

aidro
Desktop Metal Company

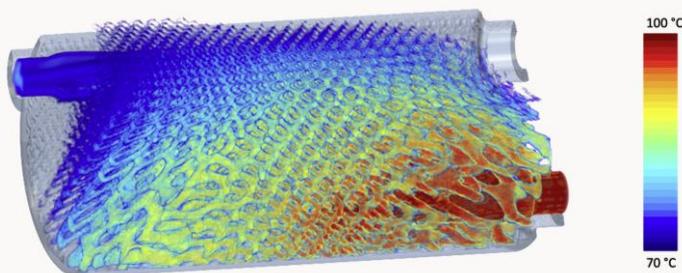
Challenges

- Validation of a new production methodology
- Reducing production time and cost

Project duration: 9 months

Industrial sectors: Manufacturing, Aerospace

Consortium coverage: Italy, UK, Austria



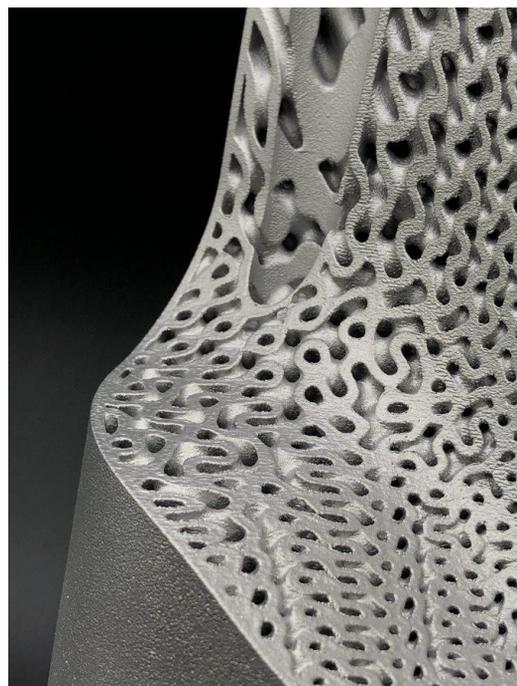
Aidro is an Italian high-tech company specialised in the design and manufacturing of hydraulic components and metal devices. Founded 40 years ago as an engineering and manufacturing company for Fluid Power solutions – such as hydraulic valves and manifolds and heat exchangers, the company has developed itself to incorporate new technologies, such as Additive Manufacturing, in their production capabilities. Following the initial adoption of 3D Metal Printing in 2017, Aidro continues to innovate with the application of this technology. In 2021, Aidro joined the Desktop Metal group.

The Challenge

A Heat Exchanger is a thermal device made of metal, used to transfer heat between two fluids separated by a solid wall to prevent the fluids from mixing. Heat Exchangers are key components in many industrial sectors, such as the aerospace and oil and gas industries. As an alternative to the more standard shell-and-tube or plate-fin solutions, Additive Manufacturing provides to opportunity to redesign Heat Exchangers, by using more complex shapes on the internal surface for better thermal exchange, reduced pressure loss, reducing weight but increasing the available surface area, fast prototyping with a high degree of customisation for small series production, and easier maintenance or replacement of the exchanger.

The Project

The 3DHX (3D Printed Smart Heat Exchanger) project aims to develop, test and validate a new Additive Manufacturing design and production workflow, a 'smart' innovative methodology for the production of metal Heat Exchangers which result in a reduction of time and costs associated with the manufacturing processes. Current design tools which are available on the market do not allow for the design process, a time-costly undertaking, to be sped up. Within the project, three objectives were set; to speed up and automate the design workflow while increasing the performance of the device, to test multiple metals and evaluate their manufacturability through 3D printing, and finally, to test a patented electromechanical surface finishing technique for the cleaning and smoothing of the internal surfaces.





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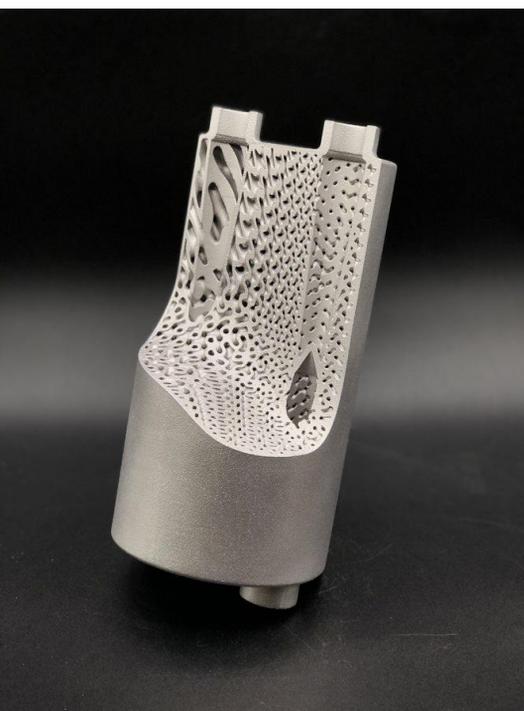
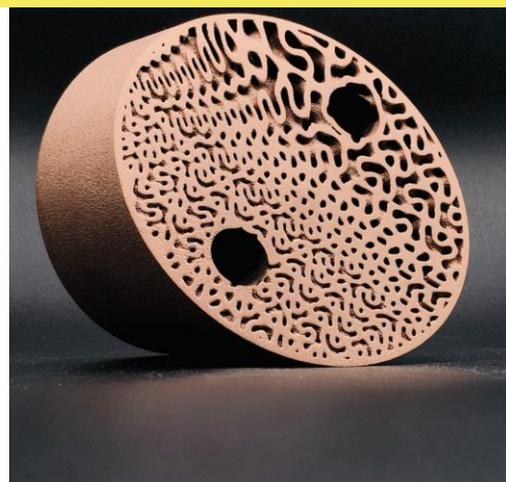
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Role of the Facility Centres

For the implementation of the 3DHX project, Aidro partnered up with Optimad Engineering based in Italy, 3T Additive Manufacturing based in the United Kingdom, and RENA Technologies based in Austria. Optimad Engineering is an engineering company in the field of software for fluid dynamics analysis, design and optimisation. With experience in modelling and simulating complex physical phenomena in several industrial sectors, they have developed their own software library dedicated to geometric parameterisation and deformation of surfaces and volume meshes. A variable frequency gyroid surface has been designed and modelled to improve the thermal fluid-dynamic behaviour of the device.

3T Additive Manufacturing is a market leading additive manufacturing production company, providing 3D Printing services for customers in a range of industrial sectors. 3T Additive

Manufacturing supported Aidro through the delivery of metal prototypes and sample Heat Exchanger, based on the Aidro component specifications. RENA Technologies is a global leader in the production of machinery for wet chemical surface treatment. With this expertise, they were responsible for the cleaning of residual powder on the surface structure inside the internal channels of the Heat Exchanger, as well as the roughness reduction of the internal surfaces.



Results achieved

3DHX allowed Aidro to acquire new and specific competences for the design, manufacturing and post-finishing of Heat Exchangers through Additive Manufacturing processes, proving the technical and economical sustainability of the solution proposed. The project also allowed Aidro to work towards the market introduction of a new Heat Exchanger, designed using the new methodology which was tested in 3DHX. The successful implementation of the 3DHX project by Aidro also served as a starting point for a follow-up R&D&I project; TOLOMHE (Topology Optimization of Micro-channel Heat Exchangers), co-funded by FF4EuroHPC – a project subsequently funded under the European High-Performance Computing Joint Undertaking. Within this project, Aidro is partnering with Optimad Engineering and CINECA, to integrate a set of computational tools in an HPC-centric framework for the topology optimisation of Micro Channel Heat Exchangers. Thus building on the results achieved and insights gained through the 3DHX project funded by 3DP PAN EU.