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Depowdering of rocket parts: Stoke Space trusts in Solukon's SPR® technology

Building rapidly reusable rockets, Stoke Space designs and additively manufactures copper thrust chambers which present an exceptional depowdering challenge. This is why Stoke chose the Solukon SPR® depowdering technology having acquired an SFM-AT800-S.

Stoke Space is a U.S. space launch company located in Kent, Washington, building the world's most efficient fully and rapidly reusable rocket designed to fly daily. Stoke's rocket will radically increase access to space opening the space economy for new and innovative technologies on orbit.

Thrust chambers with complex inner structures

Both of Stoke's first and second stages are fully reusable. The second stage, usually thrown away in conventional space industry, is able to reenter Earth's atmosphere and land after deploying payloads in space. To enable rapidly reusable vehicles, both of Stoke's first and second stage engine thrust chambers are additively designed and manufactured in-house. These thrust chambers feature regenerative cooling channels and built in manifolds. These features and internal cavities are typically difficult to depowder. This is where Solukon's depowdering technology comes into play with the SFM-AT800-S.

SFM-AT800-S in spotlight: the system for the biggest powder removal challenges

The SFM-AT800-S is Solukon's flagship machine for tough depowdering challenges and is the most widely used automated powder removal system in the additive manufacturing industry. The SFM-AT800-S can handle metal parts with maximum dimensions of 600 x 600 x 600 mm (alternatively: 800 x 400 x 550) weighing up to 300 kg. Based on the unique Solukon Smart Powder Recuperation technology SPR®, the SFM-AT800-S uses targeted vibration and unlimited 2-axis rotation in a protected atmosphere to get unfused powder out of metal laser melted parts fully automatically.

High frequency knocker for copper applications

Stoke additively prints their thrust chambers using a special copper alloy with a high conductivity to enable maximum reusability. Copper powder however makes complete powder removal more challenging due to its tendency to stick and clump within the tight



regen channels. Stoke uses a high frequency knocker provided as an add-on in the Solukon system to loosen trapped copper powder bulks from internal channels of the parts. Stoke also applies an ultrasonic vibration system to enhance the flow of the copper powder, which is directly connected to the component.

For complex geometries there's another way to optimize depowdering even further – by analyzing the CAD file of the part. The unique Solukon depowdering software SPR-Pathfinder® does so: It works with a digital twin of the part and calculates the motion pattern for the Solukon system automatically to get the powder out of the complex structures. "SPR-Pathfinder® is a convenient tool to optimize the depowdering before it even started," said Andreas Hartmann, CEO and CTO of Solukon.

Solukon is the proud depowdering partner of choice for Stoke. "We chose Solukon for their industry leading capability in automating depowdering of complex parts," said Zach Sander, Head of Engine and Fluid Systems at Stoke Space. "Regeneratively cooled rocket engine thrust chambers are notoriously difficult to depowder, and we wanted to ensure we had a robust machine to reliably depowder these difficult copper components."

Images:

Image 1: The Stoke rocket consists of two fully reusable stages.

Image 2: The SFM-AT800-S at the Stoke facility.

Image 3: Stoke Triebwerk Hot-Fire-Test. Quelle: Stoke

About Solukon

Solukon Maschinenbau GmbH is a German high-quality supplier of powder removal and processing systems for metal and polymer additive manufacturing. Founded in 2015 by Andreas Hartmann and Dominik Schmid, the company, located in Augsburg, 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 offers an intelligent software for automated depowdering of laser-melted metal parts as exclusive licensee, 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 is present on four continents. The systems are trusted by leading manufactures of 3D-printing systems, like EOS, SLM Solutions and AMCM, by institutions like NASA and Cern as well as by companies like Siemens and Ariane Group.

Solukon Maschinenbau GmbH

Contact Marketing/PR: Marina Haugg, Head of Marketing & PR
Email: marketing@solukon.de
Web: www.solukon.de