

Design and additive manufacture of a metal mould to shape plastic tubes



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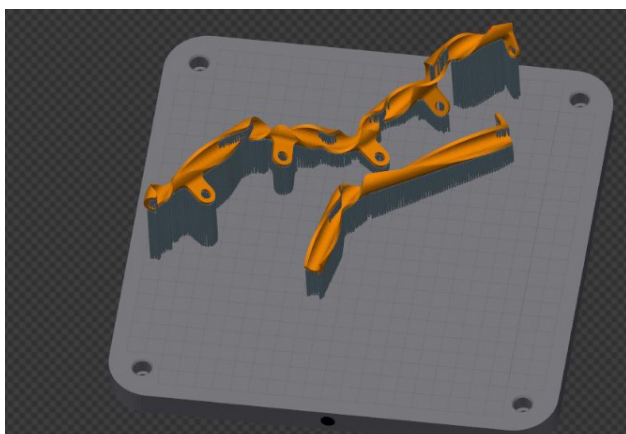
Sector: Moulding

Challenge: Design and manufacture of a mould to shape PA12 tubes, thereby optimising the manufacturing process, facilitating assembly by the worker, reducing costs and delivery times.

Solution: Manufacture of a mould made of AISI 316L stainless steel, printed in parts using SLM technology and welded after manufacture.

CHALLENGE

Redesign and manufacture of a metal mould to shape plastic tubes. The challenge consists in designing a 3D model adapted to its application and manufacturing it in stainless steel using additive technology. To optimise the manufacturing process and make it easier for the worker to assemble the PA12 tube on the mould manually, while reducing production costs and delivery times.



SOLUTION

Optimus 3D, in collaboration with the Cikatek company (Cikautxo Group), dedicated to R&D and innovative rubber and plastic solutions, proposed the design and manufacture of moulds to shape tubes using the advantages offered by additive technology.

The design process was carried out by moulding complex surfaces with AutodeskFusion360 software.

Using the plastic tube to be shaped as the reference, a mould was designed to clasp it and guide it along its entire length.

HP-Multijet Fusion 3D printing technology was key tool in the product concept phase and the printer was used for the prototype and to validate the model.

HP printing streamlined and optimised the design work flow, providing a new version ready to be manufactured in polymer (PA12) to test approximately every 4 days. Resolution is excellent by printing at layer heights of 0.08 mm. The PA12 used for the functional prototype contains a certain degree of tenacity which allows it to absorb impacts without breaking. Its thermal properties can withstand a working temperature of approximately

90°C. Therefore, despite not containing sufficient HDT to shape the required polymer tubes (>150°C), it was perfectly suitable to test the first mould designs.

The validation tests consisted in the following steps:

- 1. Heating the PA12 tube to 50°C to shape it manually over the mould.
- 2. Performing the assembly test on the mould prototype in less than 1 minute:
 - a. Verifying that the tube is properly assembled on the mould (analyse worker difficulties during the process)
 - b. Checking that the design was firmly attached to the tube along its entire length.

Once the prototype printed in PA12 is validated, final printing is carried out with metal technology.

Due to its length (315 mm), the part is printed in various sections to be welded after manufacture. The technology used is SLM–Renishaw 500M with layer heights of 0.05 mm and stainless steel 316L.



ADVANTAGES

- Reduction of delivery times: availability of the mould manufactured in AISI 316L stainless steel in 3-4 business days.
- A design adapted to worker needs: availability of a CAD digital file to redesign and validate using prototypes in polymers, thereby reducing costs.
- The customer has converted a task that is highly dependent on worker skill into a standard process that guarantees deadlines and homogeneity. The testing cycle period is improved, providing an appropriate curve and obtaining the number of tools necessary for the required flow of supply.
- Partial alterations of the design are feasible while making use of the rest of the work.
- It is much easier and inexpensive to reduce tool weight than with the traditional system.

