

Freeform Injection Molding PepsiCo Perfect Cap



PEPSICO

The Perfect Cap

THE CHALLENGE

Limited design freedom with the desired material.

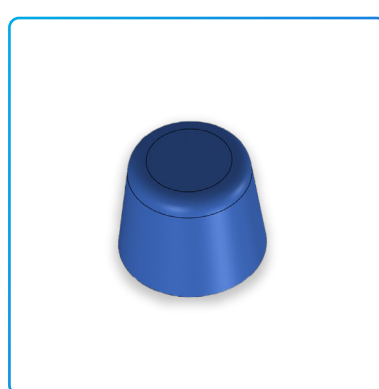
THE SOLUTION

3D printed tooling with Freeform Injection Molding, enabling foodgrade materials.

The perfect bottle cap by PepsiCo. The material used for this project is PepsiCo blue HDPE.

Part design

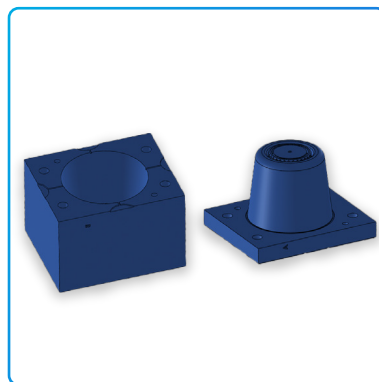
Part Design



The bottle cap was made to resemble the early PepsiCo bottle caps and the challenge lies in the inner design to ensure proper fitment via molded threads.

60 minutes

Mold Design

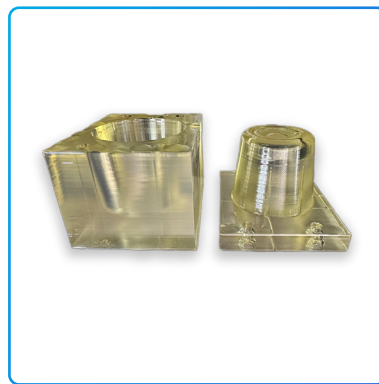


After the design is completed, the digital design (STEP file) is converted into a mold design which is done by inverting the part into a cavity, in a block of material, and then adding the inlet gate(s) and initial venting.

The 2-part initial design allows for quick visual Quality Assurance.

90 minutes

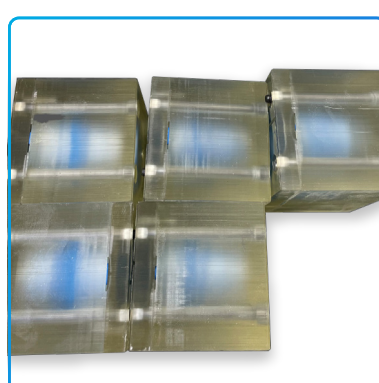
Printed Tooling



The molds were printed at a 100µm resolution to ensure good mold quality while optimizing the build for fast production.

5 minutes

Freeform Injection Molding (FIM)

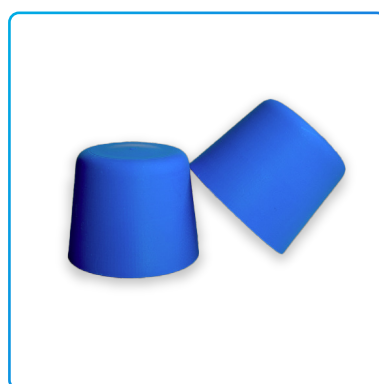


The parts were molded on a 50-ton press. However, the molds work hand-in-hand with any installed base molding unit.

An aluminum mold frame was used to hold the assembled mold, cycle time per part was around 5 minutes, and 1 minute cooling time after each shot.

1 day

Demolding



The Nexa3D alkaline solution was used for demolding these parts, in just one day.

This time can be optimized through mold re-design, by removing a part of the mold before demolding, or direct removal of the part if possible.

Total time to 1st injection molded part:
155 minutes + 1 day of demolding



Observations

- The mold design is an easy process; similar to building a mold box around the design, and then make it a cavity.
- The PepsiCo blue HDPE material filled the molds nicely in the first test rounds.
- Optimization of the demolding is recommended when running next iterations. The more material that can be removed or reused, the faster the process will be.
- Standard material data was used for molding, settings, pressure, temperatures, and more.
- Early hands-on testing for verification of assembly and performance using first-out-of-tool parts is valuable for most team members.

This includes materials, design, process, and regulatory compliance.

Should you need, the Freeform Injection Molding process enables further same day iterations.