Leak Testing Injection Blow Molded (IBM) Bottles


The process of injection blow molding (IBM) is used for the production of hollow glass and plastic objects in large quantities. In the IBM process, the polymer is injection molded onto a core pin; then the core pin is rotated to a blow molding station to be inflated and cooled. This is the least-used of the three blow molding processes, and is typically used to make small medical and single serve bottles. The process is divided into three steps: injection, blowing and ejection.

The injection blow molding machine is based on an extruder barrel and screw assembly which melts the polymer. The molten polymer is fed into a manifold where it is injected through nozzles into a hollow, heated preform mold. The preform mold forms the external shape and is clamped around a mandrel (the core rod) which forms the internal shape of the preform. The preform consists of a fully formed bottle/jar neck with a thick tube of polymer attached, which will form the body.

The preform mold opens and the core rod is rotated and clamped into the hollow, chilled blow mold. The core rod opens and allows compressed air into the preform, which inflates it to the finished article shape. After a cooling period the blow mold opens and the core rod is rotated to the ejection position. The finished article is stripped off the core rod and leak-tested prior to packing. The preform and blow mold can have many cavities, typically three to sixteen depending on the article size and the required output. There are three sets of core rods, which allow concurrent preform injection, blow molding and ejection.

**Common Machinery Types = Jomar, Uniloy Milacron**

Note: Machines sizes are commonly referred to by their clamping force e.g. 40 ton up to 250 ton
Common Bottle Types & Speeds

Common bottle types include tablet or pill bottles, liquid medicine, dropper bottles, injectables, jars, ovals, cylinders, Boston rounds, roll-on deodorant and mascara. Container resin types include HDPE, polypropylene and PET.

The process is ideal for small containers that require precise neck finishes. Blow molding rates typically range up to the 120 BPM range for the majority of applications. Bottles sizes become smaller as the molding speeds increase.

Common Leak Tester Machine Types & Uses

SC Linear Indexing Vacuum Conveyor Leak Tester

The ALPS SC Linear was originally designed with the standard Injection Blow Molded (IBM) container range in mind. This machine can typically handle the entire range of container sizes and speeds for IBM applications. A key part of the design was to consider the smallest end of the range i.e. vial or dropper bottles. SC Linear features include:

· Precise, programmable fiber-optic photo-eye to quickly and accurately sense container presence
· Flat profile conveyor chain with no gaps, to ensure small footprint containers remain stable
· Vacuum conveyor to allow precise stopping of indexing bottles at high speeds
· Probe heads with standard diameters available down to 0.875” diameter
· Small diameter rod reject cylinder to cleanly and positively reject small diameter containers
Reject and gate cylinders are built into the inboard conveyor rail for ease of setup.

The side of the conveyor frame is flush to minimize the dead area for bottle side transfers to and from the leak tester.

Integration of the SC Linear into the production line does require the setup of bottle transfers to and from the leak tester conveyor (examples shown in image above). For smaller containers, side transfers are recommended to minimize the dead space on which the bottles must travel. Care must be taken with the customer conveyor interface, and set up of the transfers, for the leak tester to operate efficiently. The Prime Sensor option is available to maintain a minimum backlog of containers across the upstream transfer.

SST Linear Leak Tester with Integrated Takeout Conveyor

The ALPS SST Linear incorporates a blow molder takeout conveyor and indexing conveyor leak tester into an integrated system. The use of a common frame allows a quick and easy pushbutton adjustment for conveyor height changeovers; which are necessary on Injection Blow Molding lines where the bottle necks exit the blow molder at a fixed height.

The takeout conveyor section will accept a ‘pause’ input to index together with the bottle takeout function. The takeout conveyor is driven by a frequency drive and controls are included to run in forward motion (normal operation) or reverse (to divert scrap during startup of the molder). An optional Counter/Diverter can be added to the end of the conveyor, to automatically count bottles into one of two boxes.
ALPS RS-S Linear was designed specifically as a compact, conveyor mounted version suitable to the IBM range of containers. Since the RS-S Linear is mounted to the customer conveyor, there is no separate leak tester conveyor height change necessary when changing the production line’s conveyor height during a bottle changeover.

- The smallest bottles e.g. 3cc vials, eye droppers, etc.
- Bottles with high height-to-footprint ratios (3:1 or 4:1 and higher) that are run at higher speed ranges.
- Bottles that tend to stick together when touching e.g. hot polypropylene.
Defect Types

· **Bottom Blow-Outs**
  Gross leaks in the base area when bottles are not properly formed
  → Very easy to detect with leak testing

· **Short Shots**
  Plastic is missing so the container necks are not fully formed
  → Detected by sealing on each container for the leak test.
    If the seal does not form a leak tight connection, the container is rejected
  → Inspection can be tuned to the desired level of sensitivity
    by adjusting the Probe Pressure (sealing force) and
    Seal Durometer (hardness)
  → Short shots that result in short containers with a level
    seal surface may be detected by using a bottle height inspection option

· **Stretched Necks**
  Extended length container necks caused by problems in the molding process on certain machine types.
  → Can be detected by sealing on the container, if not level; or by using height inspection option

· **Contamination Defects**
  → Can be detected if the contamination results in a leak
  → Vision inspection is recommended for cosmetic inspection is the needed

The ALPS RST Linear incorporates a blow molder takeout conveyor and moving head leak tester into an integrated system. The use of a common frame allows a quick and easy pushbutton adjustment for conveyor height changeovers; which are necessary on Injection Blow Molding lines where the bottle necks exit the blow molder at a fixed height. Furthermore, the use of a single conveyor eliminates the need for bottle transfers.

The takeout conveyor section will accept a ‘pause’ input to index together with the bottle takeout function. The moving head leak tester will automatically follow and match the conveyor speed, even when the conveyor indexes mid cycle of the leak test. The takeout conveyor is driven by a frequency drive and controls are included to run in forward motion (normal operation) or reverse (to divert scrap during startup of the molder). An optional Counter/Diverter can be added to the end of the conveyor, to automatically count bottles into one of two boxes.