Introduction of ATC technology center and presentation of ATC as a model of service:

synergy between different actors on additive manufacturing

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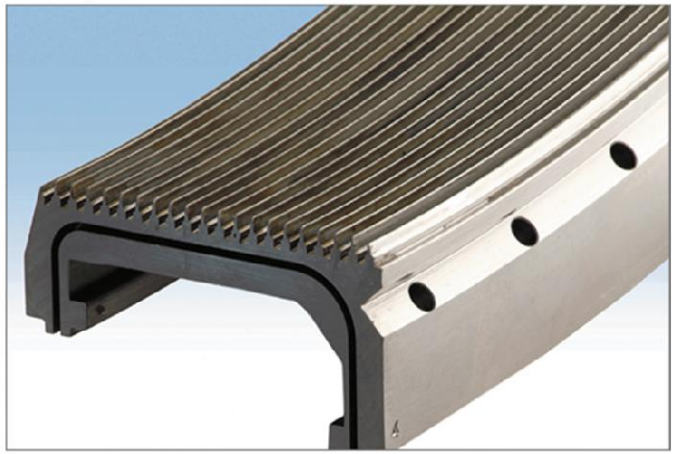
ATC Origins and GFM Role

Directional Site – Mapello (BG), Italy

Production Plant – Nembro (BG), Italy

ATC Origins and GFM Role: What We Do

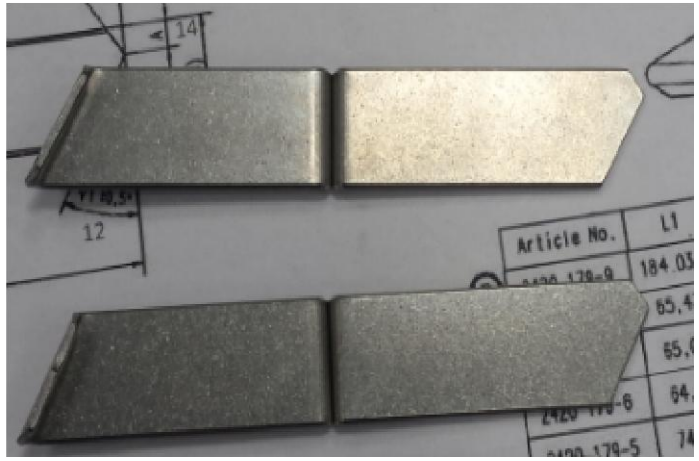
MACHINING – BUILD TO PRINT



COMPRESSOR PARTS (Disks, Rings, Oil Seal Rings, Bearings, Diffusers, Dumping elements)
TURBINE PARTS (Seal rings, Disks, Cover plates, Guide rings, shaft gland)

ATC Origins and GFM Role: What We Do

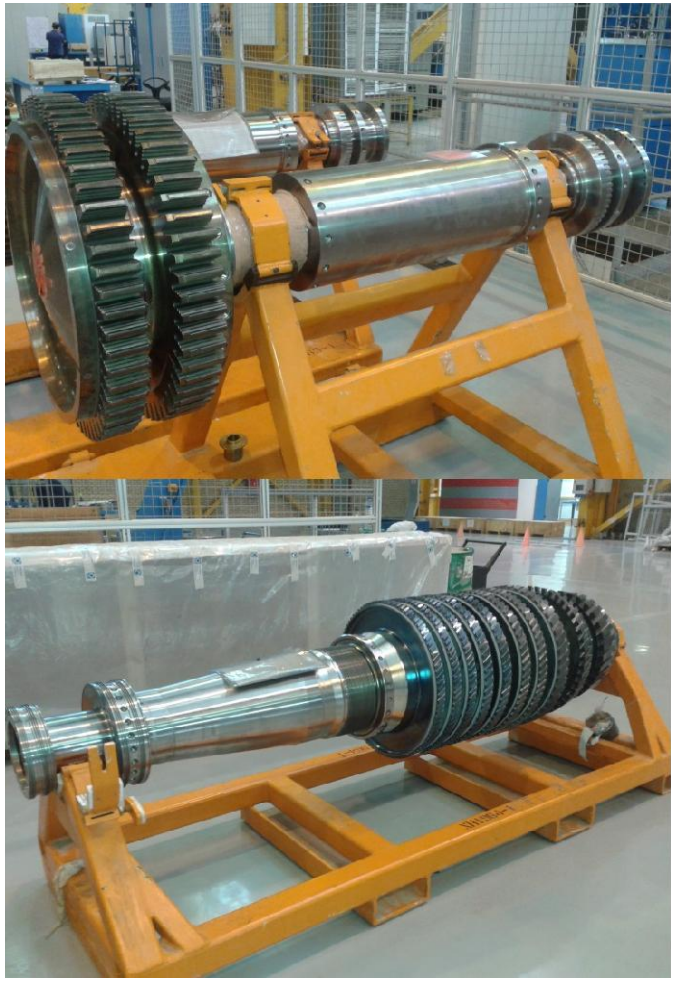
STAMPING, CUTTING, FORMING & METAL FABRICATION – BUILD TO PRINT



LOCKING AND SEAL PLATES, SEAL STRIPS

ATC Origins and GFM Role: What We Do

MACHINING + ASSEMBLY AERODERIVATIVE GAS TURBINE



ASSEMBLY OF COMPLETE ROTOR

ATC: Needs & Opportunities

	Needs	Opportunities
GFM	Introduce new manufacturing capacity	Support Customers in new development program
DMG MORI	Dissemination on their own Additive Manufacturing Technology	Market Expansion of Additive Manufacturing
itema	Evaluation of Additive Manufacturing Technology for new product design	Spare Parts production & Time to market reduction

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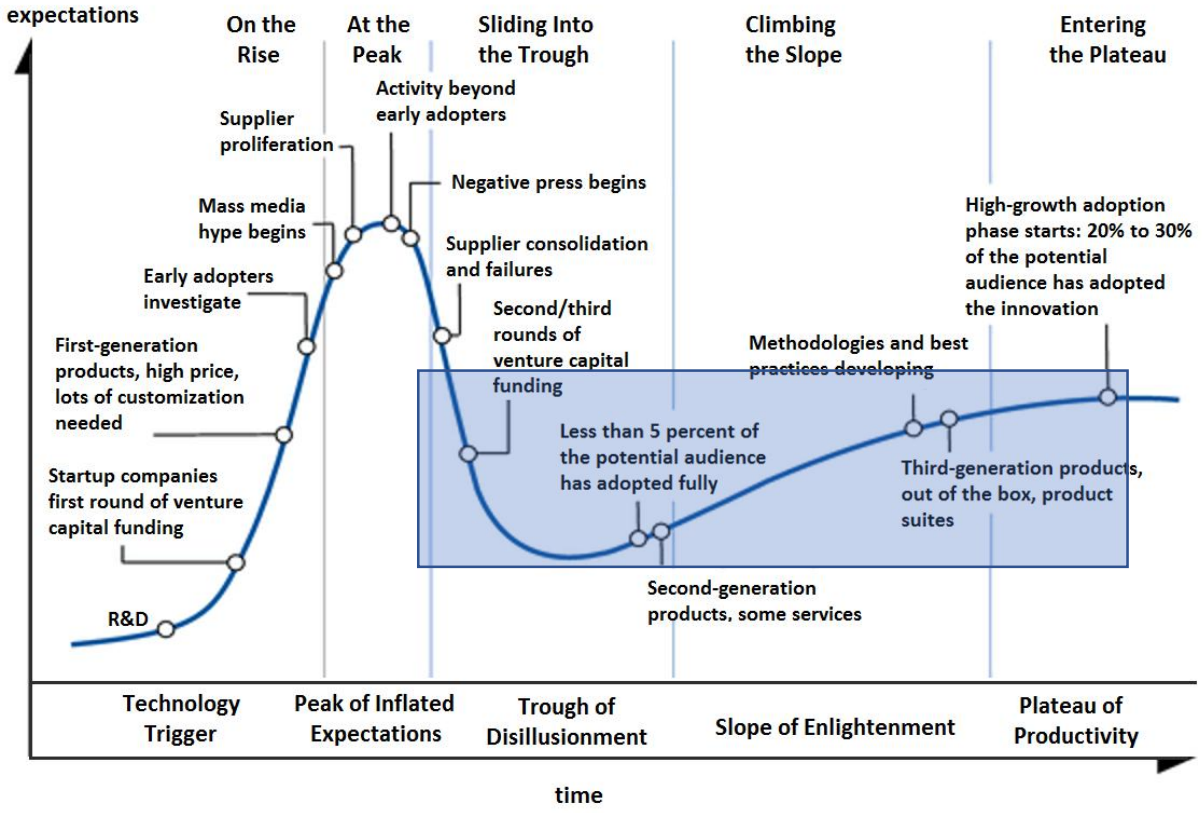
DMG MORI GFM itema

ATC: Role & Competences



Gap type:

Technology
/
Knowledge
/
Competence

Gap **Reduction** from **Idea** to **Serie Production** by **Knowledge** and **Training** to promote the spreading of technology adoption

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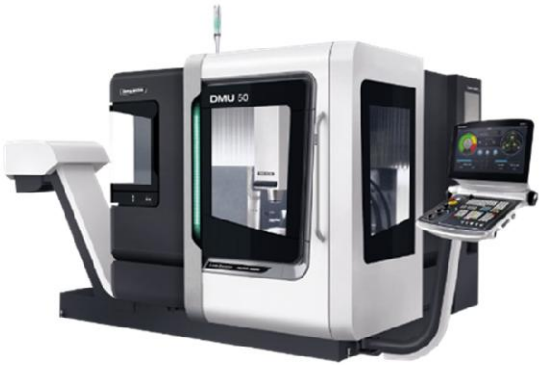
ATC: Technologies & Materials

	Lasertec 65 3D Hybrid	Lasertec 30 SLM (2)	DMU 50
			
Technology	Hybrid: Additive + Subtractive	Powder Bed Fusion	5-axis Milling Machine
Working Volume	Diameter 500mm x 350 mm	300mm x 300mm x 300mm	Diameter 450mm x 300mm
Materials	All Weldability alloys & more	Steels/Alluminum/Titanium/ Superalloys	Metallic & Polymeric Materials
Materials in ATC	AISI 316L	AISI 316L	
	Maraging 300	Inconel 718 (Hastelloy x)	
	Hastelloy X	AlSi10Mg	

ATC: Metallurgical & Test Lab

	Sample Preparation	Optical Observation	Micro Hardness Test	Mechanical Test
				
Technology	Cutting and Polishing	Inverted Optical Microscope	Micro Hardness	Material Testing Machine
Capability	Up to 150mm	25X -200X	ASTM E-387, EN ISO 6507, EN ISO 4545	100KN
Materials	Any	Any	Metallic	Metallic & Polymeric Materials
Software	N/A	HD Camera + Imaging software	Automatic Stress Profile Reconstruction	
Samples	Any	Any	Any	

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ATC: Attivities&Services

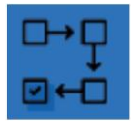
Feasibility Study

CO-ENGINEERING

FEASIBILTY STUDIES & PROTOTYPES

COST ANALISYS

Process Optimization/ Process Validation

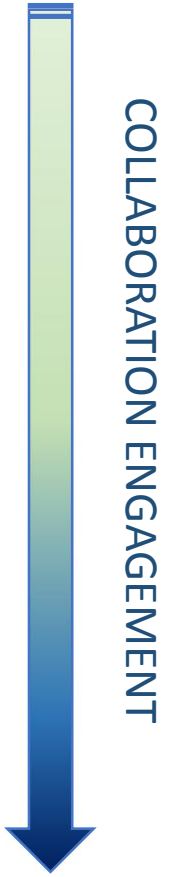


PROCESS DEVELOPMENT & OPTIMIZATION

PROCESS VALIDATION

Training/Counseling

TRAINING



COLLABORATION ENGAGEMENT

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ATC: Technical Partnership

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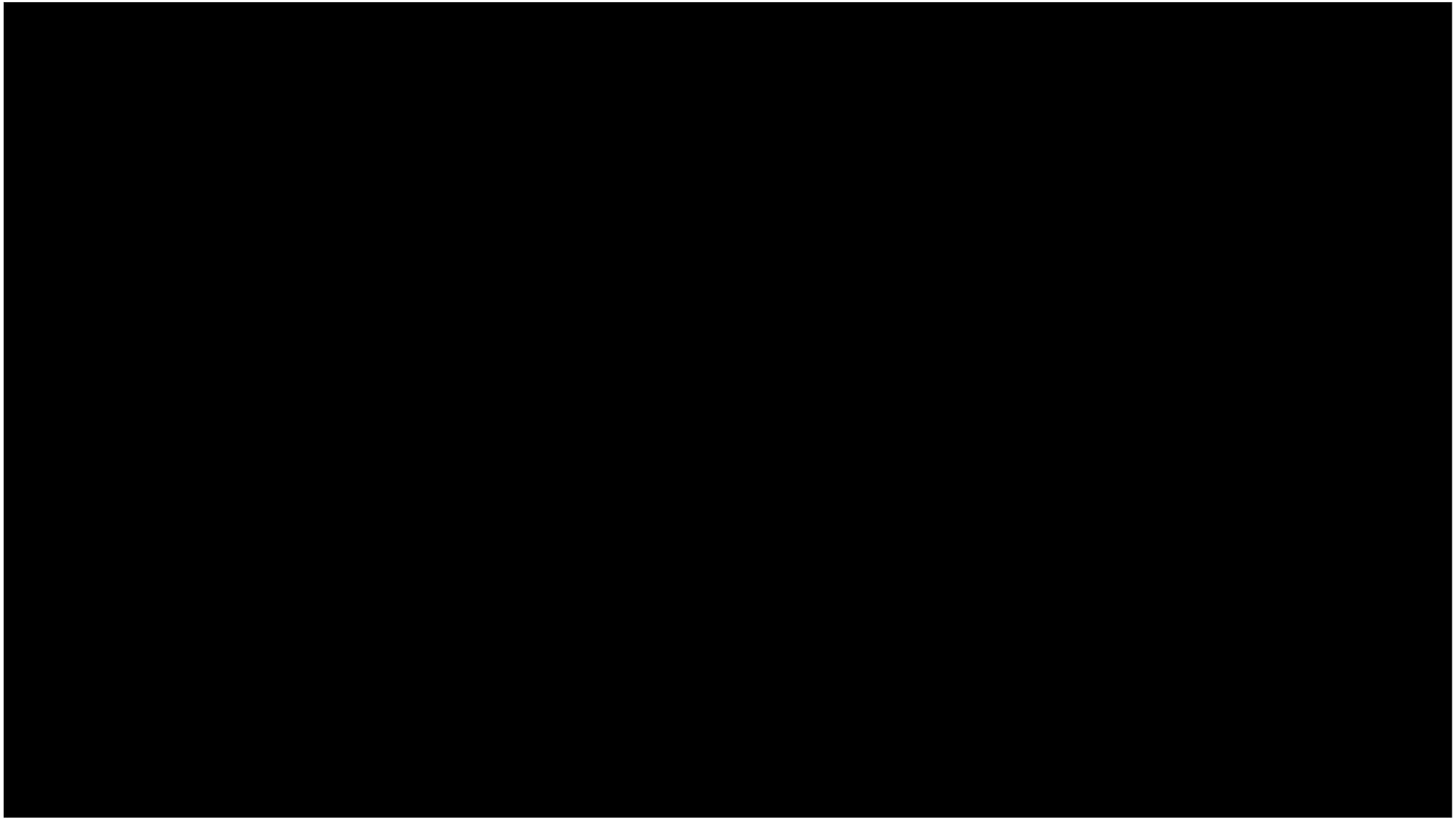
SIAD Gas Tecnici SIAD

Additive Manufacturing
VALUE CHAIN

Design/Co-engineering	Fabrication	Heat Treatment	Post Processing/ Finishing
ATC ADDITIVE TECHNOLOGY CENTER	ATC ADDITIVE TECHNOLOGY CENTER	TAV VACUUM FURNACES	ROLL WASCH

Testing RTM BREDA

ATC at glance



ATC: Feasibility Study

CO-ENGINEERING

- Technical Advising to Design for Additive Manufacturing (DFAM)
- Support to modification of geometry and components
- Materials & Processes Selection

FEASIBILITY STUDY & PROTOTYPING

- Feasibility Study of Component Manufacturing
- Prototyping
- Verification of geometrical and mechanical requirements

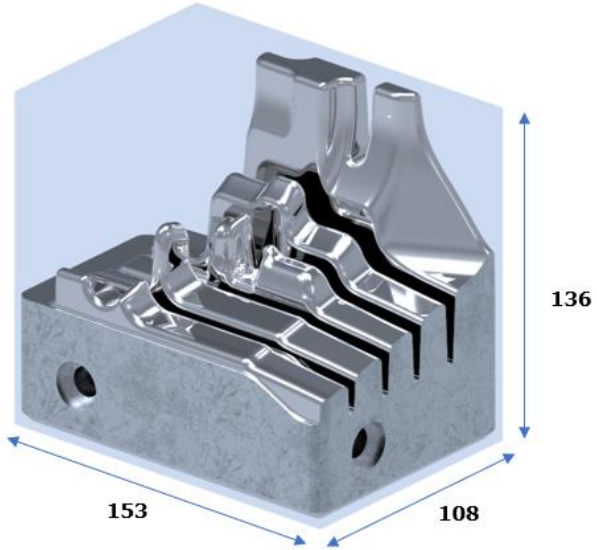
COST ANALYSIS

- Cost Analysis and Evaluation of Business Case

Time Scale: 1 – 3Months Costs: Depends on Project

ATC: Feasibility Case Study

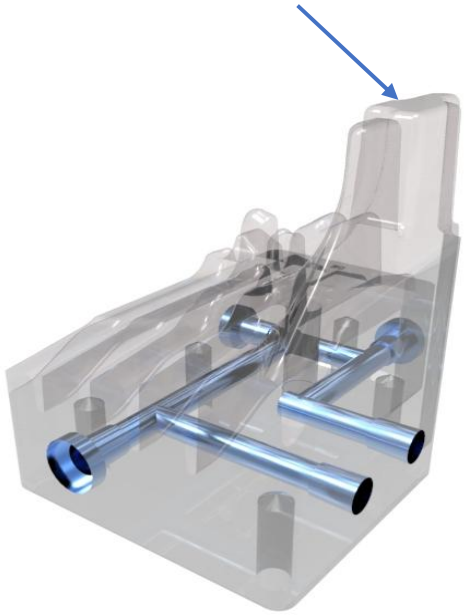
Mold Insert



Courtesy of Costampgroup

Problem

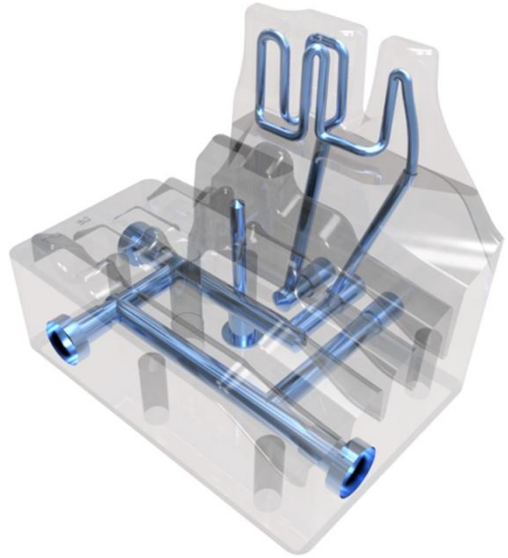
High Wear Rate



Traditional Design with 90° Holes made by Drilling

Solution

Improve Cooling Efficiency



DFAM of Cooling Conformal Channels

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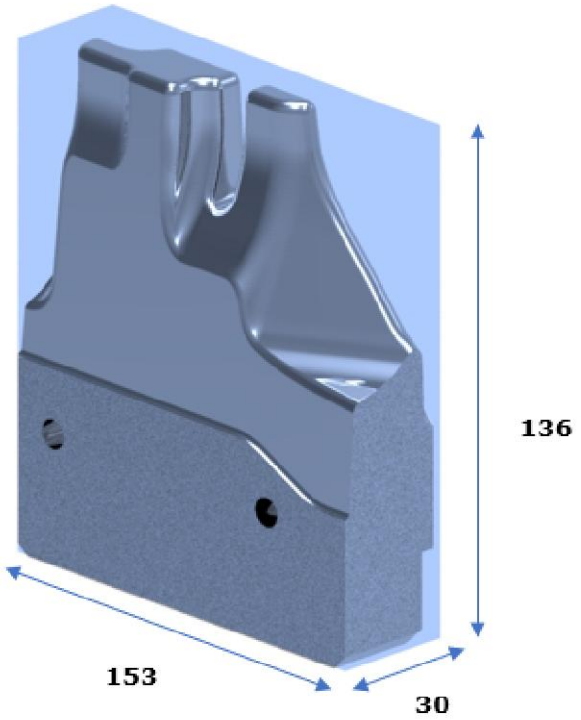
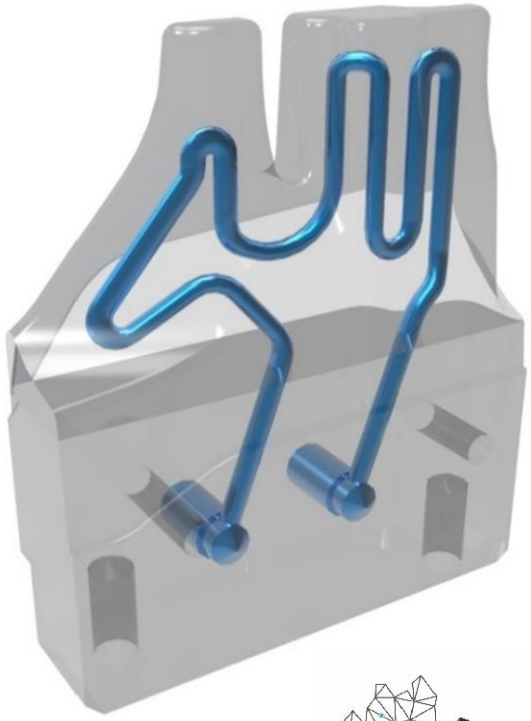
ATC: Re Design for DED Additive Manufacturing

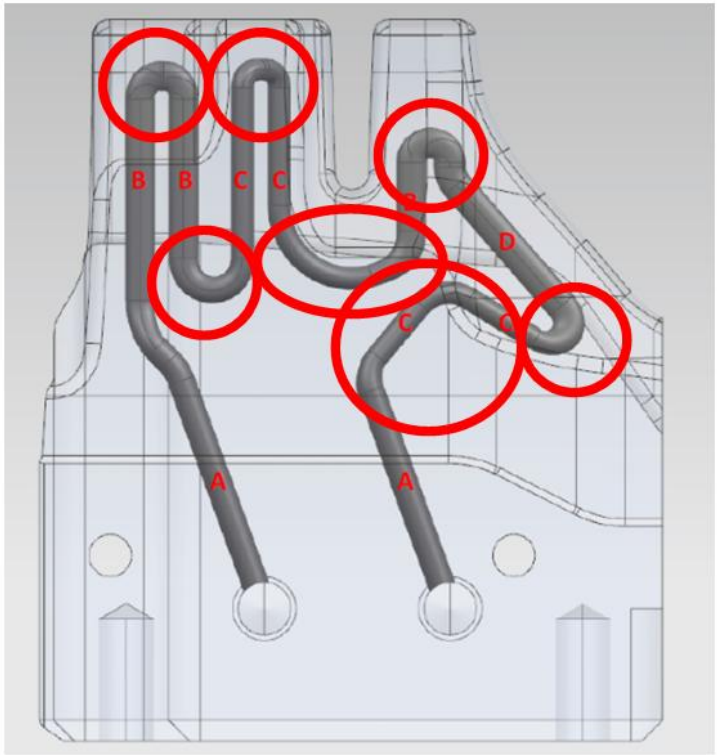
Courtesy of CostampGroup





Customer Geometry

Channels Geometry Classification



Section	Tipologia	Dimension
A	Circular	Ø 5 mm
B	Elipse	5.5 x 3.2 mm
C	Circular	Ø 4.2 mm
D	Elipse	5.8 x 3 mm

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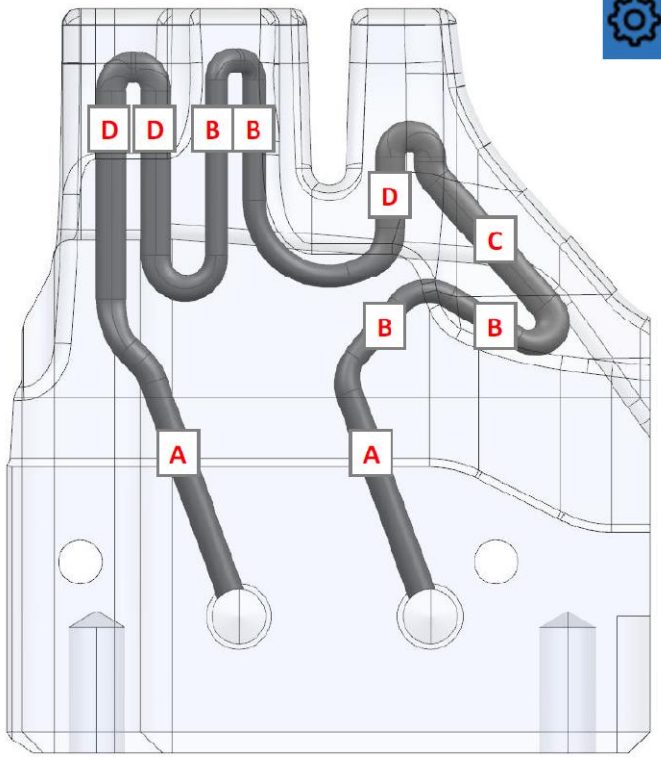
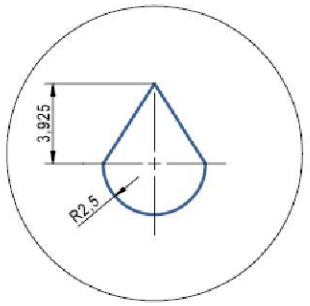
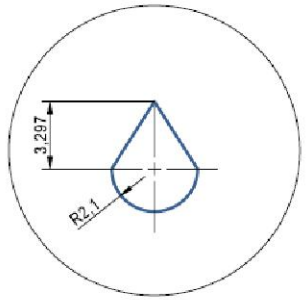
ATC: DFAM of Conformal Channels

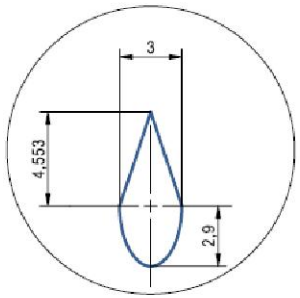




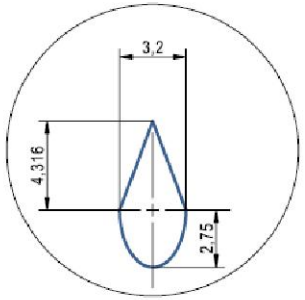
DETAIL A
SCALE 5:1



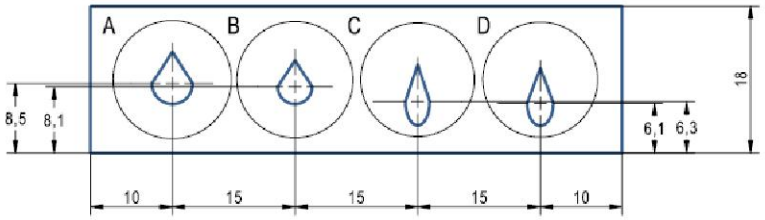
DETAIL B
SCALE 5:1

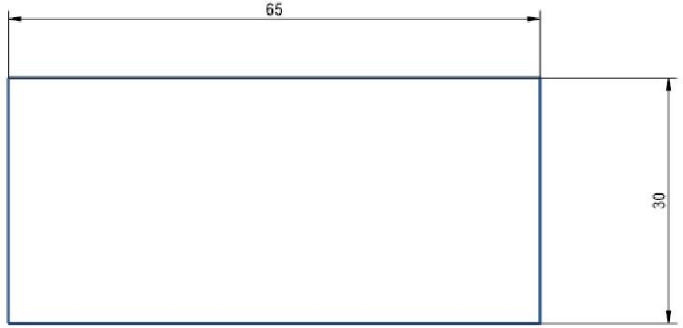


DETAIL C
SCALE 5:1



DETAIL D
SCALE 5:1





Section	Tipologia	Dimension
A	Circular	Ø 5 mm
B	Elipse	5.5 x 3.2 mm
C	Circular	Ø 4.2 mm
D	Elipse	5.8 x 3 mm

DFAM of Channel Geometry

Sample Test for Evaluation of Conformal Channels Design

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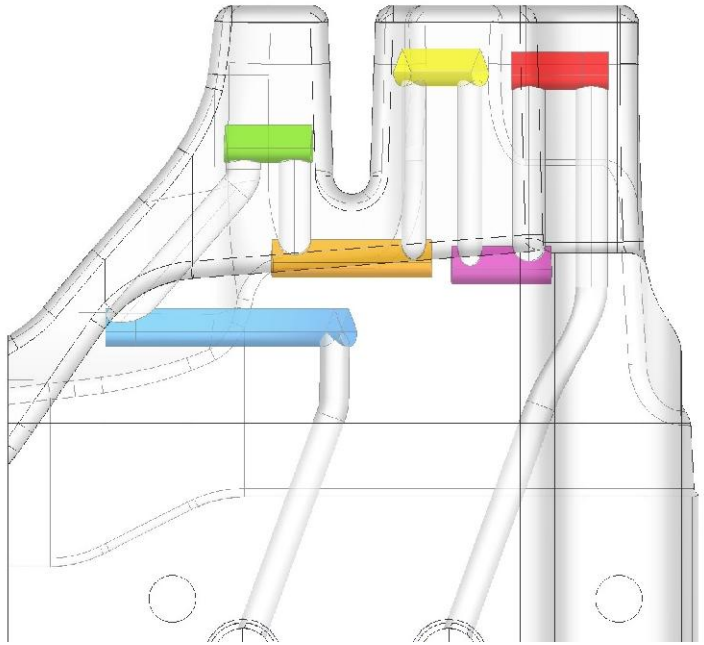
ATC: Hybrid DED Building Strategy

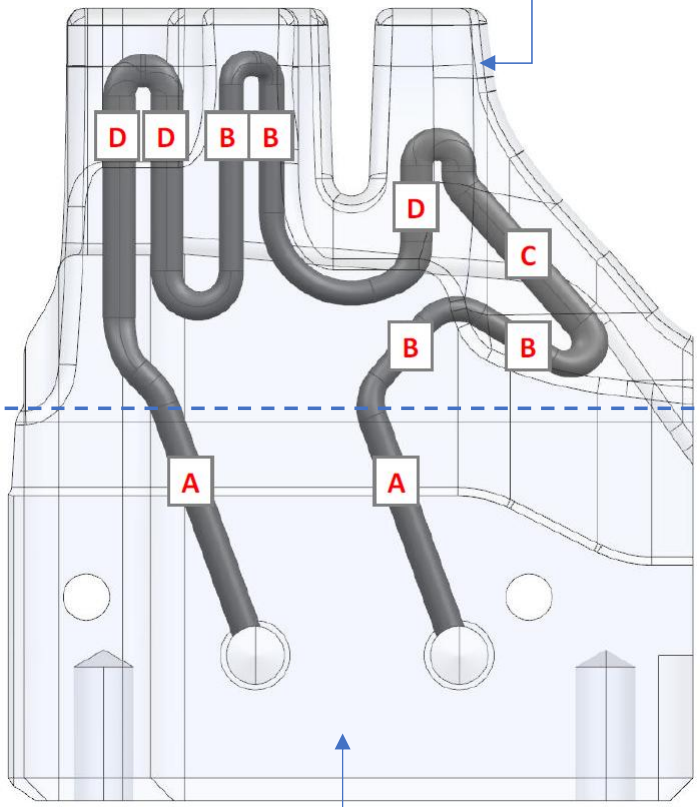


Redesign for Hybrid DED

Upper Part: complex Geometry made by Additive

Upper Part

Base



Base: Simple Geometry realizable by Machining

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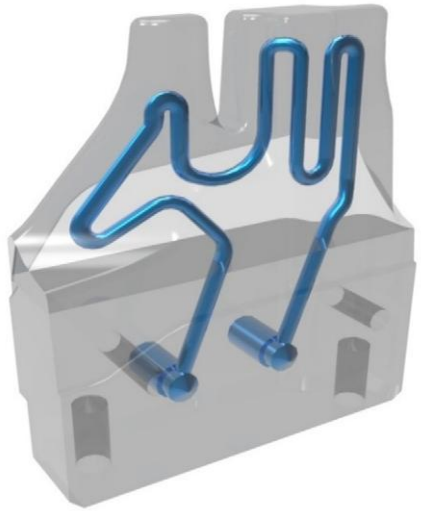
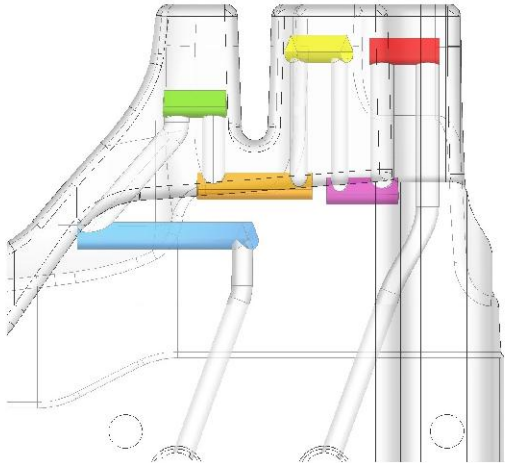
ATC Case Study: Mold Insert Prototyping

ATC Case Study: Cost Analisys

Mold Insert – Costumer Geometry -	Mold Insert Redesign for Hybrid AM

Courtesy of CostampGroup





Technology	SLM	Hybrid Additive Technology
Cost	About 3000€	About 1800€

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ATC: Process Development & Optimization

CO-ENGINEERING

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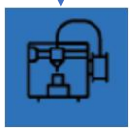

FEASIBILITY STUDY & PROTOTYPING

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COST ANALYSIS

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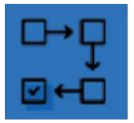


PROCESS DEVELOPMENT & OPTIMIZATION

- Identification of suitable process for the manufacturing of component
- Verify of Reliability of the Process by Pre-Serie Production
- Definition and Optimization of all Production Steps up to Post processing

PROCESS VALIDATION

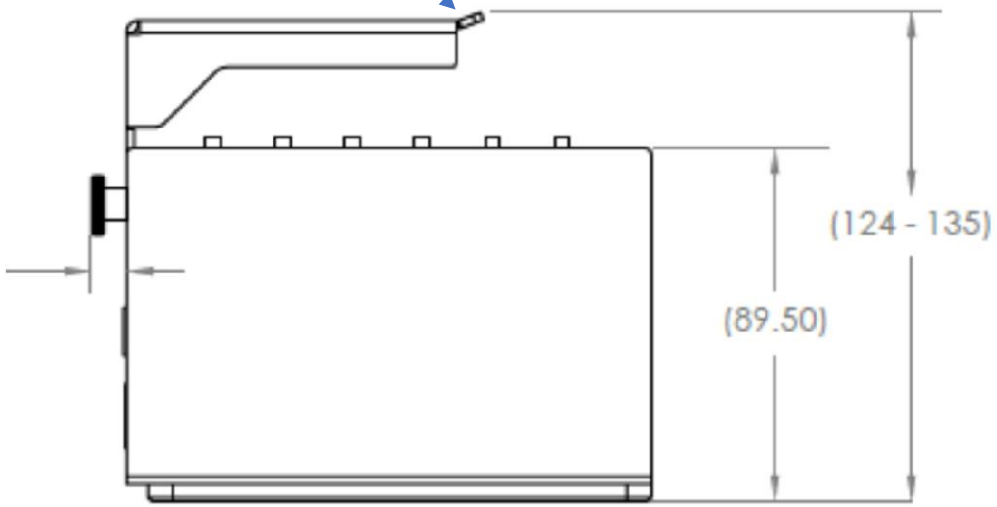
- Process Validation by Functional Test of Component or by Destructive Tests

Time Scale: 3-6 Months Costs: Depends on Project

ATC: Process Development & Optimization Case Study

Problem

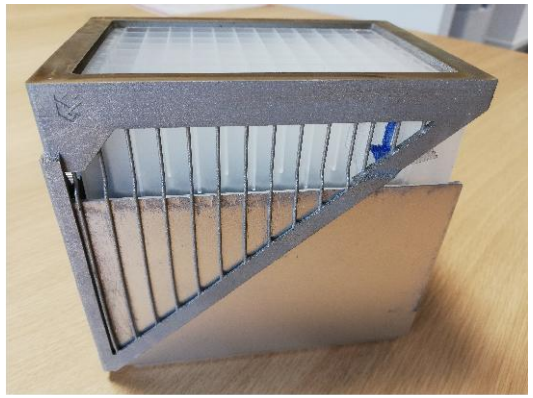
Standard Gripper with Low Stiffness

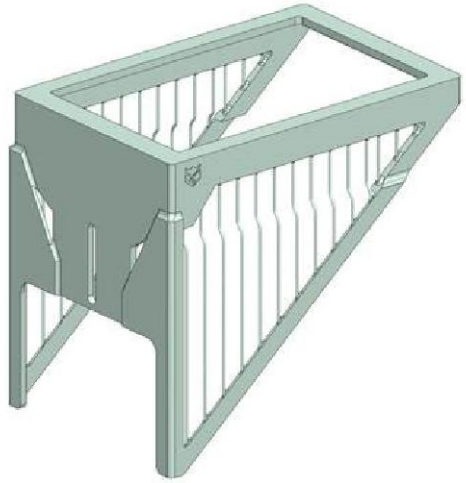


Holder for Automatic Sampling for COVID Test

Solution

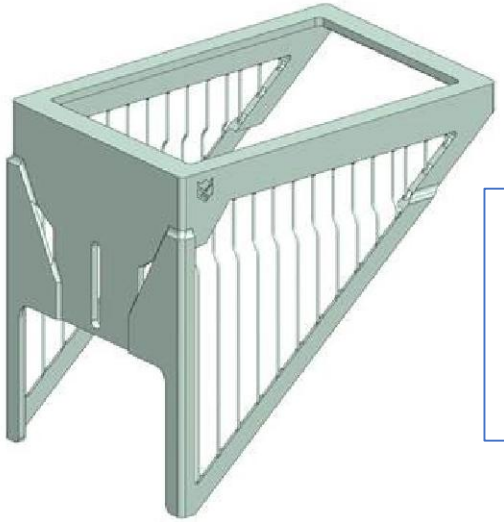
Redesign Gripper with higher stiffness and easy to handle approach



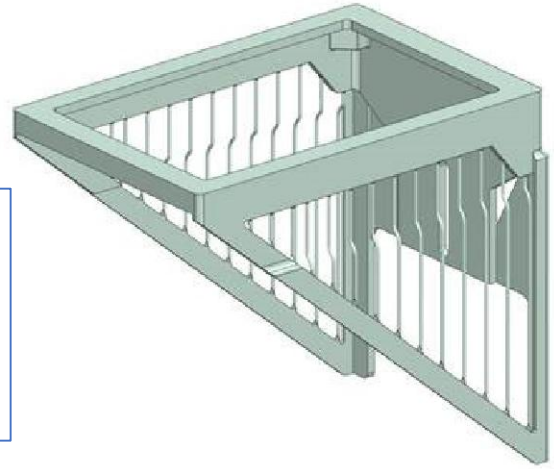


ATC: Process Development & Optimization Case Study

Easy to Handle
Approach needs to reduce interfere with tolerances control



SLM Process Calibration to reduce the interfere and maintain the maximum allowance



ATC: Process Development & Optimization Case Study

Covmatic

Covmatic is an open–source, high throughput system for COVID–19 testing. It is developed by a team of volunteers and partner organizations in Italy. This technology is freely available to all the labs in the world who need to efficiently scale testing.

The system consists of 10 liquid handling robots and 3 qPCR machines, overseen by a cloud-based control software. Each patient sample is automatically tracked through its barcode. The system generates and stores digital records, to comply with regulatory standards.

Learn more on www.covmatic.org

ATC: Process Development & Optimization Case Study

Covmatic

Corporate Partners

Porsche Consulting
Multiply Labs
Transearch
Crispy Bacon

WeMake
ATC Additive
ABB
IBM

Benchling
OpenDot
OpenTrons

Academic Partners

Politecnico di Milano
Universitá degli Studi di Milano
IIT

Association Partners

Rotary International

ATC: Training&Conseling

- Training on the Additive Technology by dedicated Courses
- Training on the job, following all the stages of the development project
- Delivery of “Recipe” for a serie-production

ATC: Funded Project

CUSTODIAN

Customized
photonics devices
for defectless
laser-based manufacturing

www.shapeyourlaser.eu

PHOTONICS 21
PHOTONICS PUBLIC PRIVATE PARTNERSHIP

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement nº 825103. CUSTODIAN project is an initiative of the Photonics Public Private Partnership.

Custodian

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Partners

10 entities focused on industrial laser manufacturing

aimen CENTRO TECNOLÓGICO

secpho collaborate to innovate

PRECITEC

NIT New Infrared Technologies

cailabs SHAPING THE LIGHT

AIDIMME TECHNOLOGY INSTITUTE

MARELLI

TU WIEN

POLITECNICO MILANO 1863

GFM

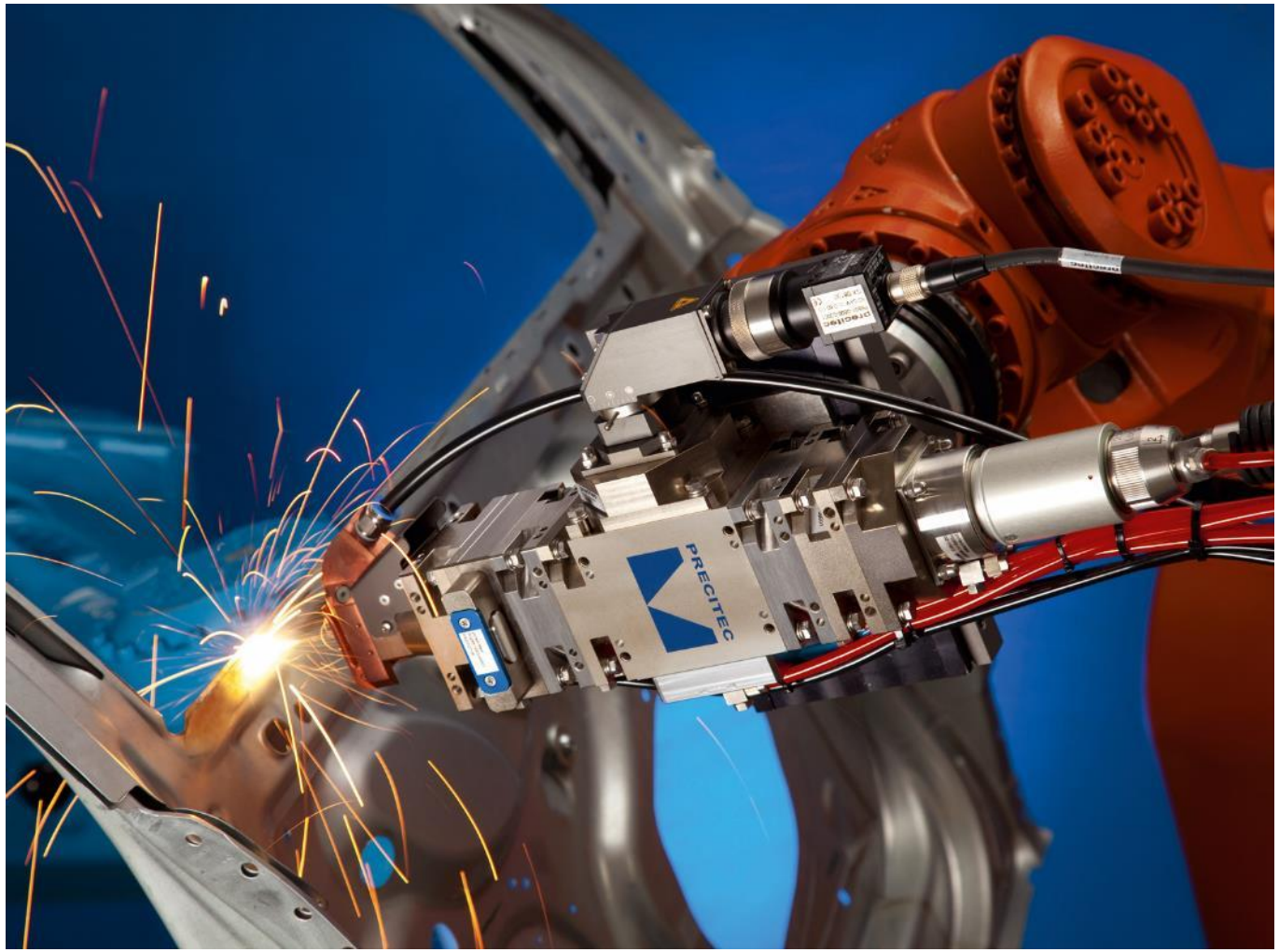
Custodian

ATC: Funded Project

The Project

The project aims to **develop a new and disruptive methodology** of application-driven laser beam tailoring of the material microstructure, and deploy this beam:

- to **solve hot cracking** in **Laser Beam Powder Bed Fusion** (PBF-LB/M)
- and to **increase quality** and **productivity in laser beam welding** (LBW) and **laser cutting**



Impact

By achieving the CUSTODIAN main objectives:

- **between 95-98% of defects will be eliminated** in LBW/PBF-LB/M parts,

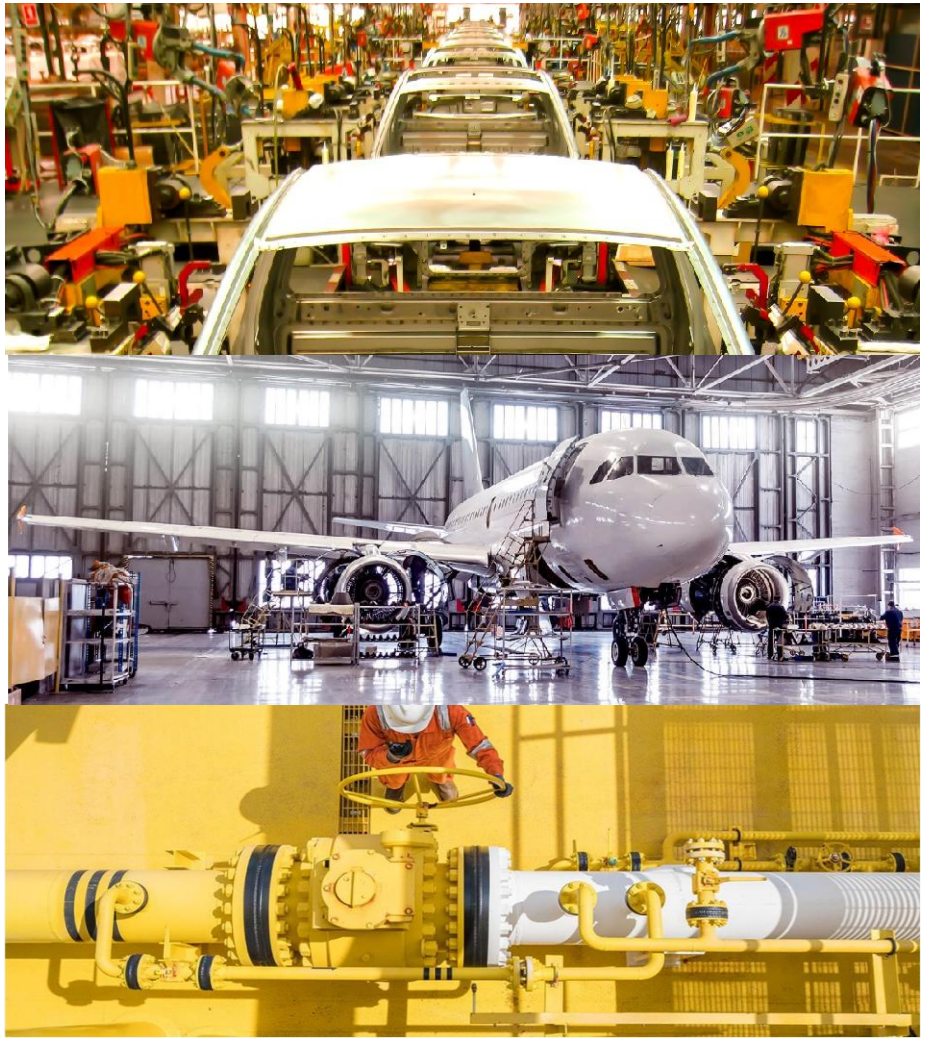
- leading to **production time decrease** respect to the traditional manufacturing **in 70%** (LBW) **and 83%** (PBF-LB/M)

- while **reducing the total costs** in **20%** (LBW) **and 60%** (PBF-LB/M)

- and taking **Laser Cutting** to a **higher performance level**

ATC: Funded Project

Applications



Automotive industry

Produce thinner walls with LBW of austenitic steel leads to 25% of weight reduction in exhaust system.

Aerospace sector

Avoid cracks caused by abrupt cooling of molten material in PBF-LB/M the leads to a reduction in time and cost in 25%.

Energy industry

Optimized geometry using PBF-LB/M leads to 40% less weight in sealing for gas & steam turbines in nickel superalloys.

GFM as industrial end user presents 2 case studies for application in Aerospace & Energy sector

ATC: Remarks&Conclusion

- Feasibility Study
- Process Optimization/Validation
- Training on the job,
- Delivery of “Recipe” for a serie-production
- Partnership for Funded Projects

Thanks for Attention

www.atc-additive.com
francesco.stortiero@atc-additive.com

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