IVS
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VALVE campus
THE VALVE INDUSTRY THINK TANK

IVS 2019 - Industrial Valve Summit Conference
Bergamo (Italy) - May 22/23, 2019

Additive Manufacturing in Oil&Gas Industries

VALERIA TIRELLI
(CEO)
AIDRO Hydraulics & 3D Printing

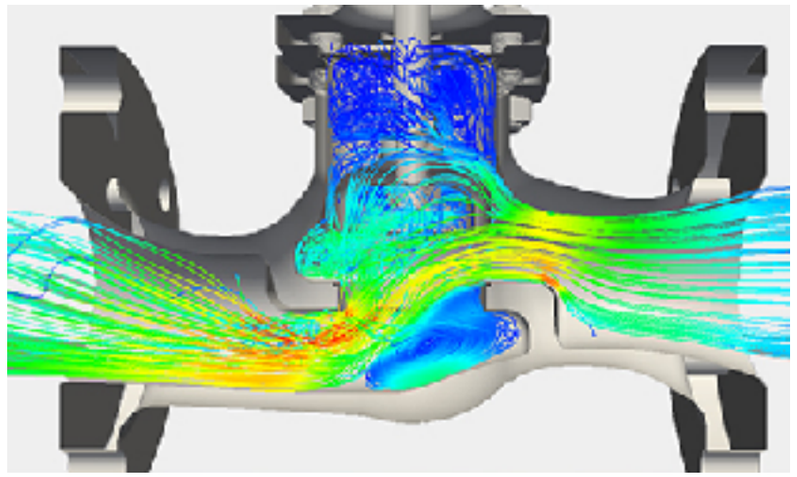
Who is Aidro?

aidro
hydraulics & 3D printing

Headquarters
in Italy
Taino (Varese)

Who is Aidro?

Leading SME in Hydraulics



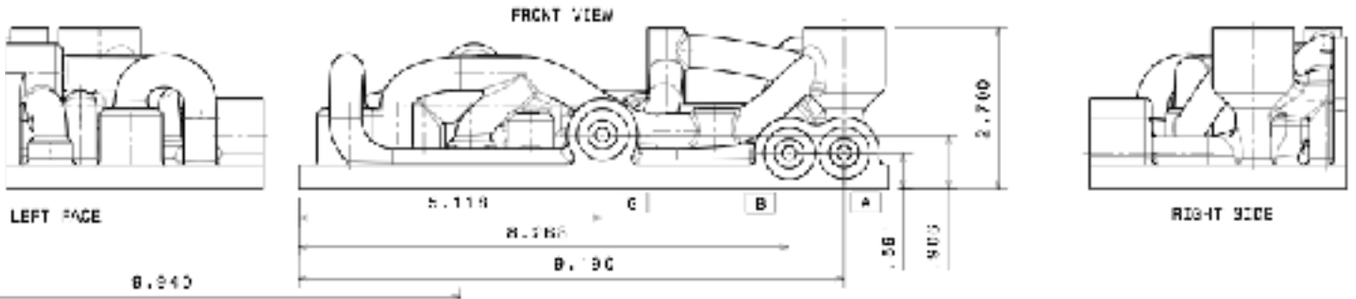
Almost 40 years of technical expertise

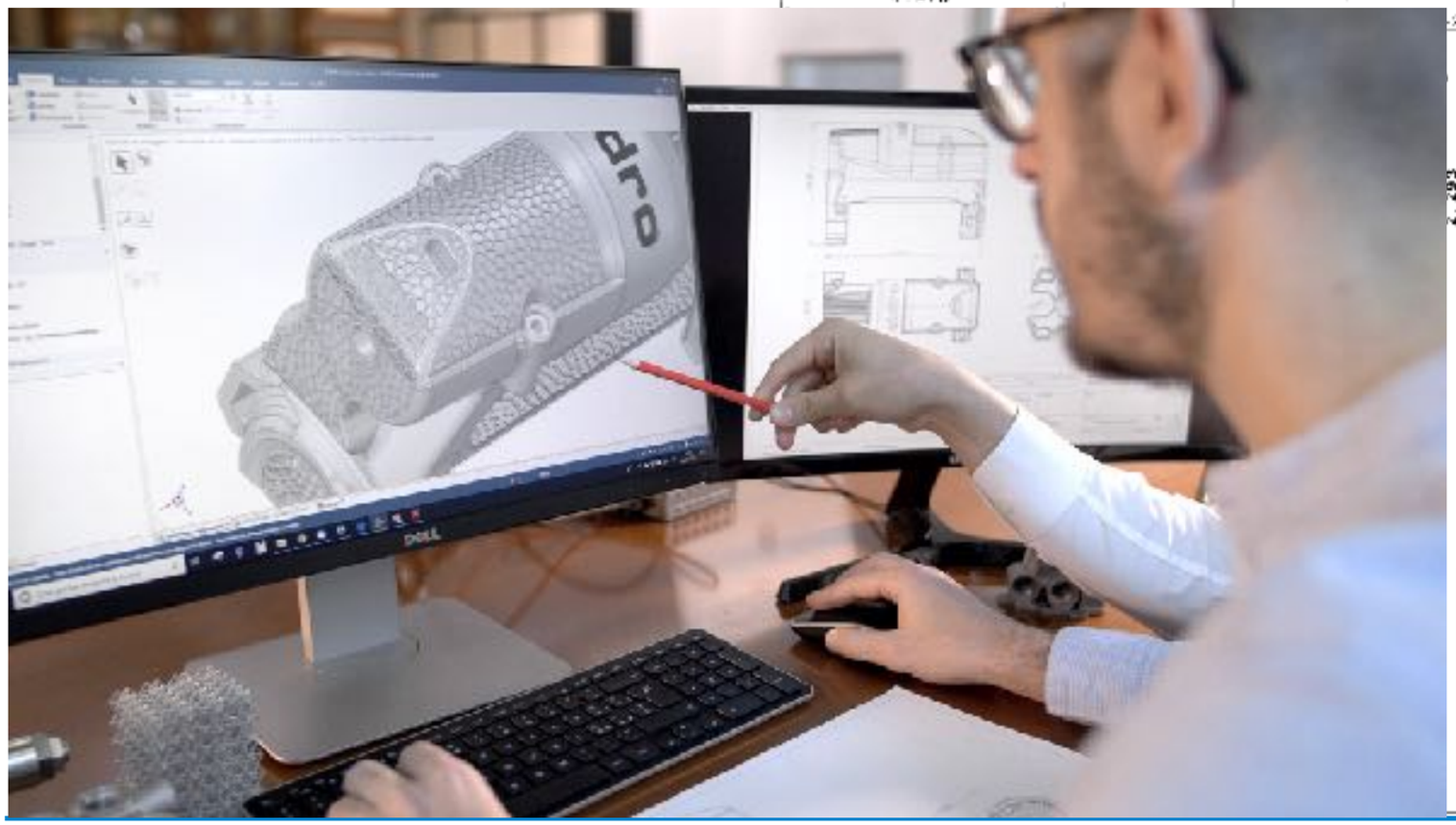
Design and Production with Additive Manufacturing for metal parts

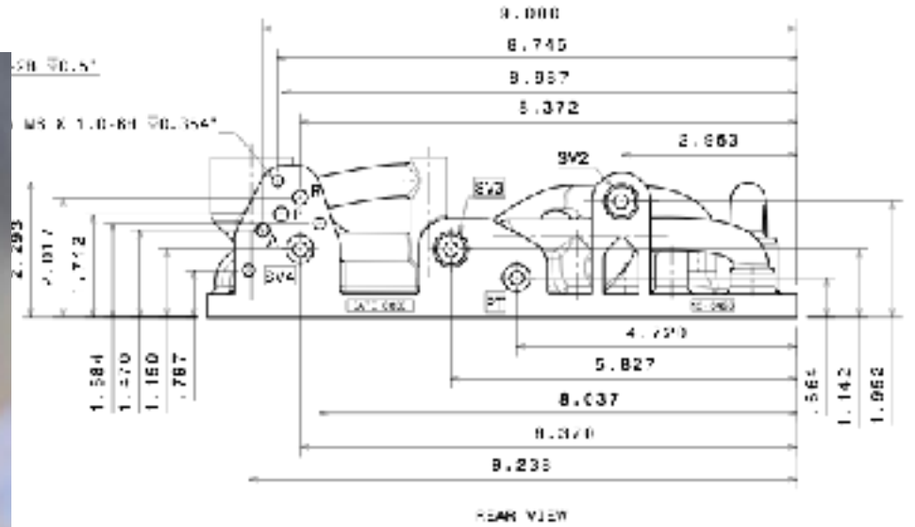
QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = AS/EN/JISQ 9100

Core Business and main activities

- Engineering and design
- Custom-made products

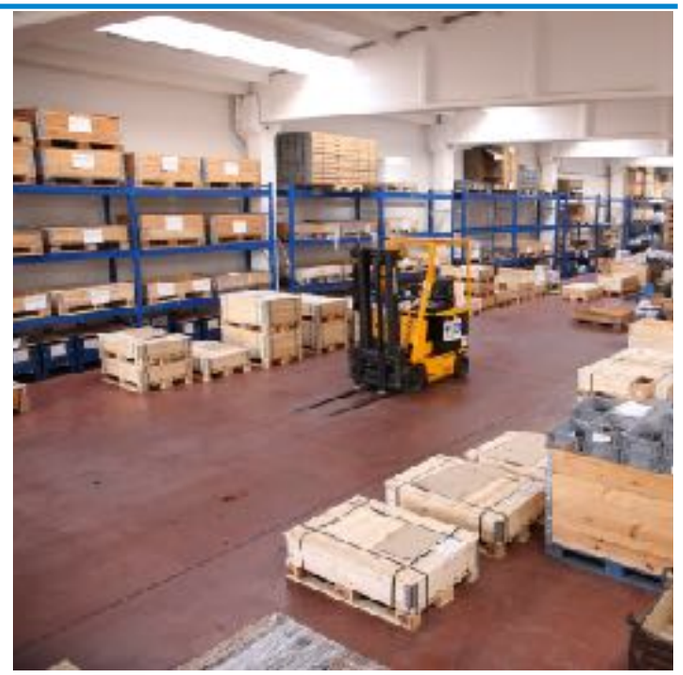


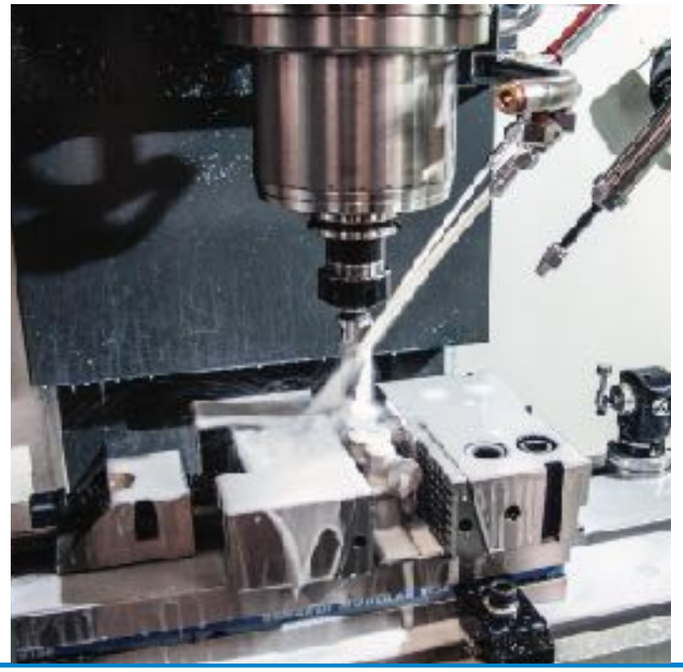




Core Business and main activities

- Production and assembly
- Metal 3D Printing and machining
- Testing 100% and Fast Delivery
- Quality System Management





Additive Manufacturing

a new way to allow ideas to come true
and
to find a solution to the problems

Additive Manufacturing

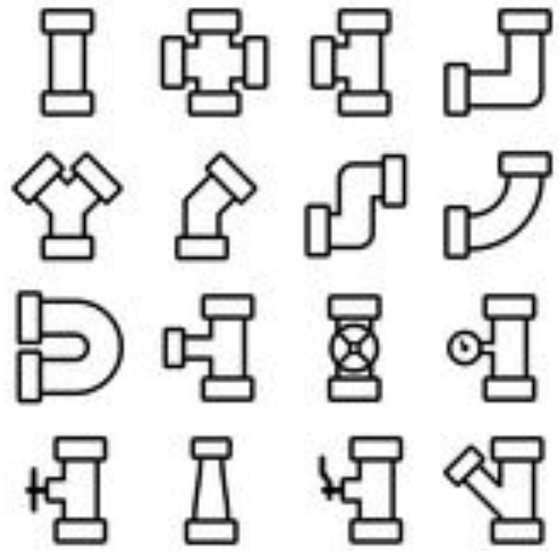
Technology
Laser Powder Bed Fusion

- Stainless Steel
- Titanium
- Inconel
- Aluminum

Advantage: Accelerate R&D

Fast Prototyping

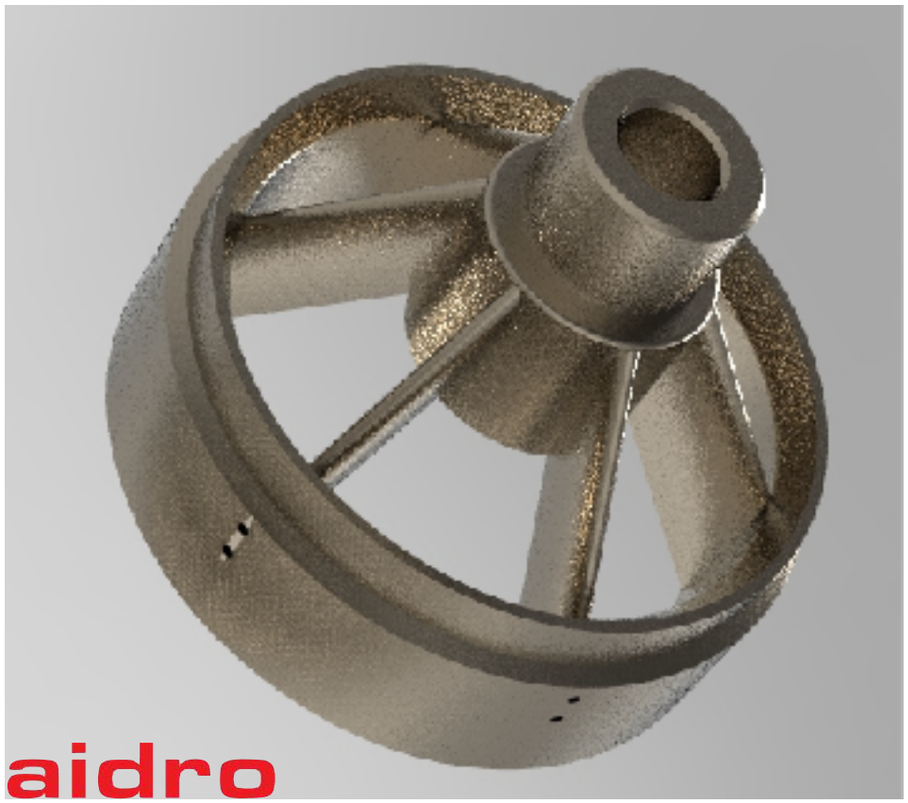
Multiple versions



Advantage: Fast delivery of spare parts

- On-demand production
- Short lead-time
- Reduction of parts in the stock
- Reduction of costs
- Possibility to repair old systems

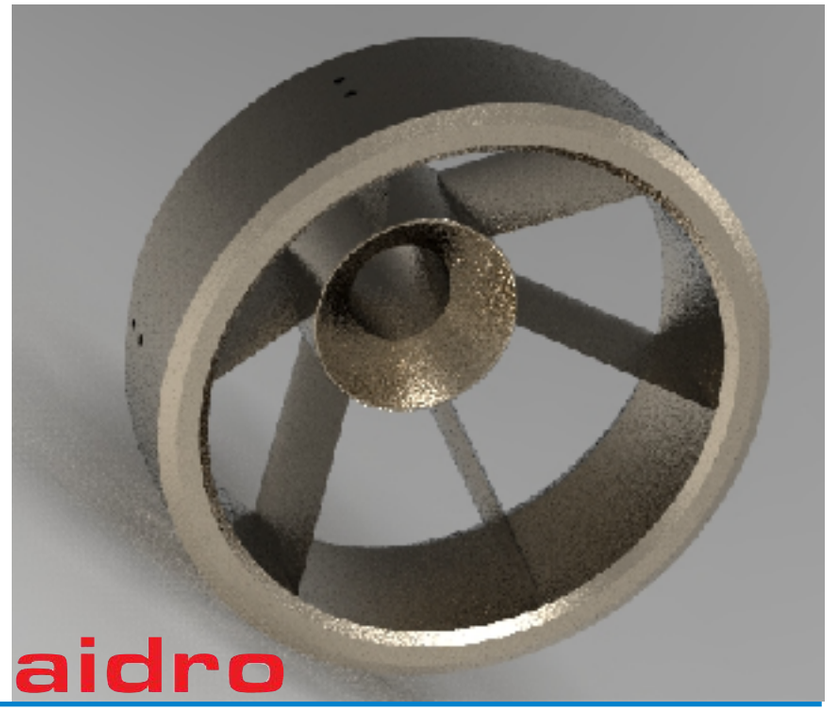
Advantage: Design Optimization



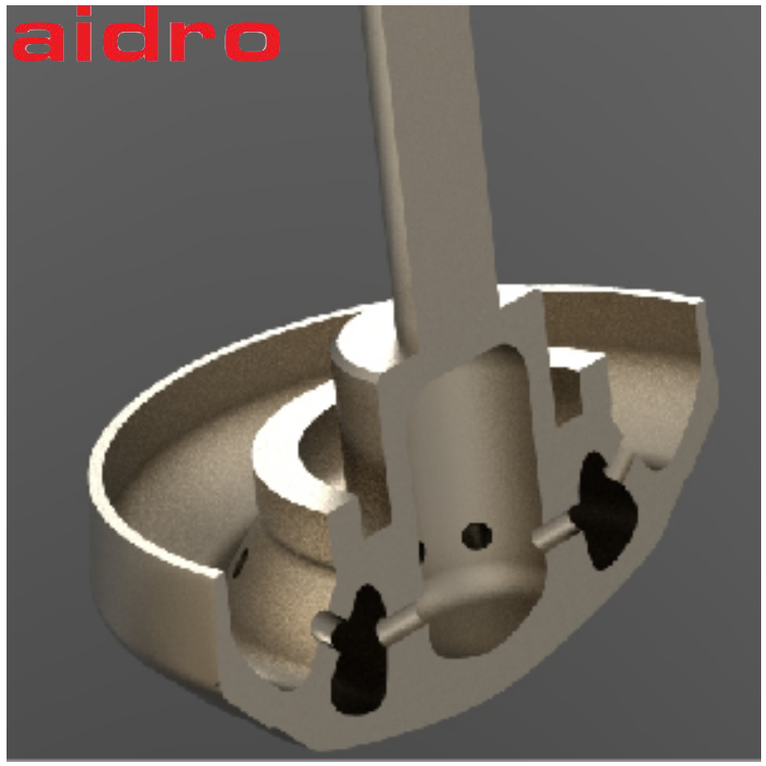
it is possible to design and produce optimized parts with :

- weight reduction
- same strength and ductility

Lightweight



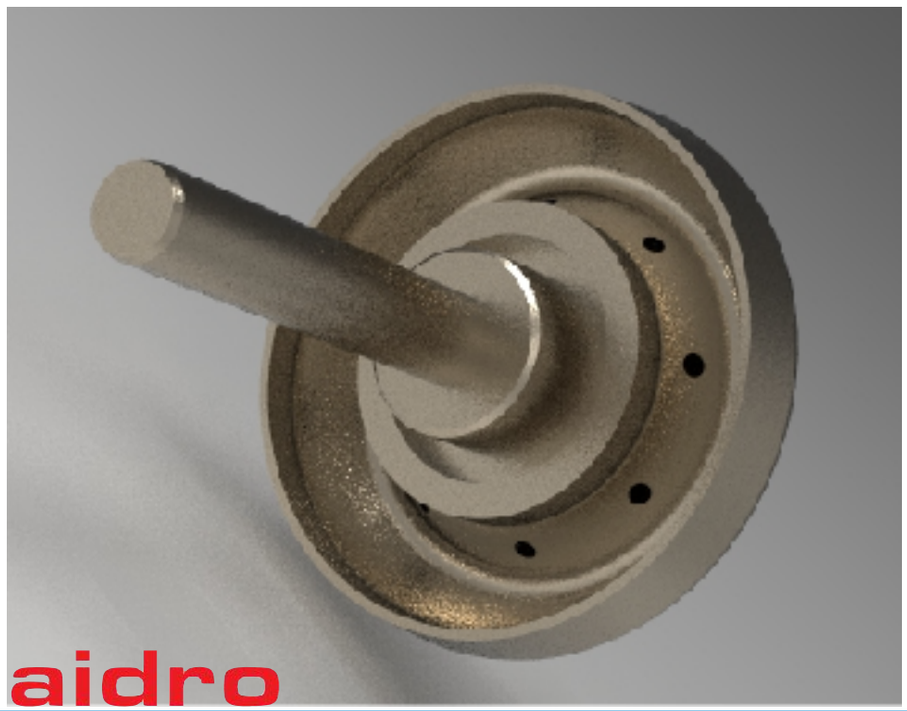
Advantage: Design Optimization



it is possible to design and produce optimized parts with:

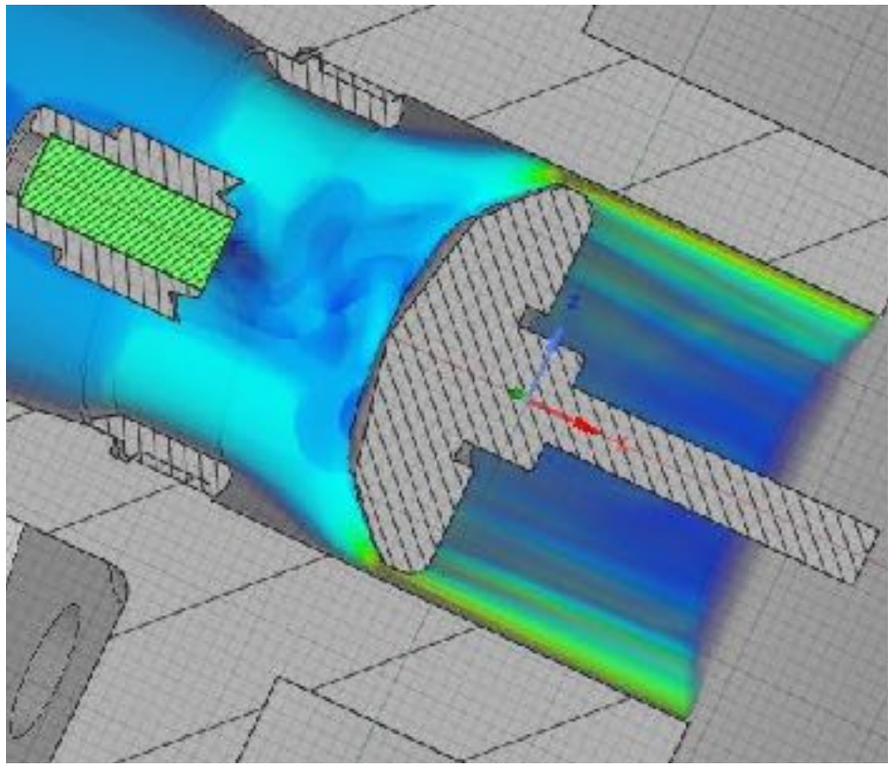
- improved efficiency
- higher performances
- better chemical conversion ratios

Improved Flow

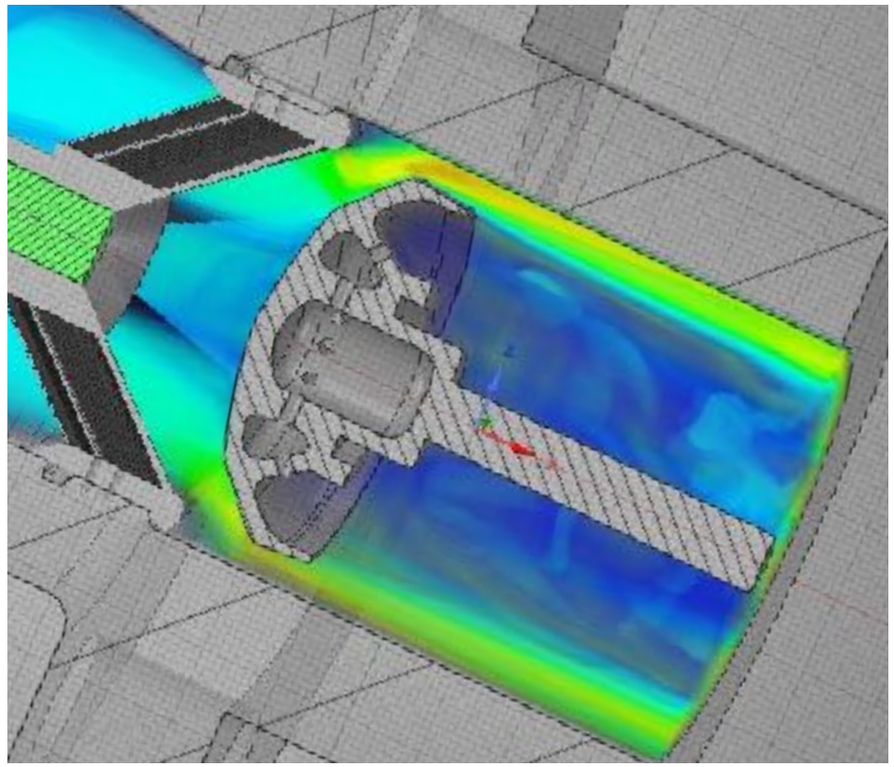


Comparison of Traditional Flow vs Optimized Flow

Traditional Production



Additive Manufacturing

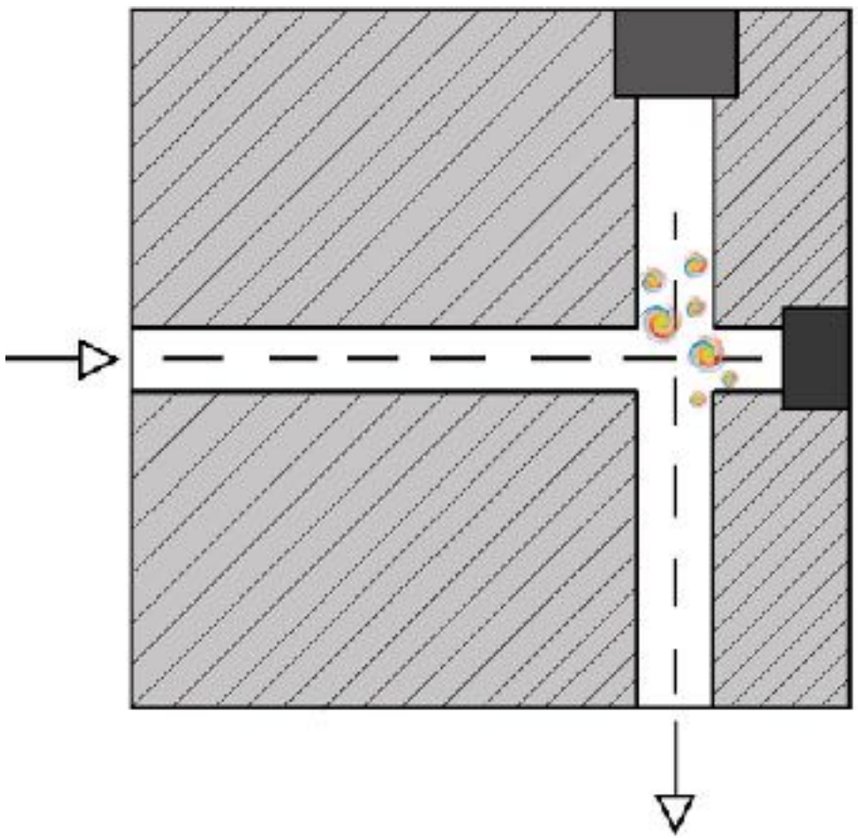


Reduction of pressure drops of 50%

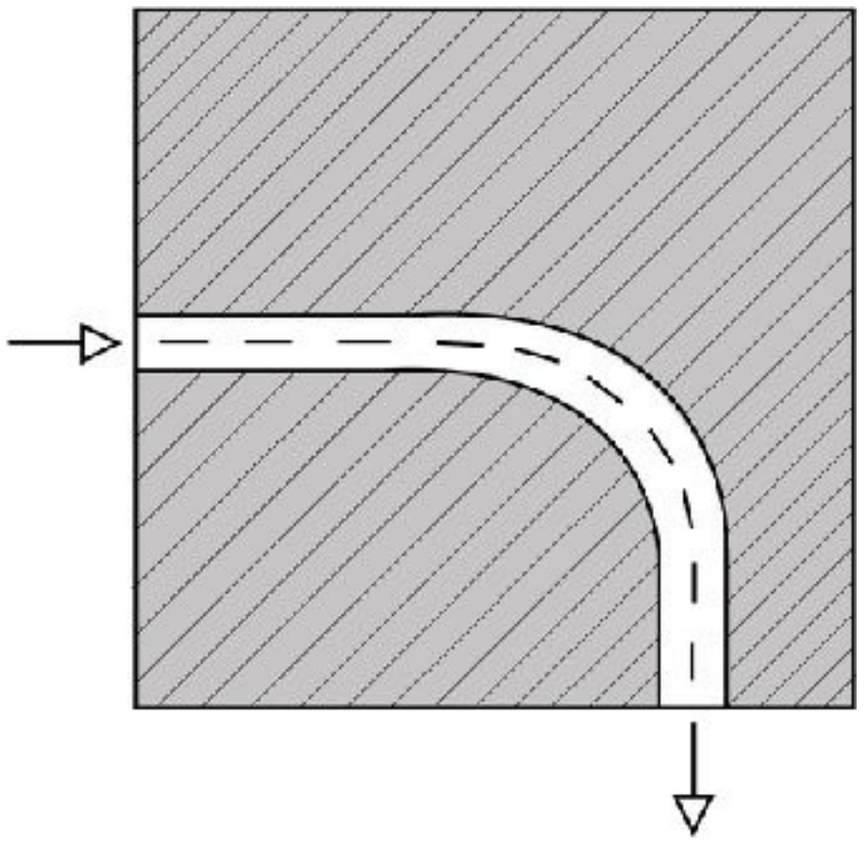
Weight reduction of 35%

Advantage: Flow Improvement

Traditional Production



Additive Manufacturing



AM allows to avoid 90 degrees intersection angles, eliminates the risk of potential leakages from auxiliary caps and plugs, reduces pressure drops

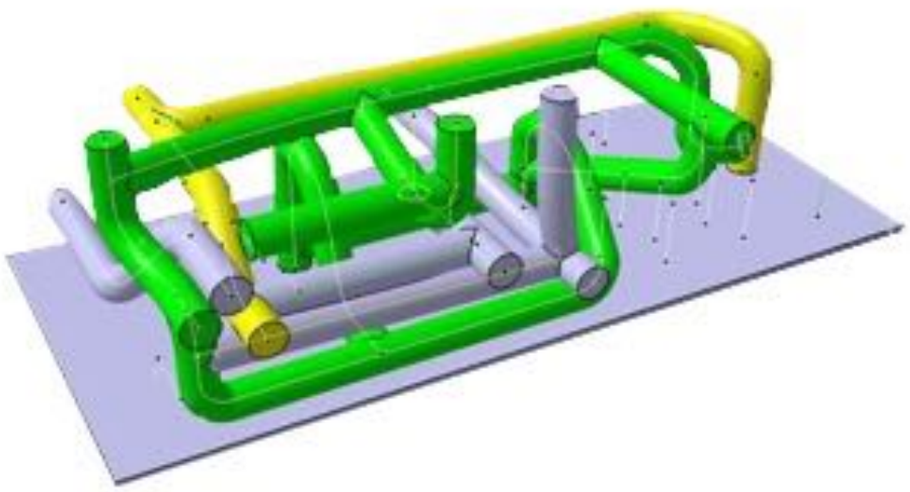
Advantage: New Approach to the Design

…thinking outside the box

Advantage: New Approach to the Design

1°step

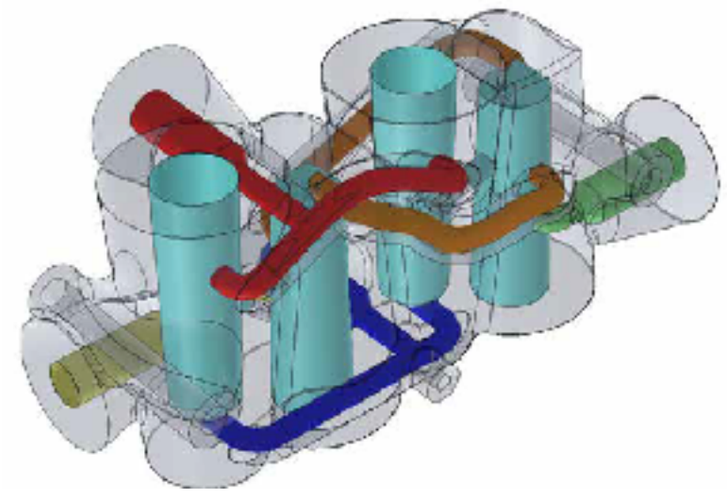
create piping and channels



internal connections

2°step

add material only where it is needed



cavities and ports

AM allows a different way to design the parts: starting from the function's needs, the piping and channels are freely designed and the material is added only where necessary

Example of Lightweight Manifold

FROM THIS

TO THIS

5 Kg

Traditional manufacturing

-75% weight

1,3 Kg

Additive Manufacturing

Example of Improved Performance Flow Manifold

FROM THIS

Traditional manufacturing

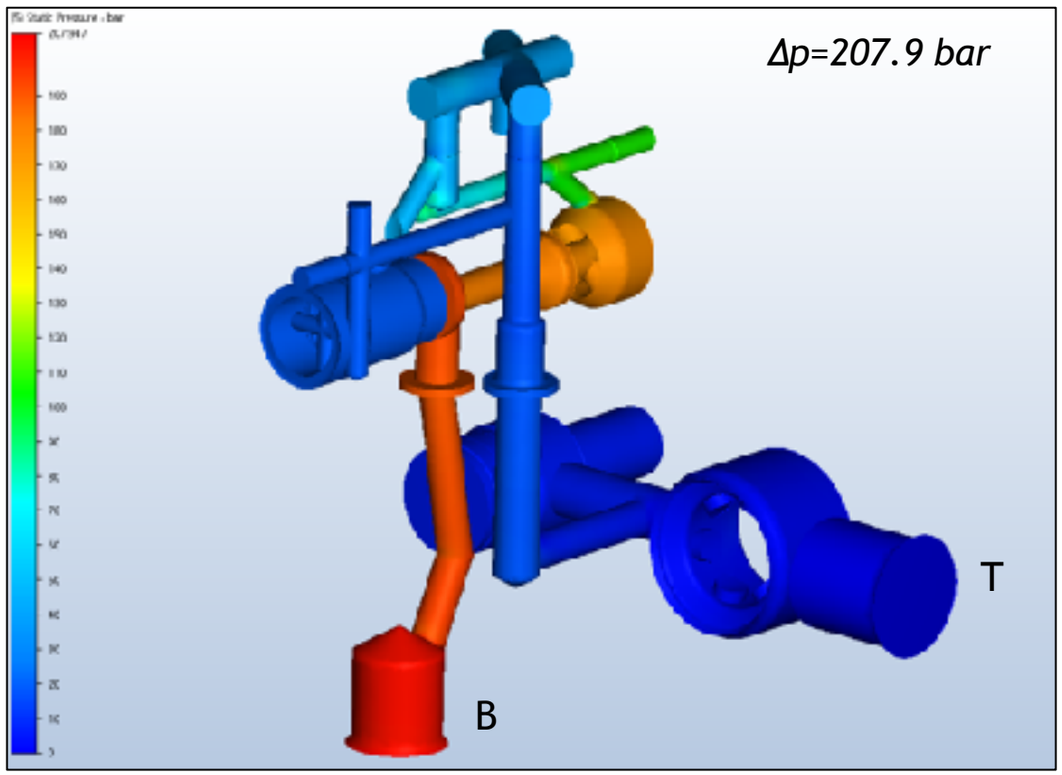
TO THIS

Additive Manufacturing

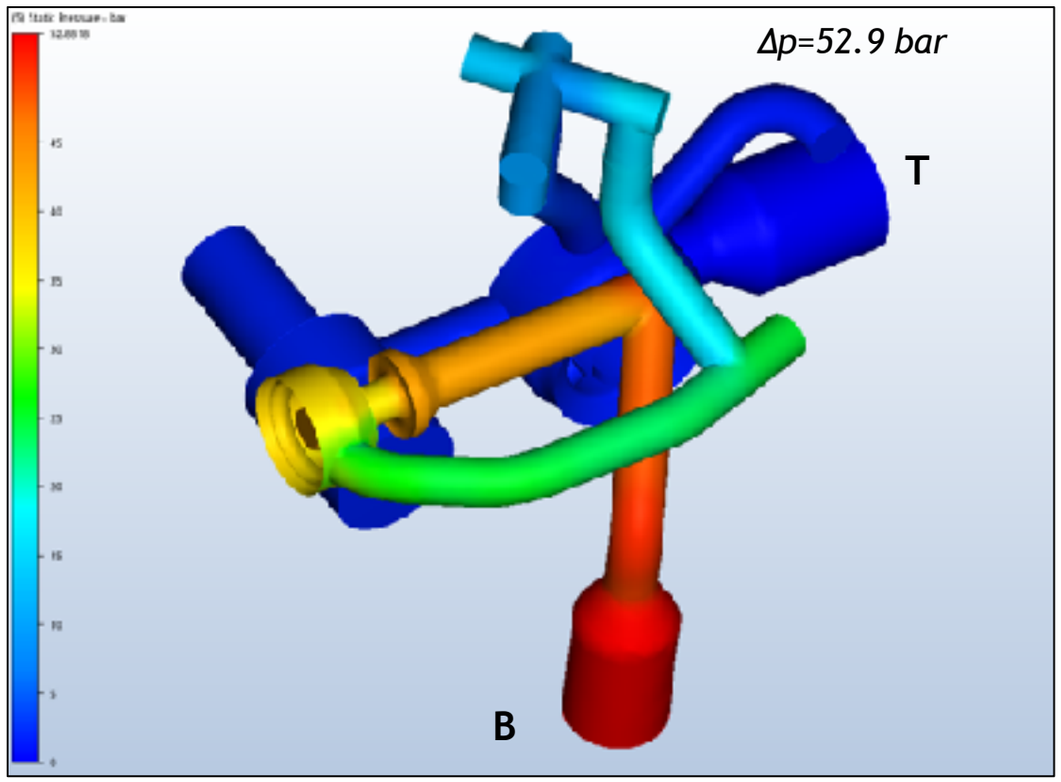
Example of Improved Performance Flow Manifold

research made in collaboration with UNIMORE UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Pressure Drop B vs T



Traditional manufacturing



Additive Manufacturing

Example of Heat Exchanger

FROM THIS

TO THIS

5 Kg

Traditional manufacturing

-85% weight
1/5 size dimension

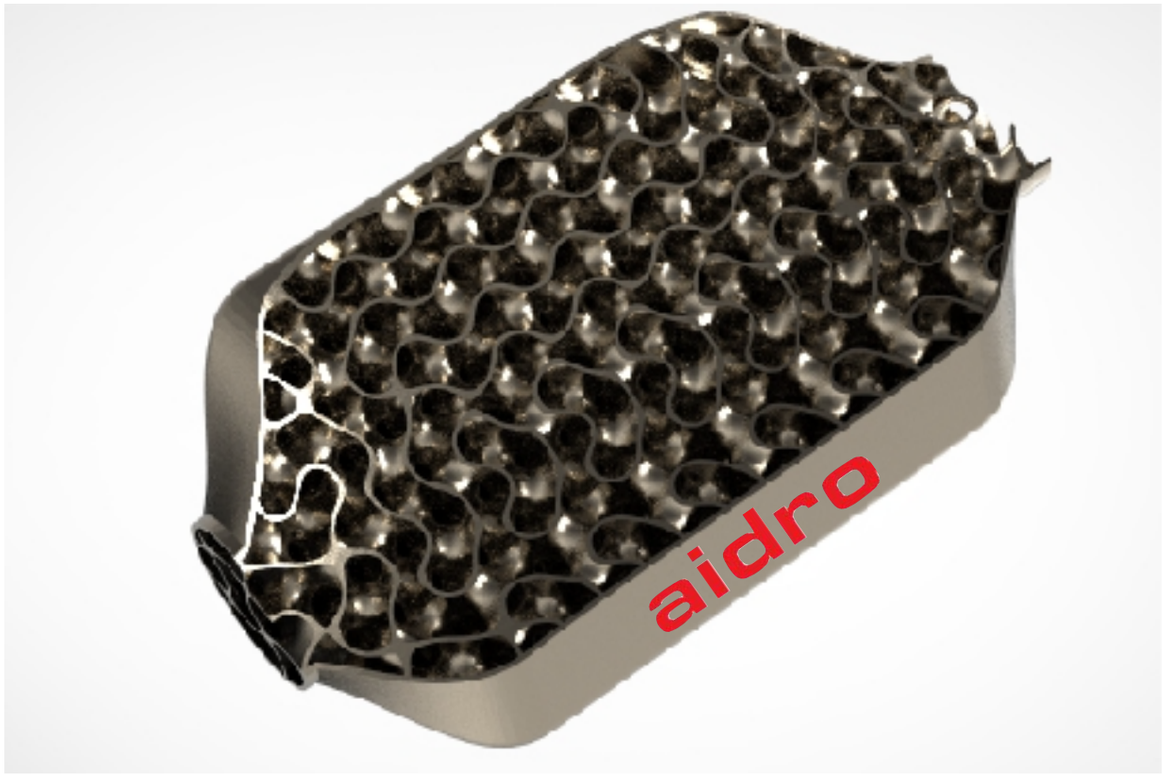
1,5 Kg

Additive Manufacturing

Example of Heat Exchanger

internal structure made with Additive Manufacturing

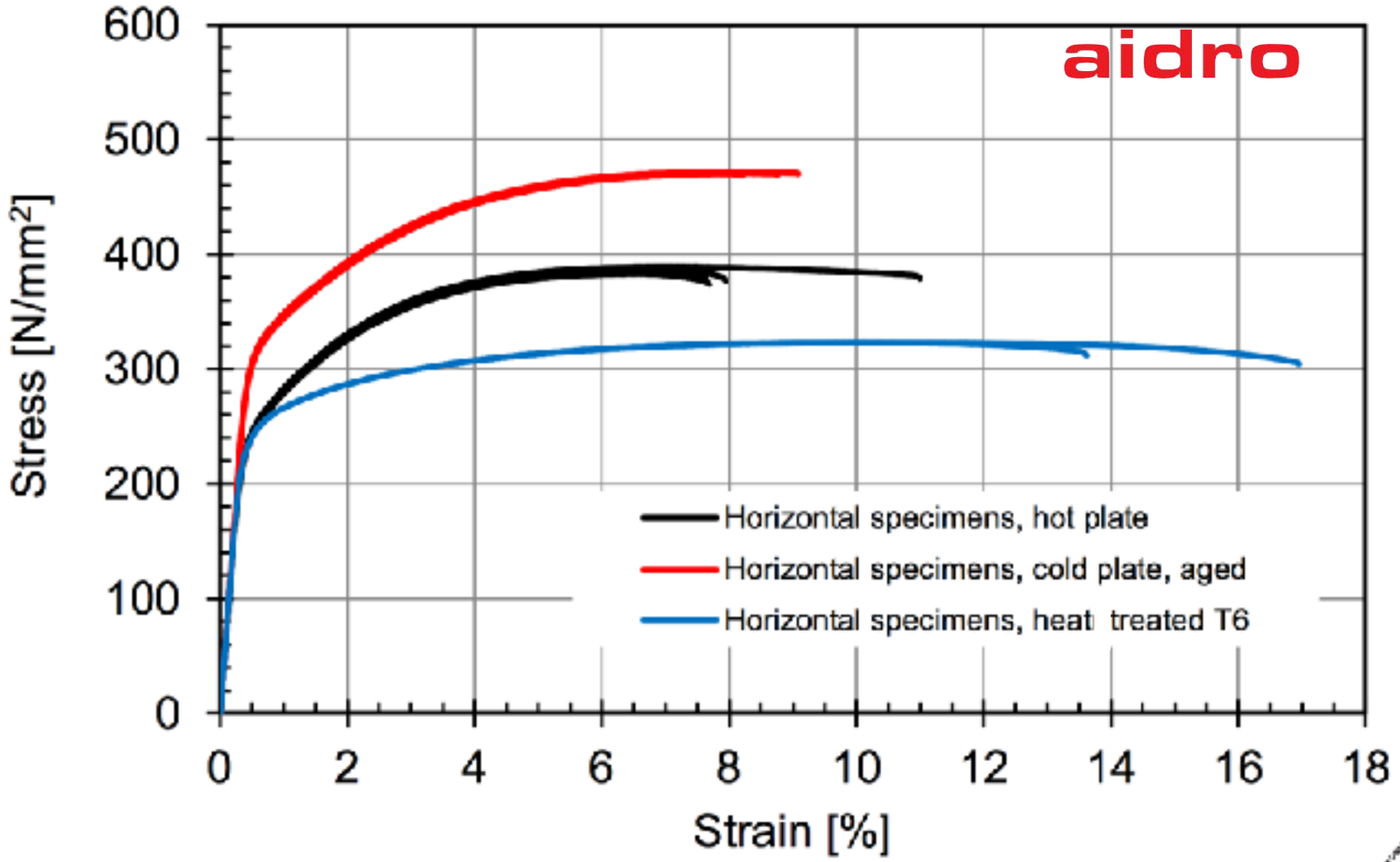
Example of Heat Exchanger



Innovative shapes are possible only with Additive Manufacturing

Mechanical Properties

Tensile strength of LPBF (laser powder bed fusion) technology



additive mfg

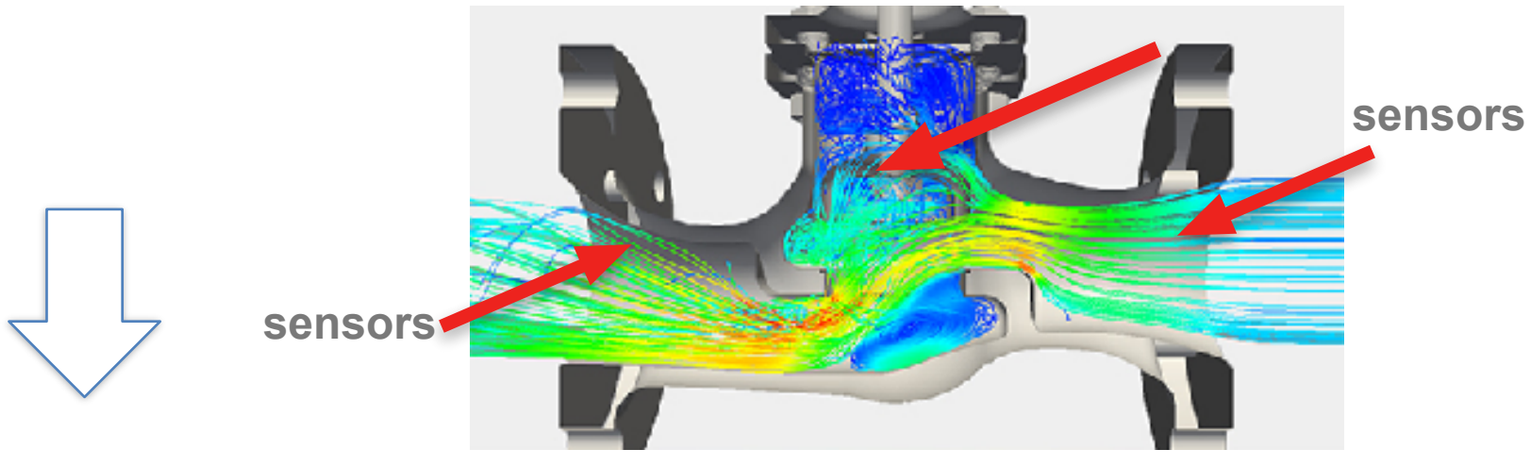
additive mfg

traditional mfg

Testing in collaboration with POLITECNICO DI MILANO

Advantage: Predictive Maintenance

With AM it is possible to integrate devices and sensors into the parts, to detect and anticipate the failure or clogging of valves and pipes

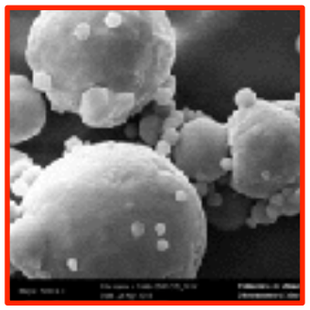


Less unwanted maintenance stops

Special seals

Special sample probes
able to detect problems in unaccessible zones

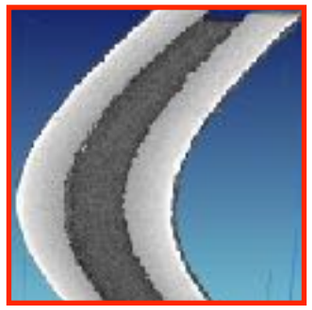
Additive Manufacturing Department



POWDER

SAFETY

FAILURE



TESTING

DESIGN

aidro

hydraulics & 3D printing

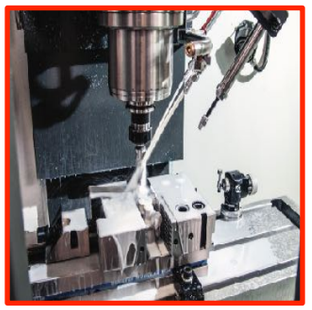
HEAT TREATMENT

3D PRINTER

3D PRINTING

SUPPORTS REMOVAL

MEASUREMENT



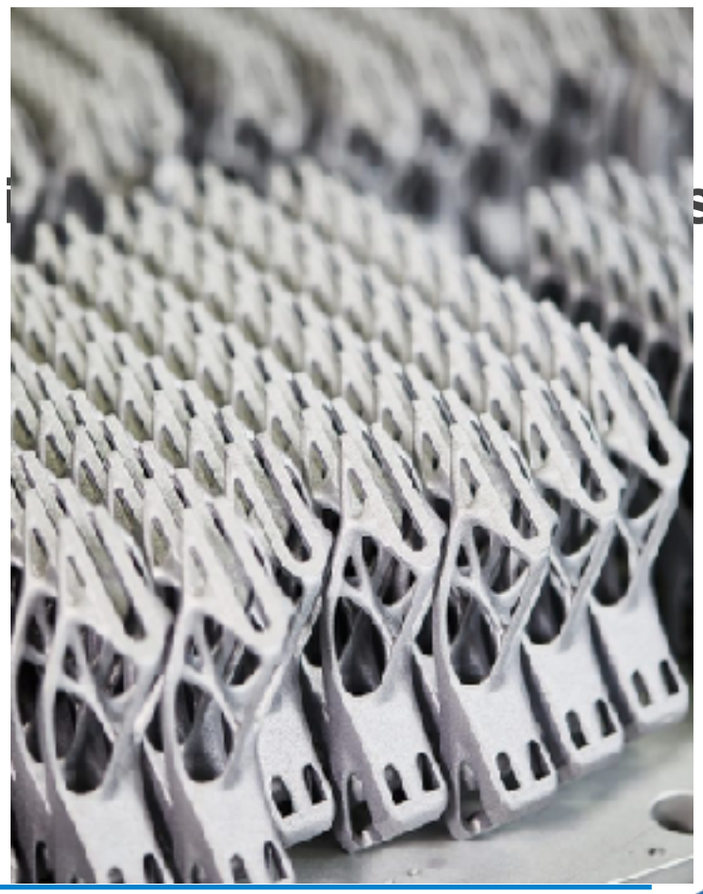
MACHINING

FUNCTIONAL TESTING

Future developments

Today weak points of LPBF (laser powder bed fusion):

- **size limitation of the printed parts**
  - **other AM technology (ex. WAAM)**
  - **bigger printers are under development**
  - **produce Small and Smart components in AM to i s**
- **productivity**
  - **multi-laser printers**
  - **possible for re-designed parts and small pieces**



courtesy of BMW

Thank you!

Do you have questions?

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