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case study

AUTOMATED DEPOWDERING WITH ULTRASONICS – USE CASE JUSTAIRTECH

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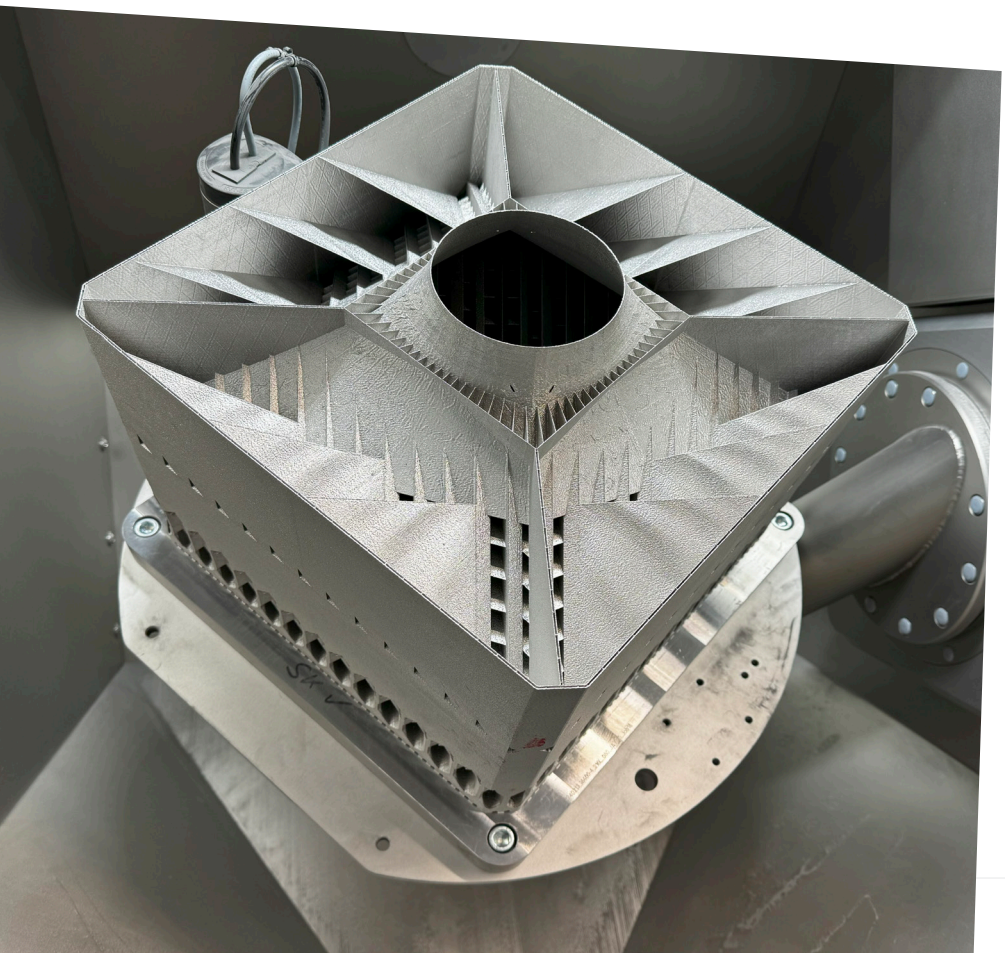
Introduction

For nearly a decade automated depowdering was widely understood as the combination of automated rotation and targeted vibration. This is still the case but with the launch of the depowdering system SFM-AT350-E Solukon has extended the vibration options with ultrasonic excitation.
This case study features the ultrasonic depowdering process of a Fractal Heat Exchanger by justairtech. The company develops and provides sustainable, highly efficient cooling systems that use air as a refrigerant, primarily targeting data centers and industrial cooling needs. The use case part, their fractal heat exchanger, is their core technology, enabling the use of air as a refrigerant and achieving 4-5 times higher efficiency than conventional systems.
They aim to decouple cooling from climate change by reducing electricity consumption and using natural refrigerants.



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SFM-AT350-E

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FACTS & FIGURES ABOUT THE APPLICATION AND DEPOWDERING PROCESS

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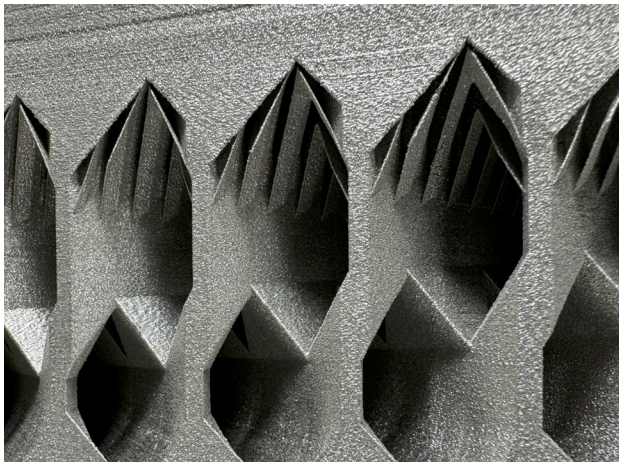
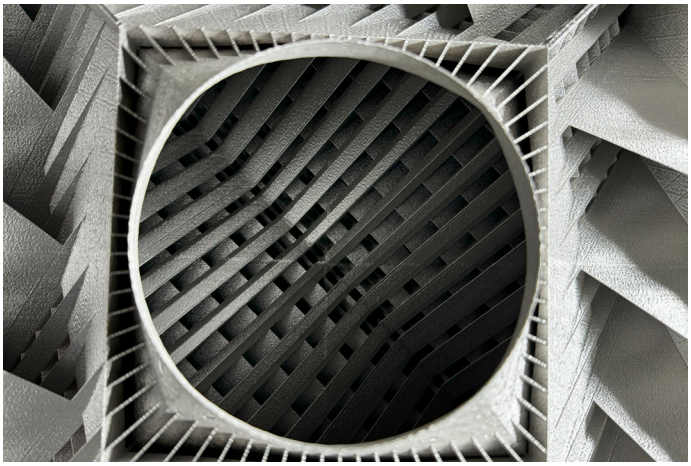
Part dimensions (incl. build plate)	350 x 350 x 350 mm
Printer with which the part was manufactured	EOS M 400-4
Material	EOS Stainless Steel 316L
Application	Fractal Heat Exchanger
Structure / surface	Complex internal geometry with many horizontally running, long and narrow channels; Channel openings of various geometrical shapes Spread over the entire base area, approximately halfway up: an area (100- 150 mm high) in which there is a vertical grid with extremely small gaps (“channels” of 0.5 x 0.5 mm).
Smallest diameter of internal feature	0.5 x 0.5 mm
Duration of automatic depowdering	337 min
Depowdering system	Solukon SFM-AT350-E with ultrasonic excitation
Mode used	Automatic mode + manual mode



Channel openings of different various geometrical shapes



View from above into the interior of the component

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The depowdering process

Before the ultrasonic depowdering process in the SFM-AT350-E a pre-cleaning has already been conducted. There was a period of time between the first and second cleaning during which the component was exposed to normal room air. It can therefore be assumed that the powder remaining inside the part reacted with moisture from the surrounding air, which further complicated the depowdering process.
The depowdering process was carried out on the SFM-AT350-E with permanent ultrasonic excitation and without an option for a pneumatic vibrator or high frequent knocker. During the depowdering also a high impact blasting gun was used to additionally loosen the powder and to get even more powder out of the part.
During depowdering in automatic mode (swiveling angle 60°-220°, rotating and swiveling speed 10°/s with waiting times of 5 seconds in each position) a strong powder flow was detected. All in all the ultrasonic depowdering process of this Fractal Heat Exchanger on the Solukon SFM-AT350-E took 337 minutes. Despite pre-cleaning, more than 1.9 kg of stainless steel powder that had attached could be removed. The Heat Exchanger is now completely depowdered.

What is the result of this use case?

This use case clearly demonstrates that ultrasonic excitation can make a significant difference when dealing with narrow, long channels. Considerably more powder was removed compared to conventional pre-cleaning using vibration and knocking.
Ultrasonic cleaning with the SFM-AT350-E is another powerful tool in Solukon's comprehensive industrial depowdering toolbox. However, the choice of excitation method still heavily depends on the geometry of the part.

What conclusions does justairtech draw from the powder removal test?

Philipp Komurka,
Head of Product Development & Technology
Additive Components & Testing,
states:

„The powder removal test impressively confirmed that even powder that gets stuck in component areas that are extremely difficult to access - in our case over 1.9 kg - can be removed automatically. The comparison with the target weight of the heat exchanger shows that the test with Solukon was extremely successful and that the component is now free of powder. This not only provides us with the necessary process reliability, but also strengthens our confidence in the industrial series application of additively manufactured components"

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About Solukon

Solukon Maschinenbau GmbH is a German high-quality supplier of powder removal and processing systems for metal and polymer additive manufacturing. In 2015, Solukon presented the world's first system for automated depowdering. Founded by Andreas Hartmann and Dominik Schmid, the Augsburg-based company has extensive experience in the development of AM systems and related peripheral equipment, and offers a full range of industrial powder processing systems.
Since 2022, Solukon has also been offering the world's first and unique intelligent software for automated simulation and (pre-)calculation of the depowdering of laser-melted metal parts, the SPR-Pathfinder®. Solukon products meet the highest functionality and safety standards and are approved for safe and reliable removal of tough-to-handle and reactive materials such as titanium and aluminum. Solukon has established itself as the market leader in the field of industrial powder removal with its powder removal systems for metal.

About justairtech

justairtech GmbH is a Munich-based clean-tech startup specializing in sustainable cooling and heating. Their 3D-printed stainless steel components, their turbomachinery and a new system set-up enable highly efficient, eco-friendly cooling systems that outperform conventional solutions. By leveraging complex lattice structures made with powder bed fusion, they reduce energy use and enhance performance. justairtech focuses on design and R&D while partnering with AM specialists for production. Their innovations show how additive manufacturing can revolutionize sustainable HVAC technology.

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