

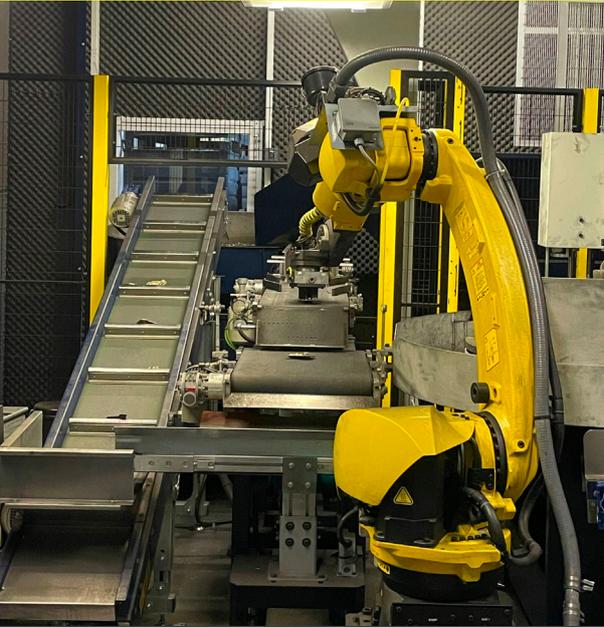


## Case Study

### Additively Manufactured Robot Grippers Save BEULCO £200,000

BEULCO GmbH & Co. KG specializes in the manufacture and processing of high quality products for the water supply.

The family company based in Attendorn has been using additively manufactured parallel grippers and vacuum cups for workpiece handling with robots since January 2020 and has already saved £200,000.



# Project Goals

## High Number of Variants and Tool Costs

BEULCO GmbH & Co. KG uses parallel grippers and vacuum cups for workpiece handling with robots and was faced with several challenges at the same time.

In production, the workpieces have to go through two steps. In the first step the components are deburred and in the second step they are machined. Robots are used as the primary operator.

All pressed workpieces have individual contours and there are a variety of over 100 different designs.

In addition, high tool costs meant that a more cost-effective alternative to the existing metal machined grippers was sought.

The aim was to manufacture individual and reliable robotic grippers in a cost-efficient manner.

# Solution

## Additive Manufacturing with Composite Materials

At the EMO 2019 in Hanover, Lutz Schopen discovered the industrial Markforged 3D printer.

The possibility of reinforcing the components with the continuous carbon fiber while printing was the main criterion for him when choosing a printer. He quickly realized that this technology would become a game changer in gripper technology for BEULCO. He believed there would be a drastic reduction in costs to manufacture end-of-arm tooling.

## Steep Learning Curve After Initial Skepticism in the Team

At first, the team was skeptical of the new technology. If it's not made of metal, it can't last." - The original quote from the team.

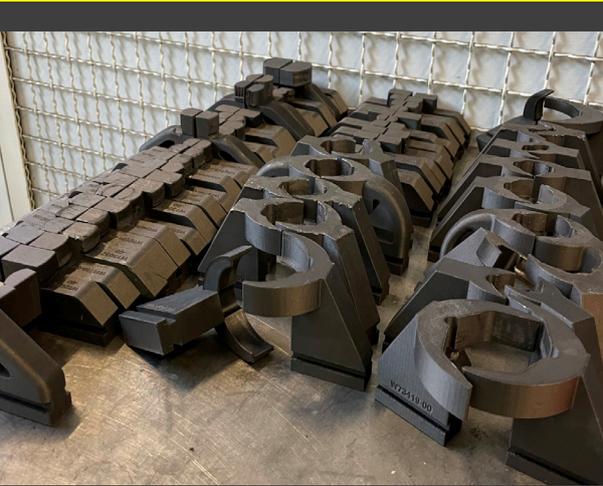
An initial sample component from Mark3D was able to quickly convince the team quickly, with results from trials. The first wear tests could be carried out and experience gained on this test stand. Among other things, a separate concept for connecting the gripper to the robot was developed, after which a rethink in the design had taken place.

The grippers were optimized for additive manufacturing during the design phase.

## At a Glance

- ✓ Limitless Opportunities
- ✓ High Customer Appearance
- ✓ Design Freedom
- ✓ Feasibility of abstract constructions
- ✓ Stability and Strength





In the course of this, the connection of the grippers was changed from a force fit to a form fit. The groove of the gripper is pushed into a C-groove of the robot, clamped with a plate and screwed. The weak points of the fastening could thus be eliminated.

Due to the modular structure, it is now possible that the grippers can be used in both processing steps on the robot systems.

### Additively Manufactured Grippers Exceed Expectations:

#### No wear noticeable on vacuum grippers!

“Not a fake, but real means of production at BEULCO GmbH & Co. KG!” Emphasizes Lutz Schopen. The new additively manufactured grippers meet the requirements in 99% of the applications. Some of the vacuum cups have already been in use for over 40,000 cycles and show no measurable wear. The high loads from fast movements have just as little influence on stability as cooling lubricants with which the components come into contact.

In addition, the procurement times (external procurement) could be reduced significantly from 4-6 weeks to 1-2 days, ideally to 24 hours. There are also gigantic savings. A total of £200,000 has already been saved on over 330 printed pairs of grippers and vacuum cups.



The Mark Two 3D printer paid for itself in less than two months!



#### Vacuum gripper in detail

Milled steel:

Weight: 3194 g

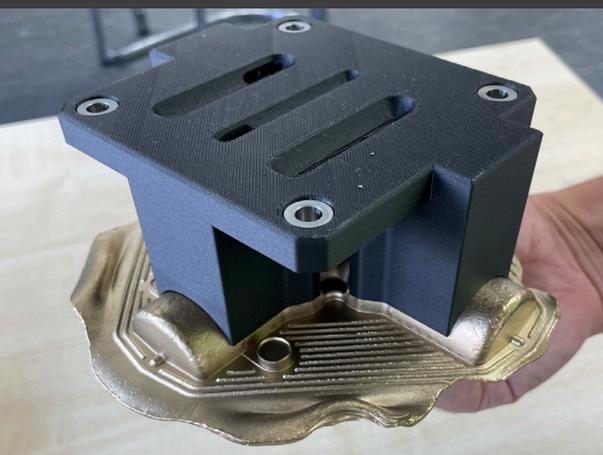
Costs: £1,145.00

Delivery time: 4-6 weeks

Additively Manufactured:

Weight: 189g

Cost: £100



*"The 3D printer ran 6500 hours in 1 1/2 years. This corresponds to a capacity utilization of around 70% in three-shift operation. We are excited about the hardware. The software is sufficient for „normal“ applications. Service and support were always exemplary!"*

*Lutz Schopen, Managing  
Director Technology,  
BEULCO GmbH & Co. KG*



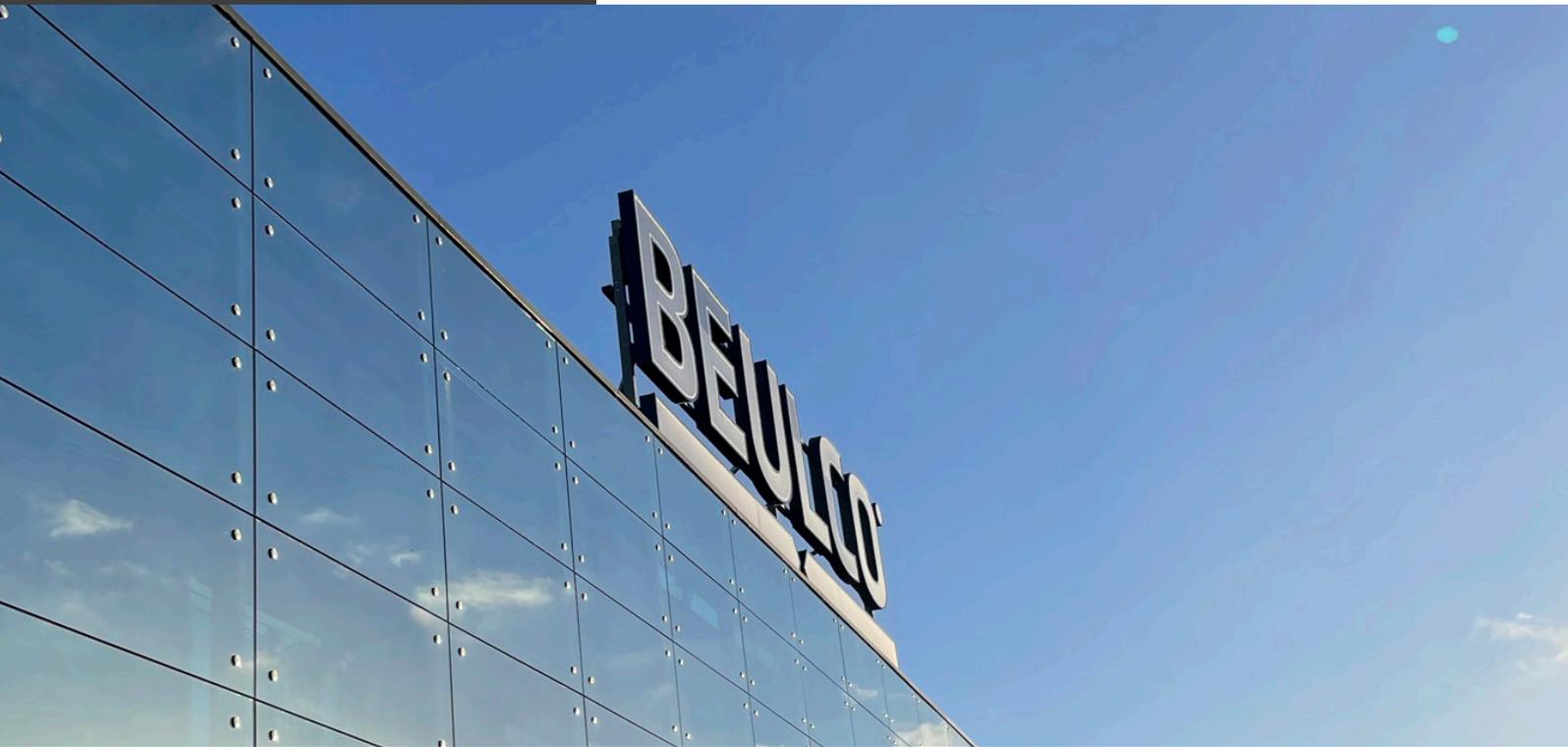
## The Future

### Additively Manufactured Clamping Jaws

Replacement grippers and grippers in new designs are still planned for the future. There is still a regular need here.

BEULCO GmbH & Co. KG sees additively manufactured clamping device jaws as a further field of application for the series production of workpieces on automatic lathes and machining centers. Here, BEULCO faces challenges such as strong forces and

high heat generation. A solution is being worked on together with Mark3D GmbH.



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