

ADDITIVE **M**ANUFACTURING Fluid Power Solutions



we create for you



New Technology

Additive Manufacturing in hydraulics

Aidro, an Italian hydraulic systems developer, has incorporated Additive Manufacturing (or Metal 3D Printing) into its manufacturing processes, to create a new generation of hydraulic solutions and to overcome the limits of conventional hydraulic components.

This new technology allows to produce fast prototypes and spare parts, functional products with the following advantages:

- lightweight and space saving
- complex geometries at no extra cost
- better performances thanks to the optimization of the internal channels, curved shapes and elimination of 90° intersection angles, absence of auxiliary caps and plugs
- fast lead time

Additive Manufacturing starts from metal powder particles that are melted using a high power laser in sequential ultra-thin layers, creating functional hydraulic 3D parts.



from
Traditional production



to
Metal 3D printing

3D metal printing

Activities

Design

new hydraulic products with complex geometries and re-design of traditional hydraulic parts to reduce weight, space saving, consolidate multiple parts into one. Dedicated softwares, FEM, fatigue analysis and stress test.

Production

with our metal 3D printer machines, a wide range of high quality metals is available such as Stainless Steel, Aluminum, Inconel, Maraging steel.

Testing

on material properties, pressure resistance, mechanical and micro-structural properties, functional test, NDT.

Measurement

dimensional control by 3D scan and reverse engineering.

Fast Prototyping

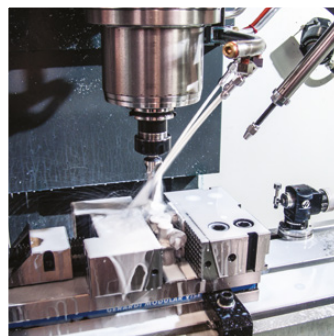
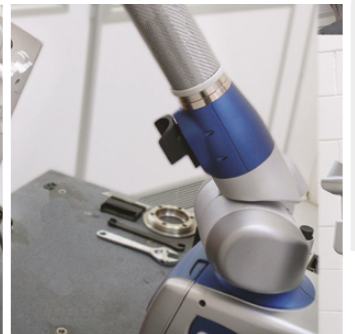
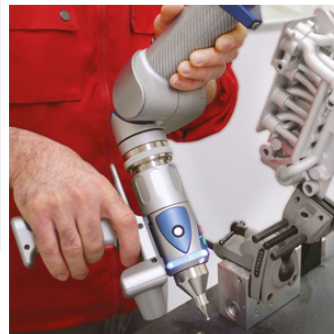
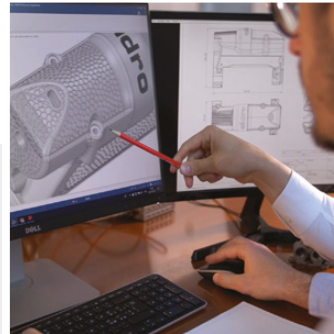
with metal 3D printing the lead time is short, as 1-2 weeks. Compared to casting mold, a 3D printed prototype is more convenient in term of cost and timing.

Post Treatments

heat treatment of 3D metal printed parts, surface finishing.

CNC finishing

with our flexible vertical machining center, we provide the machining of cavities, surfaces and parts of the 3D printed products that require a finishing.



hydraulic solutions



Solutions Center for

Additive Manufacturing in hydraulics



Aidro has established a Solutions Center for Additive Manufacturing in Hydraulics enabling AM specialists to design new hydraulic components and bring them to life with metal 3D printing technology.

Aidro has chosen the laser power bed fusion technology (LPBF, DMLS or SLM), which guarantees a high quality of metal materials and very good mechanical properties of the printed parts. The Solution Center oversees the entire process, from design to production and testing.

Finite Element Method (FEM) analysis is conducted, as well stress tests. Functional tests and mechanical properties analysis are done, as well as fatigue test, NDT on request.

Research and tests in collaboration with



POLITECNICO
MILANO 1863

In order to produce a 3D printed hydraulic solution, Aidro offers a wide range of high quality metal powders:

Stainless steel (AISI316L)

is characterized by having good corrosion resistance and mechanical properties. This is widely used for hydraulic special applications, such as oil&gas, off-shore and marine.

Aluminum (AlSi10Mg, F357)

offers good strength, hardness and dynamic properties and it is also used for parts subject to high loads. It is ideal for applications that require good thermal properties and reduced weight.

Maraging Steel

is known for possessing superior strength and toughness without losing malleability. The hydraulic parts made from this steel are easily machinable after the 3D printing process.

Inconel (625, 718)

is a heat and corrosion resistant nickel alloy characterized by having high tensile, creep and rupture strength. Components in this type of nickel alloy have typically excellent fatigue and thermal-fatigue values.

3D metal printing

3D Printed Products

Hydraulic Valve Block

- weight reduction
- space saving
- high customization



Heat Exchanger

- high performances in small size
- possibility to combine multiple parts into one
- integration of functions



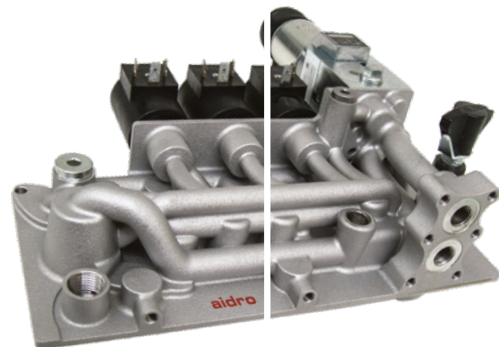
Hydraulic Spool

- feasibility of geometric forms impossible with traditional machining
- ability to combine multiple parts into one
- better performance than the traditional manufacturing



High Pressure Hydraulic Manifold

- good mechanical properties
- performances optimization
- curved internal channels
- absence of auxiliary caps and plugs



Function Integration

- sensors of temperature and pressure are integrated into the 3d printed manifold
- predictive maintenance is allowed thanks to sensors
- reduced size



hydraulic solutions

LIGHTWEIGHT HYDRAULIC MANIFOLD

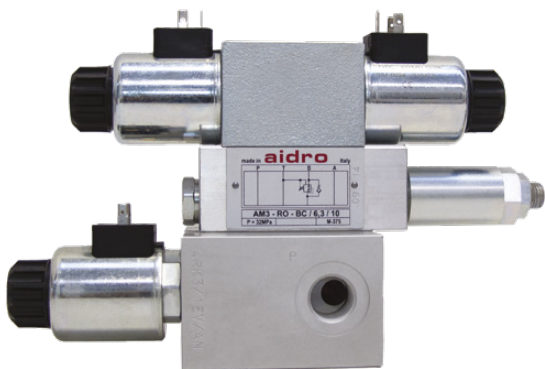
We have designed an innovative hydraulic block for mobile application and the jury of Additive Conference has nominated it the Winner of the Additive World Challenge 2018.

The redesign hydraulic manifold consolidated two parts into one, it is smaller than its predecessor, and has an optimized flow because of improved, curved channels. Moreover, the problem of leakage, caused by auxiliary plug failure, is eliminated and the weight is reduced by an impressive 70%.



3D printing advantages:

- Possible better performance than the traditional manufacturing
- Ability to combine multiple parts into one
- 70% weight reduction
- 30% size dimension



from
Traditional production

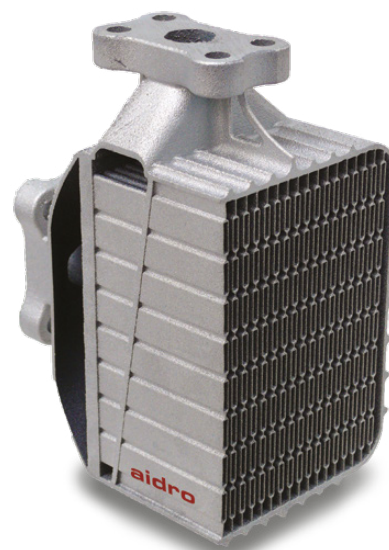
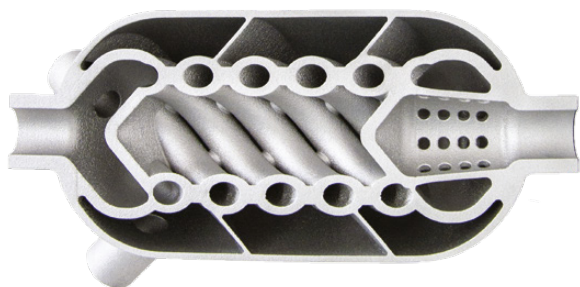


to
Metal 3D printing

HEAT EXCHANGER

Additive manufacturing is suitable for the re-design and production of Heat Exchanger. In the photos there are two examples of water-oil heat exchangers made with Additive Manufacturing in Aluminum (AlSi10Mg).

The main advantages are the weight reduction and the compactness compared to the traditional heat exchanger. With Additive Manufacturing it is possible to improve the performance thanks to innovative shapes.



3D printing advantages:

- High performances in small size
- Possibility to combine multiple parts into one
- 1/5 size dimension
- 85% weight reduction



from
Traditional production
10,8kg

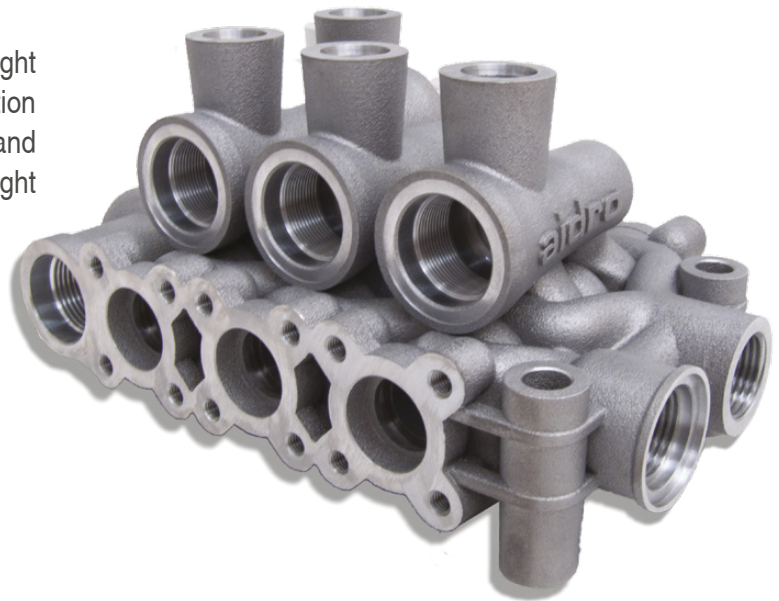
to
Metal 3D printing
1,5kg

COMBO HYDRAULIC MANIFOLD

This 3D printed Hydraulic Manifold is the combination of hydraulic block and the tree valves on the top.

Whit Additive Manufacturing is possible to combine multiple parts into one.

Compared to the conventional manifold the weight reduction is 90% for the complete 3D printed solution while the solution with conventional manifold and 3D printed valves (in the picture 2) the weight reduction is 15%



3D printing advantages:

- Combining multiple parts into one
- Lightweight solutions



conventional hydraulic manifold



conventional hydraulic manifold with
3d printed valves



3d printed hydraulic manifold and
valves (single piece)

HYDRAULIC SPOOL

This spool has been redesigned in order to be 3D printed with new holes forms, such as oval holes and square holes.

These shapes are impractical with traditional manufacturing, in particularly with CNC machining, while with additive manufacturing complex geometries are now feasible.

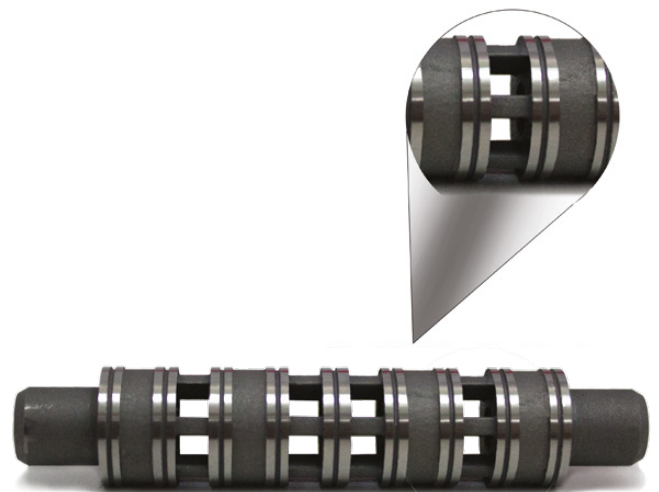
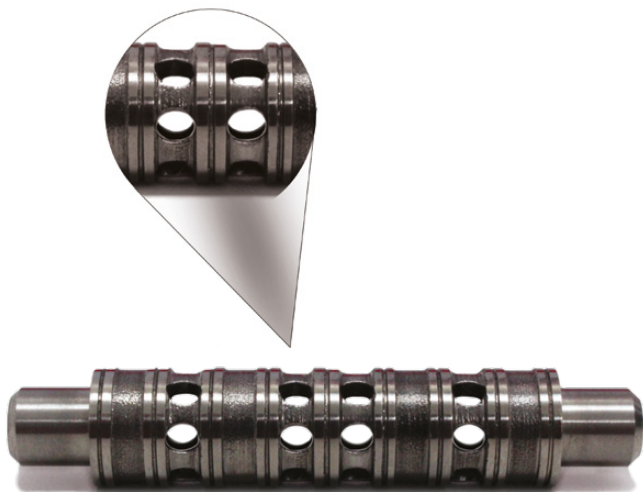
Indeed, with the new holes forms, the idea is to increase the passing area of oil inside the spool, allowing lower pressure drop. Therefore, the new design with additive manufacturing offers an higher performance.

Moreover, with the ability to build complex geometries, we have consolidated more components into one piece and our 3D printed spool is one single part. This allows to simplify the manufacturing process and reduce assembly time.



3D printing advantages:

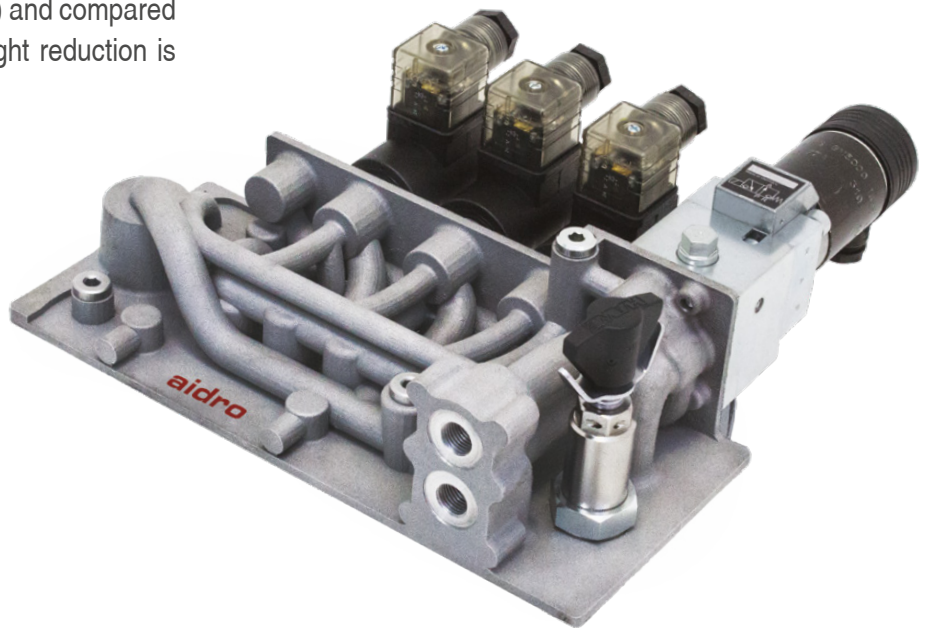
- Feasibility of geometric forms impossible with traditional machine
- Ability to combine multiple parts into one
- Possible better performance than the traditional manufacturing



HIGH PRESSURE HYDRAULIC MANIFOLD

This 3D printed Hydraulic Manifold is designed for high pressure (700 bar).

The material is Aluminum (AlSi10Mg) and compared to the conventional manifold the weight reduction is 75%.

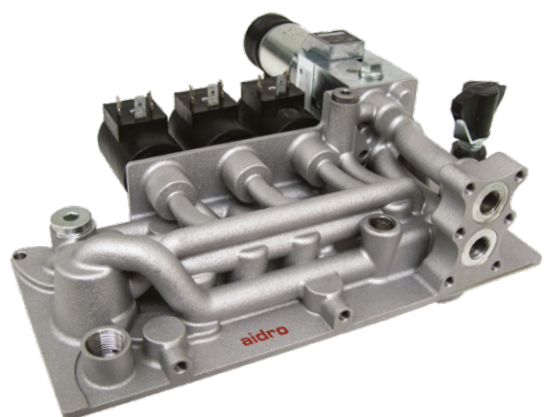


3D printing advantages:

- Optimized performances, thanks to curved channels and no more 90 degrees intersection angles
- Good material properties (similar to metal bars)
- Lightweight solutions
- High pressure resistance (700 bar)



from
Traditional production
5 kg



to
Metal 3D printing
1,3 kg

BANKABLE HYDRAULIC MANIFOLD

With metal 3D printing the manifold can be multiplied providing more functionalities.

The modular conception of valves allows to easy tailor the blocks to specific requirements.



3D printing advantages:

- Feasibility of geometric forms impossible with traditional machine
- Possible better performance than the traditional manufacturing
- Ability to combine multiple parts into one
- 75% weight reduction
- 1/2 size dimension



from
Traditional production



to
Metal 3D printing

aidro

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3D metal printing hydraulic solutions