



# Utilization of 3D-printing in injection molding

Jyväskylä | 26.01.2023 | Patrik Oksanen

# Body of presentation

- 3D Formtech as a company
- Taking advantage of 3D-printing before mold acquisition
- Utilizing 3D-printing in making molds
- Utilization of 3D-printing in injection molding operations



# 3D Formtech



Offer AM  
manufacturing and  
designing



Company location is  
in Jyväskylä/ Finland



3D Formtech was  
founded on begin of  
2014.



Turnover  
03/2022 est. 2,3M€



High quality EOS  
equipments and  
certified materials



ISO9001:2015  
certificate



Employees: 16

# Machines

- 6 EOS Plastic machine
  - 3x EOS P396 and 3x EOS P110
  - Printing area 330x330x600mm
- 2 EOS metal machine
  - EOS M290
  - Printing area 250x250x325mm



# Materials

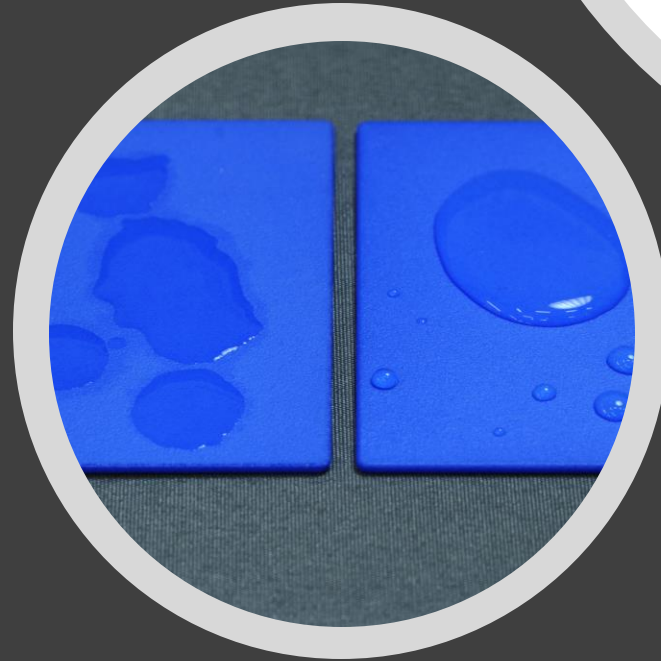
- Plastic Materials:
  - PA2200, FDA approved
  - PA3200GF (30% glass reinforced)
  - PA2210FR (flame retardant UL94-V0)
  - PA2241FR (JAR-25)
  - TPU (elastic, shore A86)
  - AD Sint, PA11 ESD material
- Metal Materials:
  - MS1, maraging steel 1.2709
  - 316L
  - AlSi10Mg
  - Ti64
  - TiCP (Grade2)



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# Post-processing, Plastics

- **Dye Mansion Powershot C:** Automatic part cleaning
- **Dye Mansion Powershot S:** Automatic Surface treatment. Homogeneous, semi-glossy, improved scratch-resistance end-use part finish.
- **Dye Mansion DM60:** High quality dyeing with RAL codes
- **Micro coating:** Developed by 3DFormtech. Water, oil, UV and dust resistance coating for challenging environments
- **Inserting:** Brass hitserts and quickserts



# • Post-processing, Metals

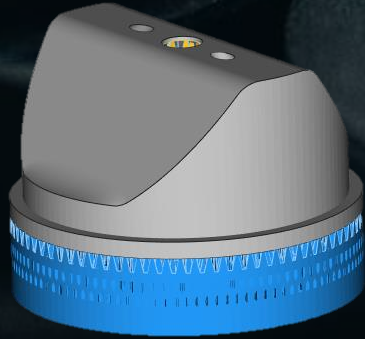
- Stress relief heat treatments
- 3-axis CNC finishing for more demanding accuracies and surfaces
- Tumble polishing
- Electropolishing
- Diamond paste polishing



3D-model



3D-model with support structures



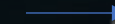
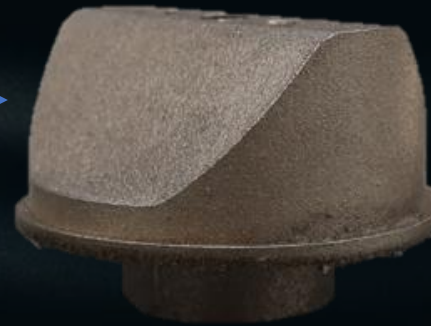
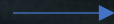
Tumble polishing is centrifugal mass polishing with three different media (rough, fine and polishing one)



Process time in the barrel takes ~3-4 h including three different sections



Raw 3D-printed part



Finished part after tumble polishing



The quality of the final polished result depends on the initial state of raw 3D-printed part

Well designed part (less support structures needed) is quick and more affordable to polish

All of our metals can be polished:

- 316L
- Ti64 / Ti grade 2
- AlSi10Mg
- MS1-Maraging steel



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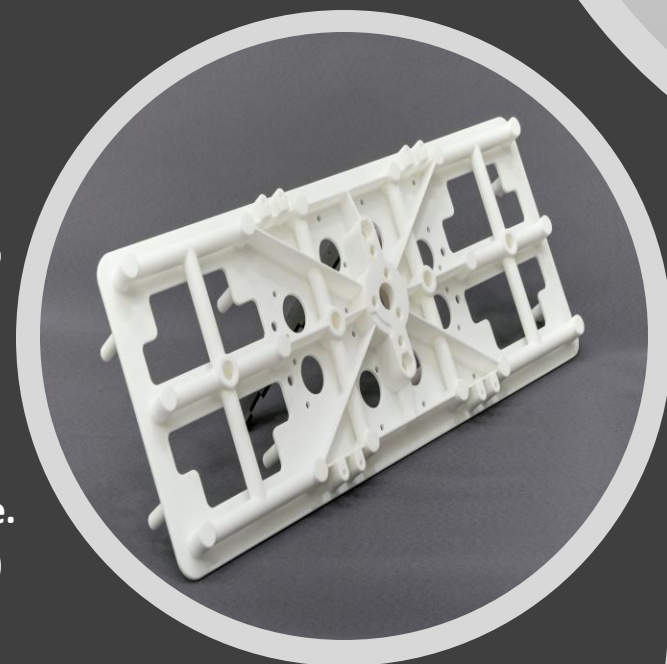
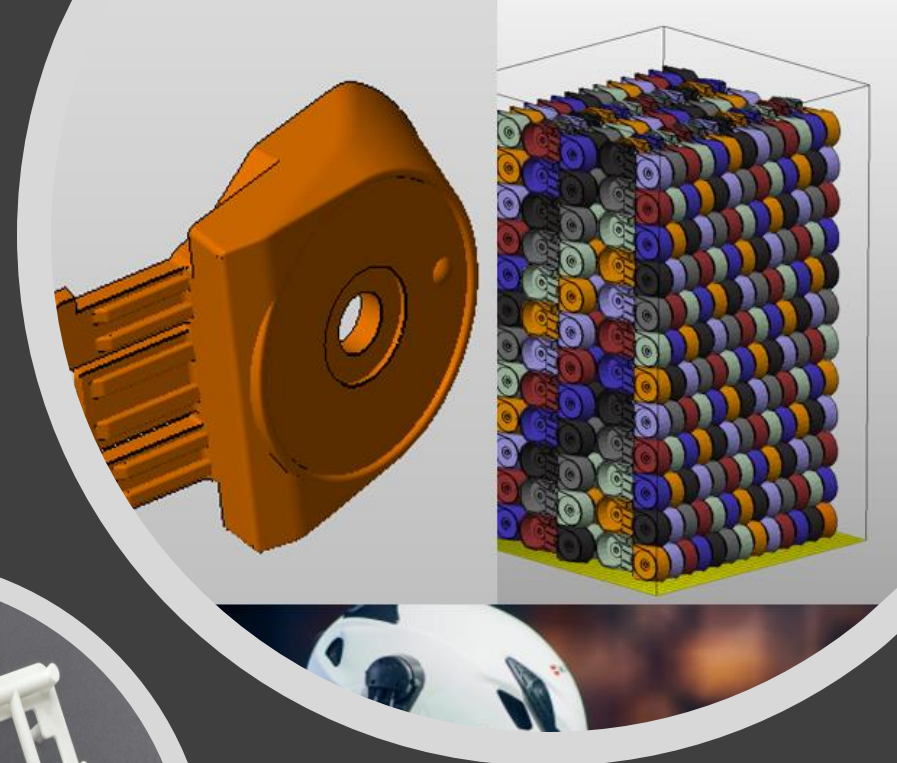
# Taking advantage of 3D-printing before mold acquisition

- **Protos**

- Verification of parts intended for injection molding (Design, dimensioning, mechanics).
- Product presentation and market research.
- Insurance for the purchase of the mold.

- **Serial production**

- The purchase of the mold is not cost-effective due to volume of demand.
- The client does not want to commit to the current design.
- There are different modular versions from the parts.
- 3D-printing production while the mold is being made.
- More precise tolerances in serial production (Batch 0 / end-use product validation).
- Cheaper prices in serial production.

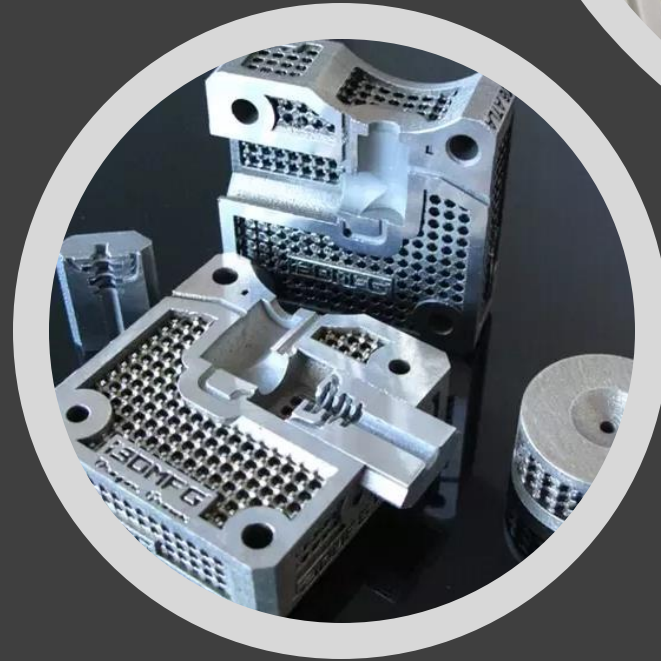


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# Utilizing 3D-printing in making molds

## • Molds

- Small and complex molds can be 3D-printed from metal or plastic.
- Accuracy, quality and post-processes have developed to required level
- The potential benefits of 3D-printed mold: Conformal and optimized cooling channels, weight reduce, time saving, negative drafts available, revision management, costs savings and other smart solutions.



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14% higher production rate

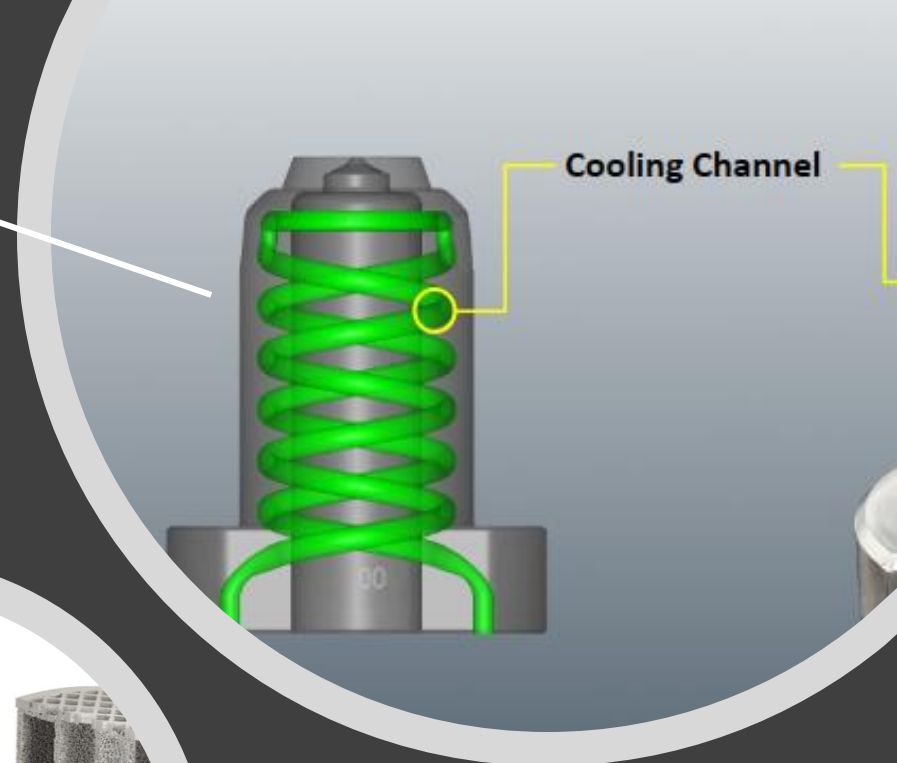
# Utilizing 3D-printing in making molds

- **Mold cores and inserts**

- Better warpage control and higher production rates with conformal cooling channels.
- Different product versions by rapid inserts changing.
- Negative drafts are available.
- The use of bronze?

- **Porous structures**

- Laser parameters can be used to make porous parts in a controlled manner. This strategy can be used for example, by directing the gases away from the cavity directly through the mold structure because of porosity. In this case, there is no need to use gas escape channels separately.



30% higher production rate

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# Utilization of 3D-printing in injection molding operations

- **Grippers**

- Collecting parts from cavities with compressed air using customized tools (to get rid of ejector pin traces).
- For handling parts/tools after the casting process.

- **Jigs**

- Intended for casting parts. For example: insertion, assembly or manual removal of casting gates or parting line traces.

- **Package material**

- 3D-Printed customized supports



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Thank you!

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