

Summary

Savillex fluoropolymer lab bottles are manufactured by a unique stretch blow molding process that provides several key benefits, enhancing both the bottle's functionality and performance. Compared with the traditional extrusion blow molding process used to manufacture all other fluoropolymer bottles, stretch blow molding enables much more accurate and precise molding of the bottle neck and thread, which gives a much more secure seal, eliminating potential leaks. A smooth inner neck shape and the absence of molding imperfections inside the bottle neck allow controllable, drip-free pouring. The side walls and base have a much smoother surface finish. Manufactured inside a clean room from only the highest purity grade PFA resin, Savillex lab bottles are the cleanest, most advanced fluoropolymer bottles ever produced.



Savillex Lab Bottle Range

Shape and Design

Available in 50 mL, 100 mL, 250 mL, 500 mL, 1 L, and 2 L, Savillex lab bottles feature a wide mouthed 45mm diameter neck with a GL45 threaded cap (closure). A 33mm diameter closure is used on the 50 mL bottle. Except for the 50 mL version, all bottles are produced in a reagent bottle shape - shorter and wider than traditional fluoropolymer bottles. This makes them more stable and less easily knocked over: a useful safety feature. Manufactured from the highest purity grade (lowest trace metals content) virgin PFA resin, no regrind (recycled scrap material) resin is ever used. The closure is molded from the same resin type and grade as the bottle, so only PFA comes into contact with the contents.

Stretch Blow Molding vs. Extrusion Blow Molding

In recent years, stretch blow molding has overtaken extrusion blow molding to become the predominantly used method for producing plastic bottles – almost every soda bottle is now made in this way. The benefit of stretch blow molding for bottle production is that it allows the neck and threads to be molded very accurately. This is because stretch blow molding is a two-step process. First, a “preform” is injection molded. A preform looks like a miniature version of the final product, comprising of the finished size neck and threads and a small, thick walled tube section, which will be blown into the final bottle shape. Because the preform is injection molded, the neck and threads are produced very accurately, enabling an excellent seal with the closure (all closures are injection molded). In addition, no insert (liner) is needed inside the closure to produce a leakproof seal.

In contrast, extrusion blow molding is a one step process. A molten tube of plastic is extruded into the molding press. The heated mold (tool) is closed over the molten tube, and pressurized air is injected into the interior of the tube, forcing the molten plastic to conform to the shape of the tool. The neck and threads are molded at the same time, and the excess polymer is trimmed off the top and bottom (producing excess waste). Because the neck and thread are molded during the blow molding step, the accuracy and finish are much poorer than when the injection molded, and secondary machining must be performed to improve the quality of the bottle lip.



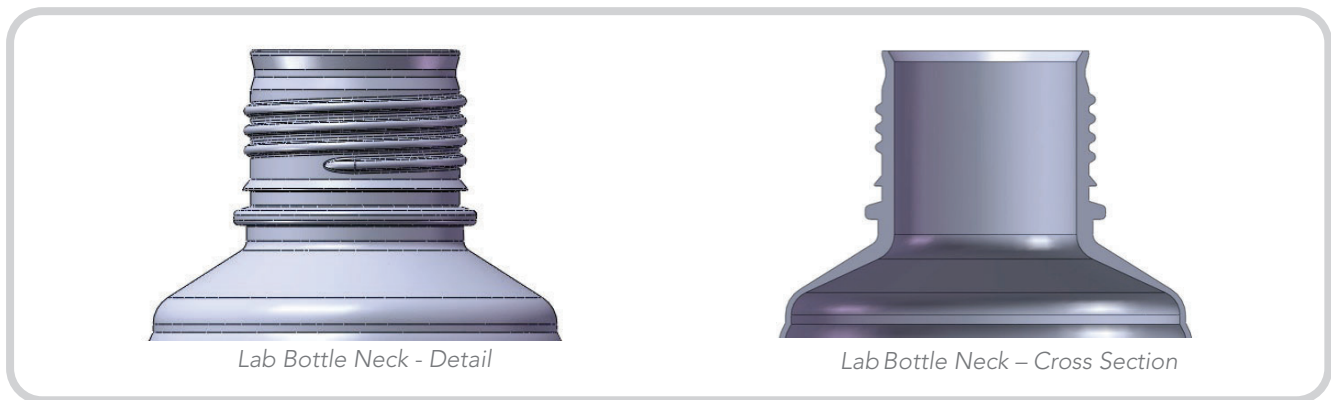
*Preform for 500 mL lab bottle.
Neck and threads already formed
prior to the blow molding step.*

There is no commercially available stretch blow molding machinery that can handle the demands of fluoropolymer molding, so Savillex designed and built its own stretch blow molding machinery in-house. Among all fluoropolymer bottles on the market, only Savillex bottles are produced using stretch blow molding and feature the benefits of this manufacturing technique.

Neck and Thread

Savillex lab bottles feature a unique 3.5 turn thread design (other fluoropolymer bottles have only 1.5 thread turns). More thread turns means greater thread engagement: this gives Savillex bottles a much more secure closure. As a result, a much better seal is achieved, capable of holding higher pressure without leaking. In addition, seal integrity is maintained over long storage periods because closure “relaxation” is eliminated. The bottle neck drawing below shows the 3.5 thread turns of the Savillex lab bottle.

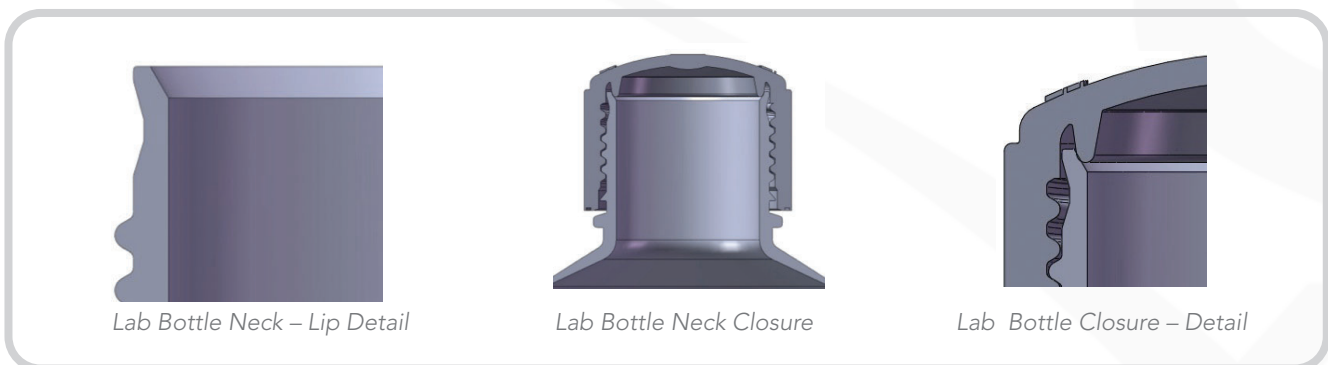
Because the neck is injection molded, the inside of the neck can be designed perfectly smooth and cylindrical. With extrusion blow molding, the excess polymer forms ridges inside the neck’s base, allowing pockets to be formed where liquid becomes trapped. With a Savillex bottle, there are no such issues, and the smooth inner neck contour allows very controllable pouring, which is an important safety feature when dispensing concentrated acids.



Lip and Closure

Another benefit of stretch blow molding is that, because it is injection molded, the shape of the lip of the neck is very accurately formed. The angled inner lip is very smooth – no additional machining of the lip is required to improve the seal. The shape of the inner lip also completely eliminates drips when pouring which is an important safety benefit when dispensing concentrated acids – especially HF.

The Savillex GL45 closure shown has an inner lip that aligns and seals with the lip of the bottle neck. Because both surfaces are injection molded, an excellent seal is achieved, and because no machining of the bottle lip is required, the surface is free from machining marks that can degrade the quality of the seal. No cap liner is required, which avoids the risk of contamination, for example when the liner is placed on the lab bench and then used to reseal the bottle. Liners can also easily be lost or discarded, which then means the bottle is not sealed properly.



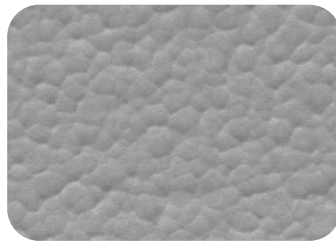
Surface Finish

Another benefit of stretch blow molding is its much smoother surface finish: the preform, being injection molded, has a very smooth surface, which is retained when the preform is blown into the final bottle. The SEM images below provide a graphic comparison of the difference in surface smoothness between a Savillex lab bottle and a traditional extrusion blow molded bottle. The top images compare the inside walls and the bottom images compare the inside base of the bottles.

The much smoother surface finish of the Savillex bottles improves cleaning effectiveness and significantly reduces the likelihood of trace metals being trapped on the surface and causing residual contamination where bottles are used multiple times.



Savillex Lab Bottle Inside Wall
(250x SEM Magnification)



Competitor Bottle Inside Wall
(250x SEM Magnification)



Savillex Lab Bottle Inside Base
(1000x SEM Magnification)



Competitor Bottle Inside Base
(1000x SEM Magnification)

Summary

By applying, for the first time, stretch blow molding technology to the production of fluoropolymer bottles, Savillex has raised the design and performance of lab bottles to new levels. Savillex lab bottles have superior pouring and sealing characteristics, and a smoother surface finish than any traditional bottle.