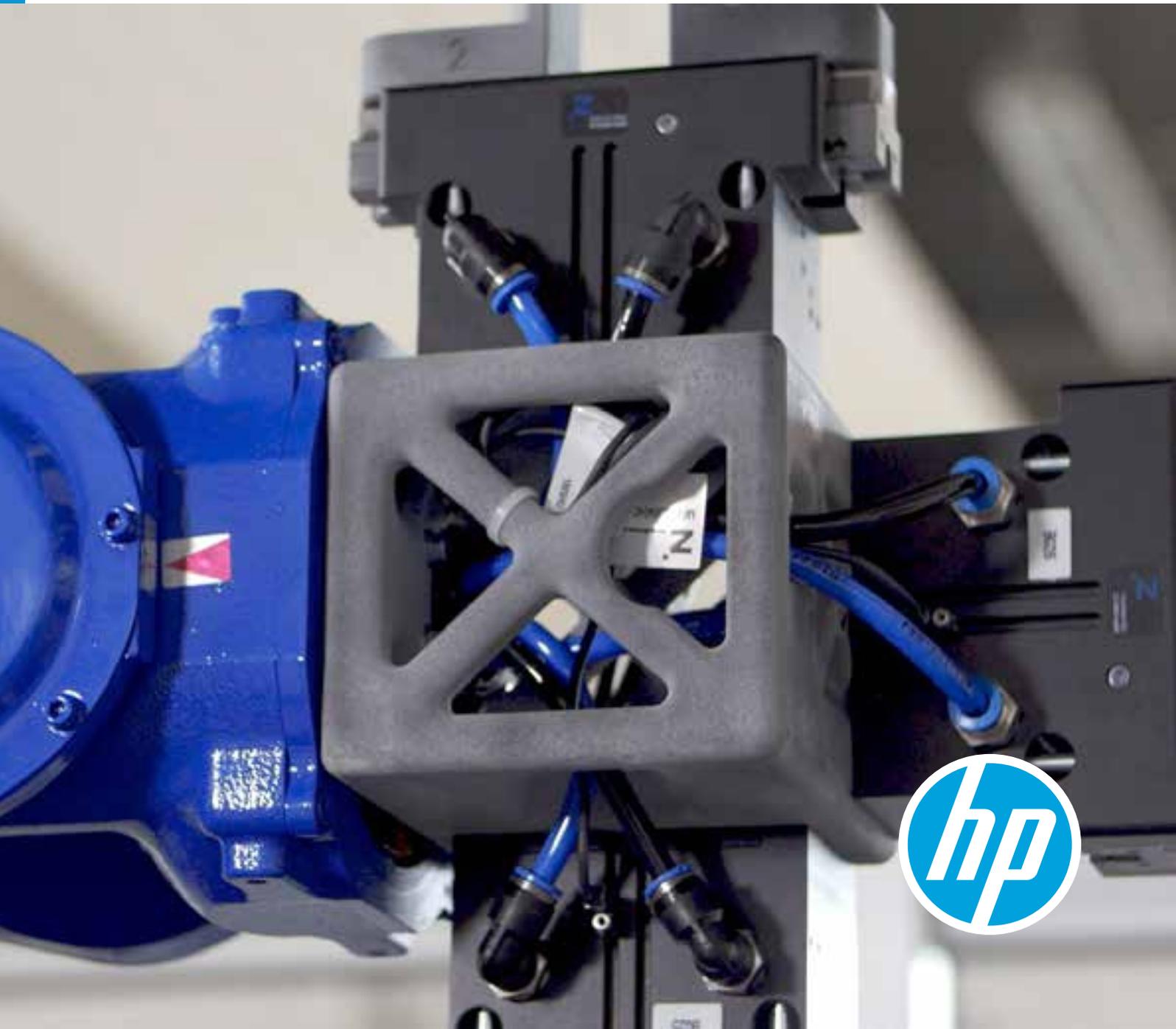


CASE STUDY | CNC WÜRFEL

CNC Würfel transforms manufacturing automation with HP Multi Jet Fusion technology



From jigs, fixtures, and tooling to final parts, **CNC Würfel** relies on HP MJF to save money, cut time, and customize production



Introduction

CNC Würfel specializes in manufacturing and process automation and optimization in a variety of industries, from automotive to medical technology to food.

Based in Singen, Germany, CNC Würfel started implementing 3D printing technology into their systems by 2017 to observe the effects of the process. With the technology, they printed components that had originally been produced with a milling cutter or a lathe, both of

which resulted in long lead times. But by 3D printing such parts, they decreased production time and were able to print prototypes to test systems operations.

Since the implementation of 3D printing, CNC Würfel's business has grown from originally receiving and processing two orders per month to now receiving between 10 and 20 orders per month.

• Industry

Industrial

• Sector

Machinery and equipment

• Objective

To maximize production speed and decrease production costs using 3D printing and HP Multi Jet Fusion (MJF) technology to manufacture a customized robot arm gripper (final part) and a master part repository.

• Approach

CNC Würfel sought to meet customers' needs for more time- and cost-efficient production by replacing a final part and tooling with 3D printed parts using HP MJF technology. Through myriad design iterations and tests, they developed solutions that would have not been possible with traditional manufacturing methods.

• Technology | Solution

HP Multi Jet Fusion technology, HP Jet Fusion 3D Printing Solutions

• Material

HP 3D High Reusability¹ PA 12

1. Based on using recommended packing densities and compared to selective laser sintering (SLS) technology, offers excellent reusability without sacrificing mechanical performance. Tested according to ASTM D638, ASTM D256, ASTM D790, and ASTM D648 and using a 3D scanner for dimensional accuracy. Testing monitored using statistical process controls.

Challenge

In terms of final part production, CNC Würfel wanted to find a new way to produce their gripper adapter, a part that picks up items from many conveyor belts and locations, thus requiring several components and various types of gripping systems. Using traditional manufacturing methods, their lead times range from eight to 10 weeks, a period that includes design, gathering parts, and putting the systems into operation.

In one specific case, a customer requested a multi-directional gripper that could pick up all items from the belt in one step. CNC Würfel responded by designing three pairs of gripping fingers at the front of the robot so that it can properly grip multiple items at once.

Producing a gripping adapter with a milling cutter or lathe is extremely difficult as it requires extensive knowledge and prompts questions regarding designing for milling,

the component's ability to tolerate the process, and how to prevent snapping or tearing when positioning the external tubing required for this process.

One step of CNC Würfel's automation process involves milling, which is followed by assessment. During these stages of production, atmospheric factors and temperature variations may cause deviations in tolerances, factors that must be closely observed during automation. If deviations occur, CNC Würfel would be forced to discard half of what they produced because the tolerances would not match. To prevent this, they needed to find a way to integrate a master part into the system that can provide the customer with easy access and inspection, or one that is integrated in the process and automatically conducts inspections. This part must be able to withstand both human- and weather-related external influences.

Solution

CNC Würfel turned to 3D printing to produce their gripper adapter at faster speeds and using a more straightforward process. They were able to design a simpler component that is in line with their needs, and they produced it in fewer than two days.

“Ultimately it came down to three models, from round to angled,” said Lars Weiß, responsible for 3D printing and sales for CNC-Automation Würfel. **“This is then applied to the final product, which is now used in three of our automation systems. This gripper adapter looks like an attached box section that has the screw connections, bores for pneumatic connections, and blow-off valves, and that is so flexibly designed that we almost certainly wouldn't have been able to make it with milling.”**

For their master part repository, CNC Würfel conceptualized a box made of metal, stainless steel, or another weather-resistant material that can house the entire part. Then they needed to bend, trim, weld, and somehow assemble the metal box to create a molded barrier that protects the parts within. However, such design and production would lead to extremely high costs of approximately 4.500€ (\$5,176) per case.

Therefore, they decided to adjust the design for 3D printing by creating a high-quality visual of the master part case, which ultimately consisted of four parts: the cover, the base, and two brackets to hold it in place.

Result

From design to the finished component, the process to produce the gripper adapter used to take between eight and 10 weeks, but using HP Multi Jet Fusion technology, the production time decreased to only two days, an overall time reduction of approximately two months.

“Even with our tests, it took us a total of two weeks. So, in two weeks, we designed the entire part, printed tests, tested them on the system, and arrived at the final product,” Weiß said.

HP MJF design costs for the gripper adapter are between 1.500€ and 2.000€ (\$1,725 to \$2,300), with a 3D printing cost of 200€ (\$230). Previous methods cost CNC Würfel up to three times more, allowing for cost savings of approximately 66%.

CNC Würfel’s master part repository is now integrated into their automation system and is part of the automation process. After a specific number of units have been produced, the robot removes the master part from this case, places it in the testing station, takes the necessary measurements, and compares the values with the last set of measured parts. **“There is also a manual request on our systems, which theoretically means that this test can be carried out at any time,”** Weiß says.

The master part repository was printed and cooled in three days and then mounted in three days, for a total production time of one week. Previous methods would have taken between eight and 10 weeks, resulting in a time reduction of two months.

The previous cost with traditional manufacturing methods would have been approximately 4.500€ (\$5,176), but when using HP MJF, the 3D printed part costs between 150€ and 250€ (\$172 and \$287), not including design, for a cost reduction of 95%.

The 3D printed master part repository also resulted in a weight reduction of 84%: The original metal box weighed between 6 and 8 kilograms (13 to 17 pounds), but the maximum weight of the HP MJF-produced box is 2 kilograms (4.4 pounds).

Weiß added: **“Both the gripper adapter and the master part repository are built into the same system, creating a custom solution for the customer.”**

Since introducing these processes and parts into production, CNC Würfel now produces approximately 150 parts per month.

“HP MJF is better and more optimal for our needs, uses a better material, and doesn’t require as much maintenance,” Weiß says. **“Our customers want more and more 3D printed parts. The demand continues to rise. In the last two months, we’ve gone from one to two design spaces a week to five a week, and this trend continues, including in demand.”**

“The contexts and ways in which 3D printing can be used are constantly expanding, and in the business world as well as the consumer world, the possibilities are practically limitless,” says Oliver Würfel, Managing Director, CNC-Automation Würfel. **“In all areas of the industry, 3D printing will definitely have a great impact and revolutionize what we do.”**

Learn more about HP Multi Jet Fusion technology at:

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