available which can attach a separate handle to a container.

The RHB equipment at Progressive is well suited to make containers from 2-oz to 1-gallon with neck finishes ranging from 18mm to 120mm in diameter.