FREEFORM INJECTION MOLDING IN PACKAGING FLIP-TOP-CAPS AND LIVING HINGES

The Part: A classic flip-top cap, in various designs The Materials: Recycled Polypropylene and Food Grade Polypropylene

PART DESIGN(S)

The flip-top cap comes in many designs. The challenging part is often around the "living hinge". We work with STEP files as input from our clients.

30 minutes

Time

MOLD DESIGN(S)

Converting the STEP file into a Freeform Injection Mold design is done by inverting the part into a cavity, in a block of material and then adding inlet gate(s) and initial venting. Find <u>design video examples on our website</u>:

The 2-part initial design is sometimes created to allow for quick visual Quality Assurance studies, early on (filling, venting, quick part release to check areas around the flip hinge part) The final assembled mold is filled as-one and de-molded as-one.



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1 hour

PRINTED TOOLING

The first molds we printed in a 100um resolution. We also tried in 50um and 20um and seeing no difference in parts performance, we prioritized speed over visuals. The AddiFab platform allows a range of print resolutions: X/Y from 10um to 50um and Z from 10 to 200um.







5 minutes

FREEFORM INJECTION MOLDING (FIM)

The parts were molded on a 50 ton Krauss Maffei. Our molds work hand-in-hand with any installed base molding unit. From 7 ton Babyplasts to 250+ ton HUSKYs works great. An aluminum mold frame was used to hold the assembled FIM mold. Cycle time per part was around 5 minutes. No cooling needed with FIM, as we typically eject the filled cavity after each shot.



1-3 days

DE-MOLDING

We choose to use our chemical dissolver for these parts, since the part contains undercuts that prevent mold separation. They need 1-3 days in the de-molding station. Could be optimized via mold re-design, with a focus for quicker de-molding, thinner walls etc. Our print resins handle 450 Degree Celcius and can also be used for split-molds and multi-shot molds, re-usable for low volume manufacturing - in a takeapartable-design often.

FIRST OUT-OF-TOOL PARTS

These flip-top cap photos are all the first out-of-tool ones: no postprocessing, no polishing. We like to see, what a starting point looks like, and then iterate rapidly from there. Details in design and functionality, stand out clearly, and the caps flip hundreds of times without showing signs of fatigue. Just as you would expect from a conventional, injection-molded flip cap. Materials shown are foodgrade Polypropylene (translucent) and 98% Recycled Polypropylene (black)















Total time to 1st injection molded part:

1hrs 35 mins + 1-3 days of

de-molding

OBSERVATIONS

- The mold design was an easy process...think like building a mold box around your design file, and then....make it a cavity.
- The Polypropylene materials seem to fill the molds nicely in the first test rounds already. Tried 4 other Polypropylene materials with success.
- Optimization for de-molding is always a good thing, running next iterations. The more material you can remove or reuse, the faster and cheaper will be your process. Also consider multi-use molds, if the design allows for this.
- Datasheet materials have been used for molding data, settings, pressure, temperatures, and more
- Early hands-on testing for i.e. assembly and performance using first-out-of-tool parts is valuable for many team members: materials, design, process, regulatory....and if you need to make another round of iterations, you can make these same or next day.

Freeform Injection Molding Why/How/What?

WHY: Enabling you to accelerate, validate and de-risk your hardware development journeys.

HOW: Introducing unlimited design freedom + access to any injection molding material, including your own.

WHAT: The impact: Same or next-day injection-molded production-grade parts with built-in performance> all the way from Rapid Prototyping to Low Volume Manufacturing.



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