



REINVENT THE WHEEL. AND HOW YOU MAKE IT.

HP JET FUSION 3D PRINTING

DAVIDE FERRULLI
Country Lead, 3D Printing - Italy

2D Print & PC leadership

\$48.2B
Revenue
in FY16

\$52.1B
Revenue
in FY17



HP's Commercial PCs
rank #1 or #2
in 44 of the top
48 countries



HP ships 1.7 PCs
every second



HP's Printing
ranks #1 or #2
in 42 of the top 45
countries (ink + laser)



HP ships 1 printer
every second



Powering **430**
of the Global Fortune
500 companies

VANTAGGI DELLA FABBRICAZIONE IN ADDITIVE MFG

- *E' piu' facile - Progettazione senza vincoli*
- *Prodotti Migliori*
- *Libertà di modifica*
- *Eliminazione costi e tempi per le attrezzature*
- *Personalizzabilità senza incremento costi*
- *Produzione On-Demand*
- *Nessun Lotto Minimo*
- *Riduzione dei costi di Magazzino*
- *Ottimizzazione della Supply Chain*
- *Minore spreco di materia prima*

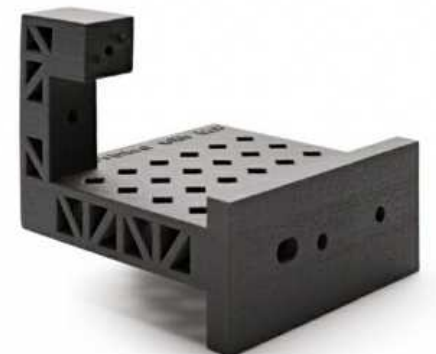


>70%

di riduzione del costo

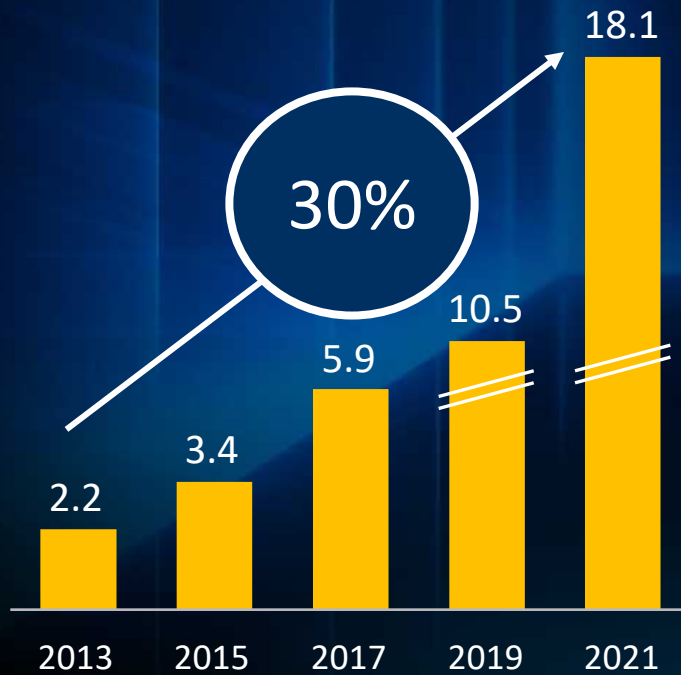
>80%

di riduzione del peso

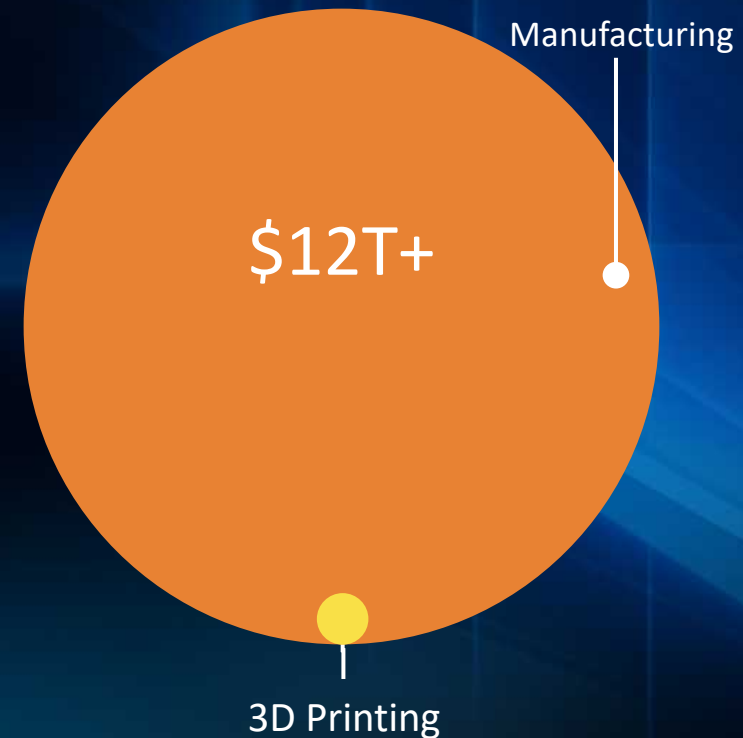


3D PRINTING MARKET POTENTIAL

3D Printing market expected to continue strong growth



But... manufacturing sector offers greater potential for 3D printing



I limiti della stampa 3D ad oggi



Velocità

TEMPO DI PRODUZIONE

- Il tempo di stampa è ore o giorni
- Necessita di tempo per le post-lavorazioni



Part Performance

PRESTAZIONI DEL PEZZO

- Finitura superficiale e dettagli
- Precisione dimensionale
- Proprietà meccaniche inferiori al pezzo prodotto in maniera tradizionale e **anisotrope**



Costi

COSTO TOTALE PEZZO

- Monopolio materiali = \$\$\$\$
- Costo macchina
- Costo operatore per post-processing

Multi Jet Fusion: Design Parameters

SPEED

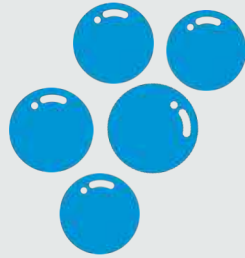
1



Process **layers**
in **one pass**

PART PERFORMANCE

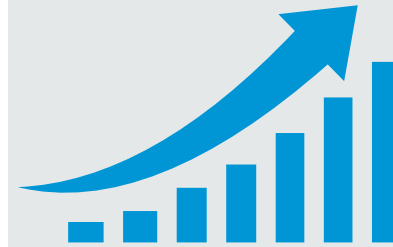
2



Build **functional** parts,
modify the **properties** of
the material **at voxel level**

ECONOMICS

3



Cut **running costs** by **half**

VIDEO

<https://youtu.be/VXntl3ff5tc>



MATERIALS PARTNERS

FY17 – OPEN MATERIALS PLATFORM DRIVING EXPANSION



We create chemistry



Lehmann & Voss & Co.



dresser
group

50+ materials leaders
engaging today

World's first
open 3D materials lab

Industry's first
3D materials
development kit

ROADMAP FOR HP 3D PRINTING BUSINESS



SIGNIFICANT MOMENTUM IN THE FIRST YEAR

FY17 – DELIVERING A DISRUPTIVE AND DIFFERENTIATED SOLUTION

Repeat customers,
multiple unit orders

Leaders in
key verticals

Production applications:
50+% of all
benchmarks



PIUSI

Pre-serie



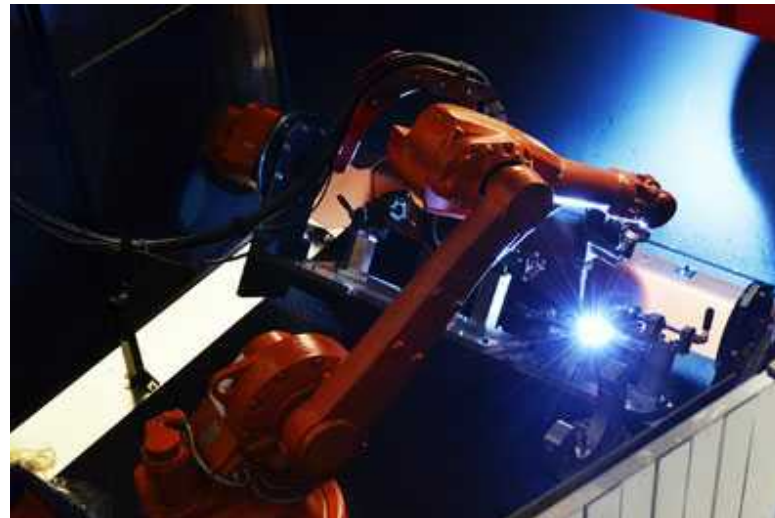
Contaltri PIUSI K400

Alluminio – versione originale per Benzina, Diesel e Kerosene



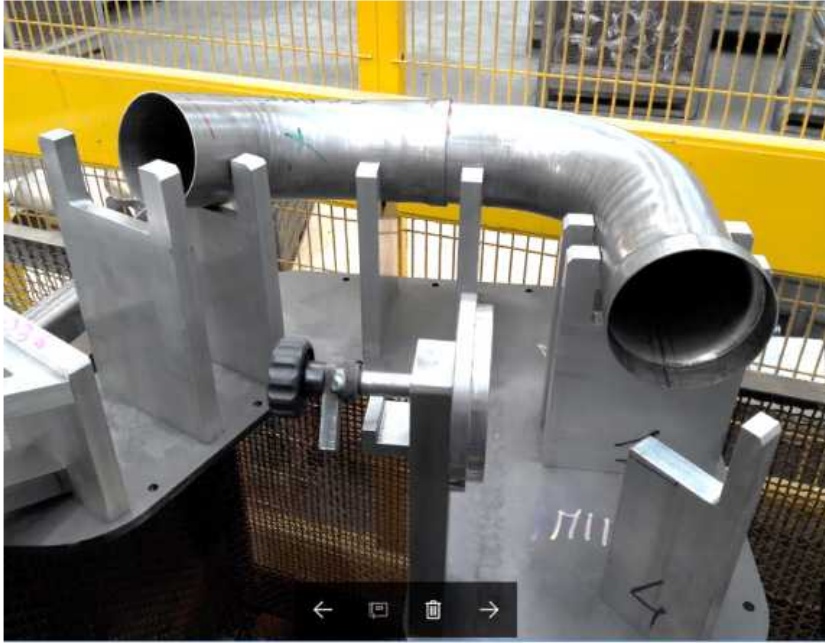
HP MJF HR PA12 – componente riprogettato per Adblue





Fixtures for shape checking

Current solution: metal CNC + welding



MJF solution



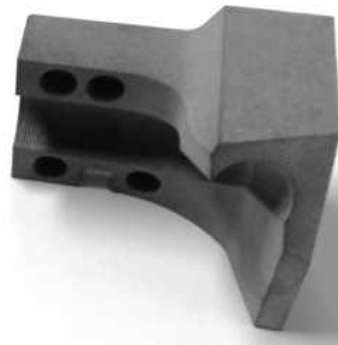
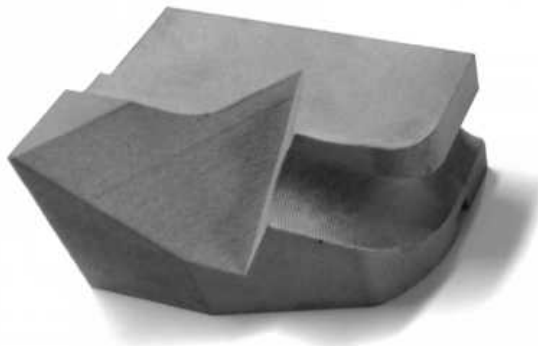
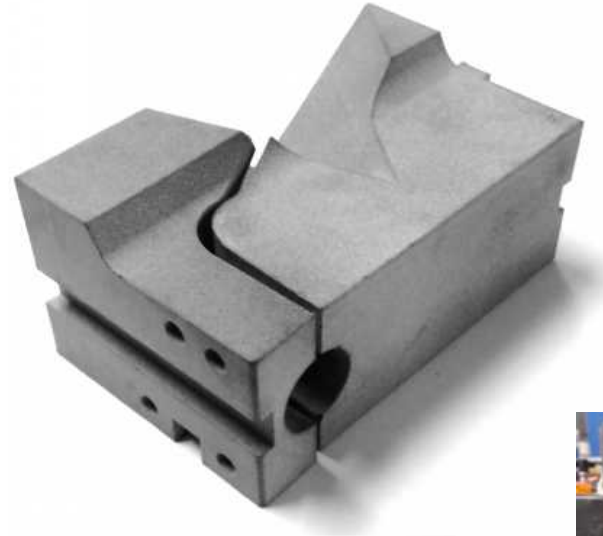
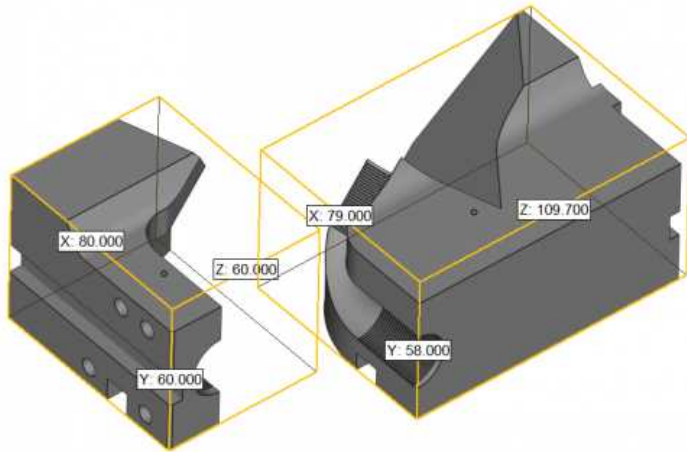
Reduction of number of parts
Reduction of labor
Reduction of production time and costs



Pain points & Challenges:

- Big parts
 - Massive parts
 - Warping
- > Redesign and correct orientation selection for MJF

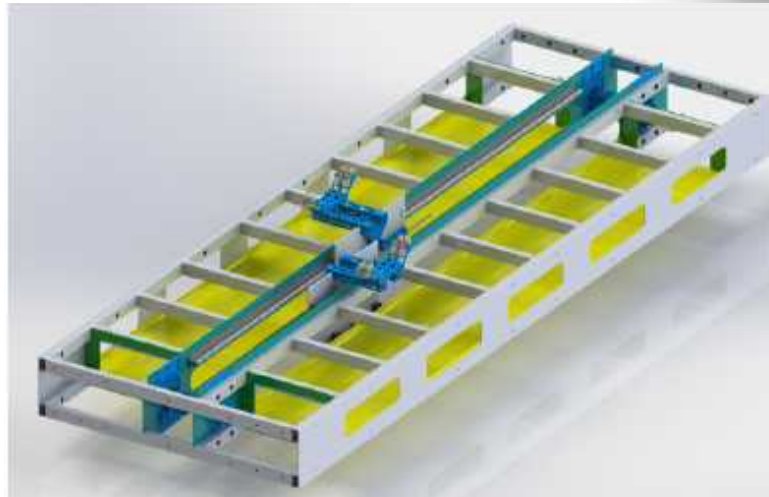
MJF Tube bending molds

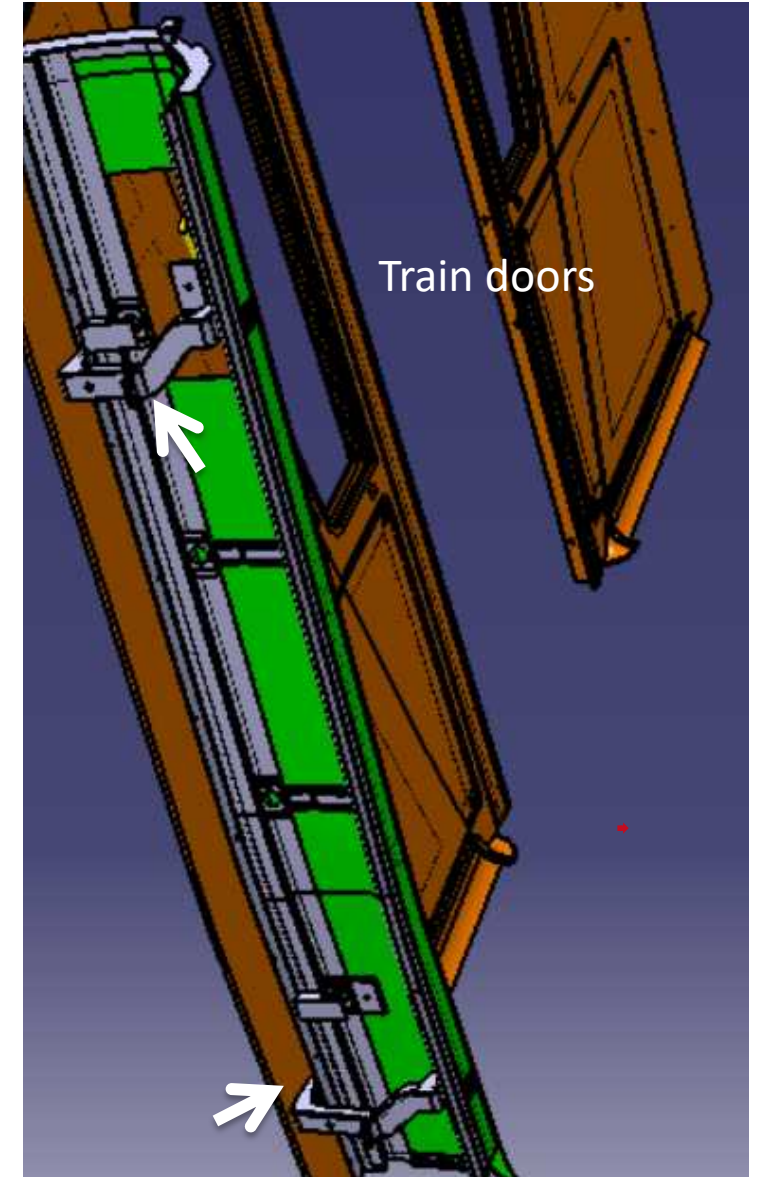


Conventional solution:
metal CNC + welding

Ficep S3

- The main structural components of the new painting arm in the DaVinci Automatic Paint Machine is being designed directly for MJF.
- The challenges they have overcome with this design are:
 - Extremely light weight
Cost reduction of motors, gearboxes, etc.
 - Geometry optimization:
 - Y axis reduction.
 - Z axis reduction from 1,5 to 0,3m (80%)
 - Filter station reduction.

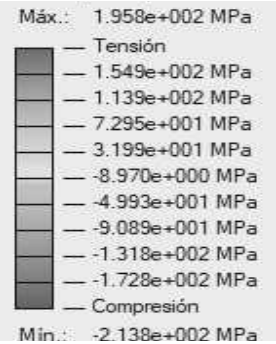
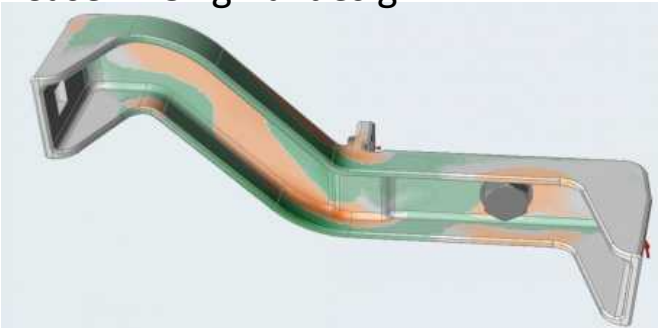




Train door bracket

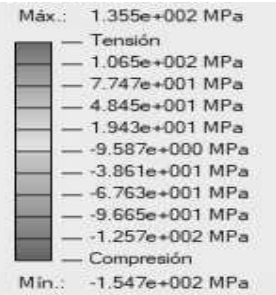
- Objective:
Substitute current sand casted aluminium part for MJF.
- Cost of manufacturing a unique part like this one as spare part is around 600€ with the sand casting manufacturing process.
- Mechanical requirements: Withstand more than 750 N per Support.
- 2 different iterations of the design with FEA analysis have been done in order to get the best design to meet the defined requirements.

Case 1: Original design



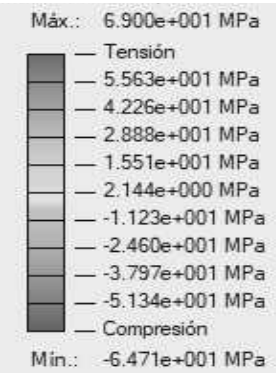
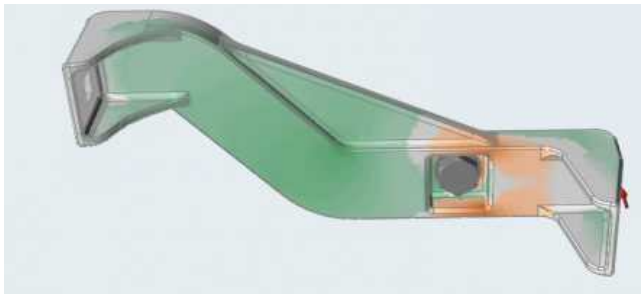
First FEA analysis is done only by replacing the original material (aluminium) by the HP 3D High Reusability PA12 to detect the weak areas.

Case 2: Design iteration 1



The first design iteration is done with the introduction of an internal lattice structure who reinforces the part. It is stronger than the previous one, but still needs to be improved.

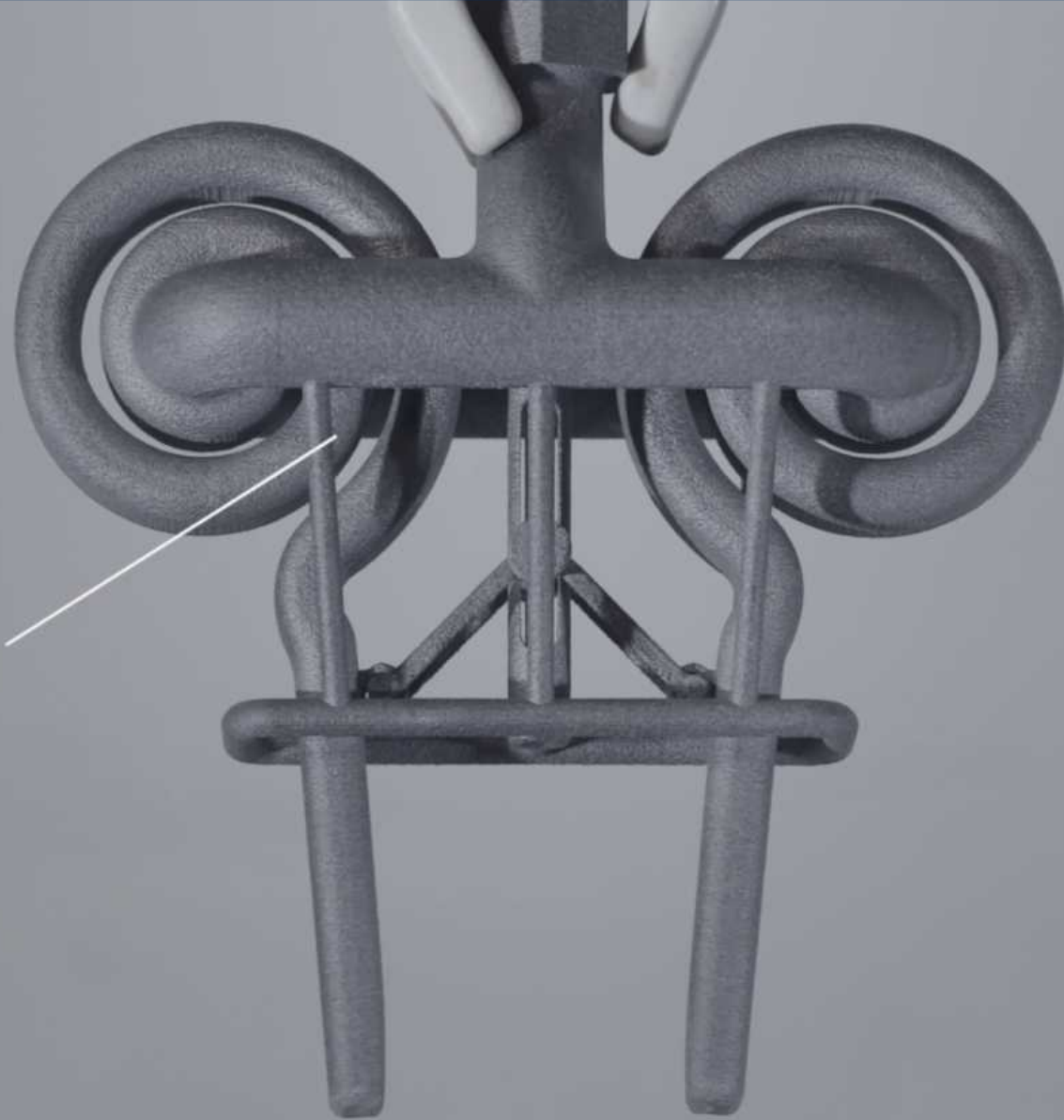
Case 3: Design iteration 2



the second design iteration adds additional material an introduces a rib which help to reinforce the weak spot of the part. The FEA confirms the design is now inside specifications.

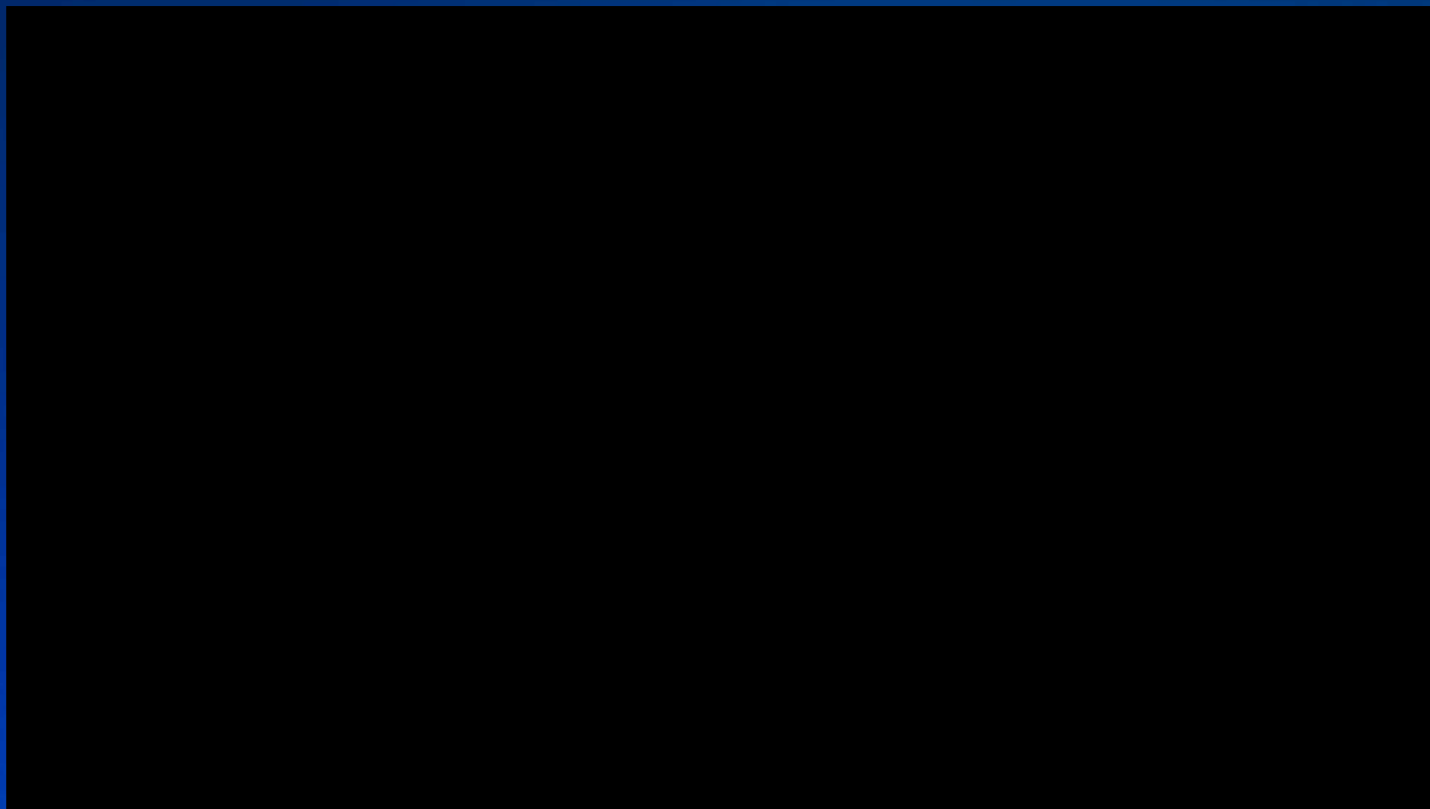


PNEUMATIC SYSTEM



Mani di presa

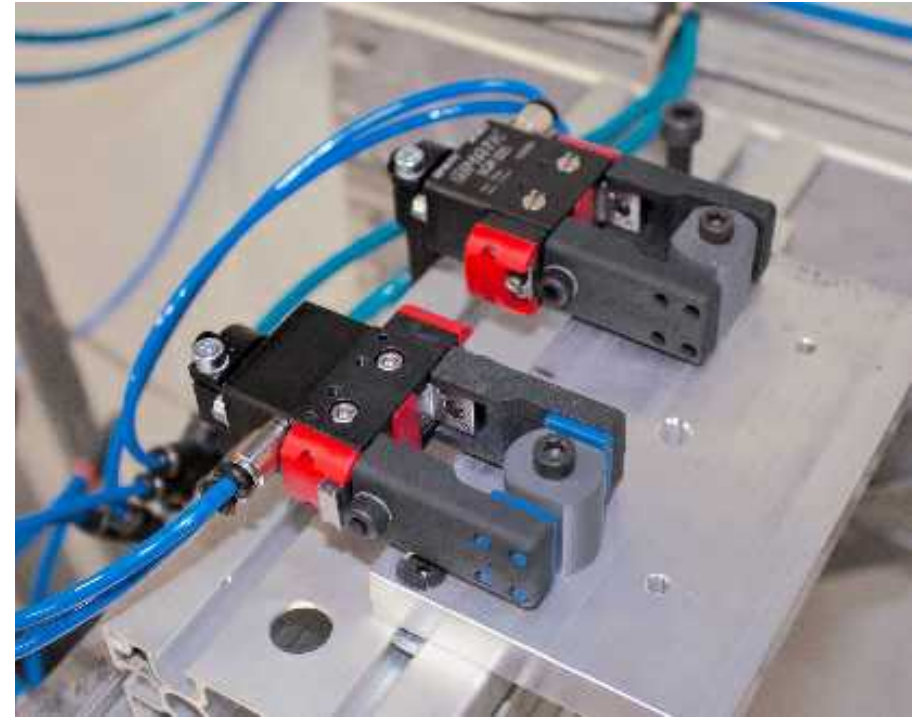
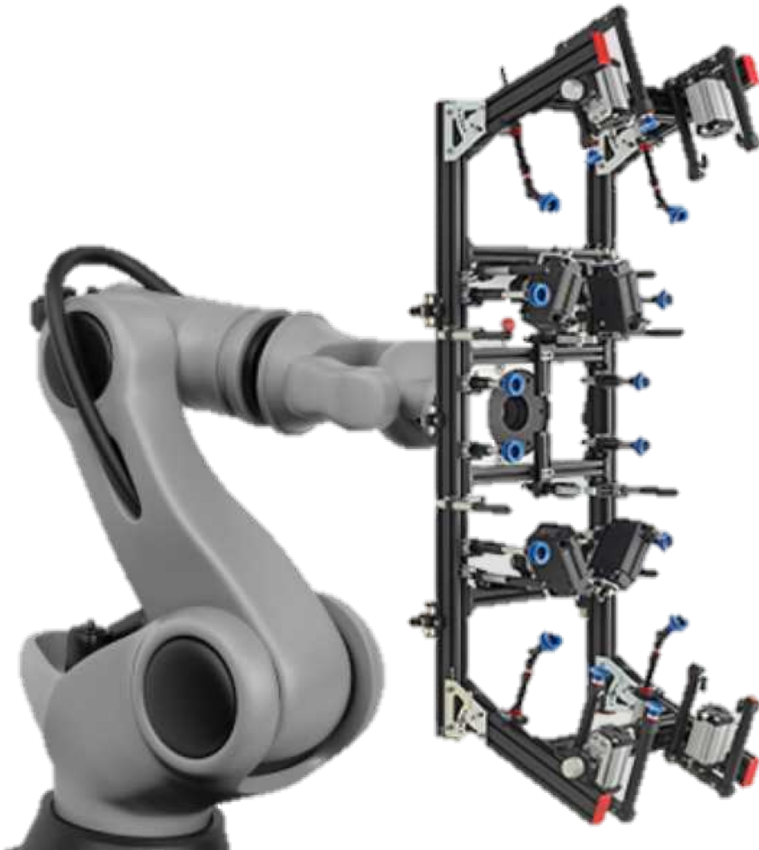
Riduzione peso, componenti a tenuta



CNC Machined part: 1830 g.
 HP 3D MJF part: 237 g.
87% Overall weight reduction

GIMATIC

- Customized fingers for Gimatic grippers
- Tools for internal production
- Components for series production

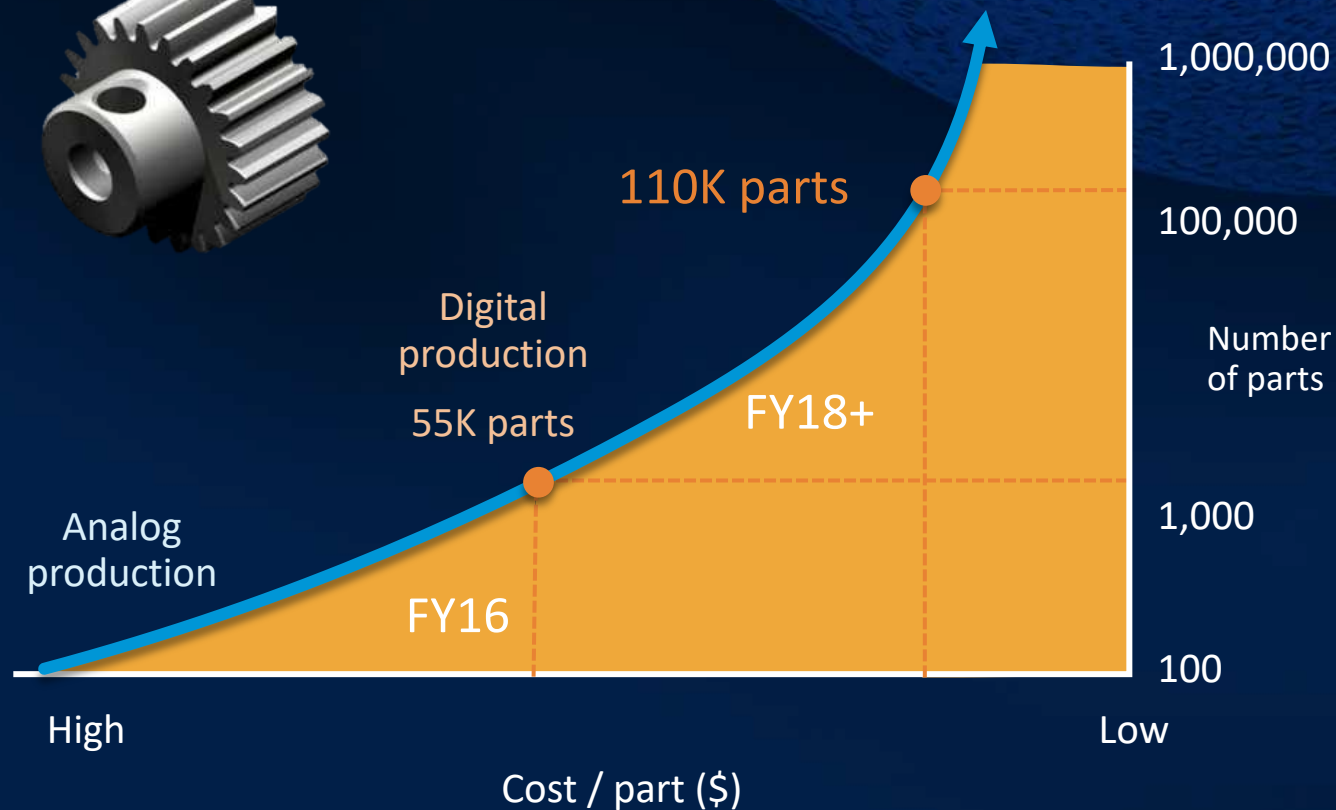


[HTTPS://WWW.YOUTUBE.COM/WATCH?V=BUKSLI2SEDY](https://www.youtube.com/watch?v=BUKSLI2SEDY)



SIGNIFICANT MOMENTUM IN THE FIRST YEAR

DELIVERING BREAKTHROUGH ECONOMICS



Driving
materials costs
down

Reducing
cost-per-part (CPP)

Doubling
break-even
to **110K**

CONTINUE DRIVING THE DIGITAL INDUSTRIAL TRANSFORMATION

EXPAND PORTFOLIO AND ADDRESSABLE MARKET



Color

New **voxel level**
design and applications

One technology
for prototyping **and** production



Broader portfolio

Cover much **wider**
market opportunity

The new HP Jet Fusion 3D Printer series

New **voxel level**
design and applications

Four different product options starting in the 50,000s EUR

4-AGENT CONFIGURABILITY



JET FUSION 340 3D PRINTER

7.5 x 10 x 9.8 in Build Volume



JET FUSION 540 3D PRINTER

7.5 x 13.1 x 9.8 in Build Volume

Increasing Price →

8-AGENT CONFIGURABILITY



JET FUSION 380 3D PRINTER

7.5 x 10 x 9.8 in Build Volume



JET FUSION 580 3D PRINTER

7.5 x 13.1 x 9.8 in Build Volume

Increasing Price →

**One technology
for prototyping and
production**

CONTINUE DRIVING THE DIGITAL INDUSTRIAL TRANSFORMATION

FUTURE – EXPAND PORTFOLIO AND ADDRESSABLE MARKET

Announce **metals** technology
in **FY18**

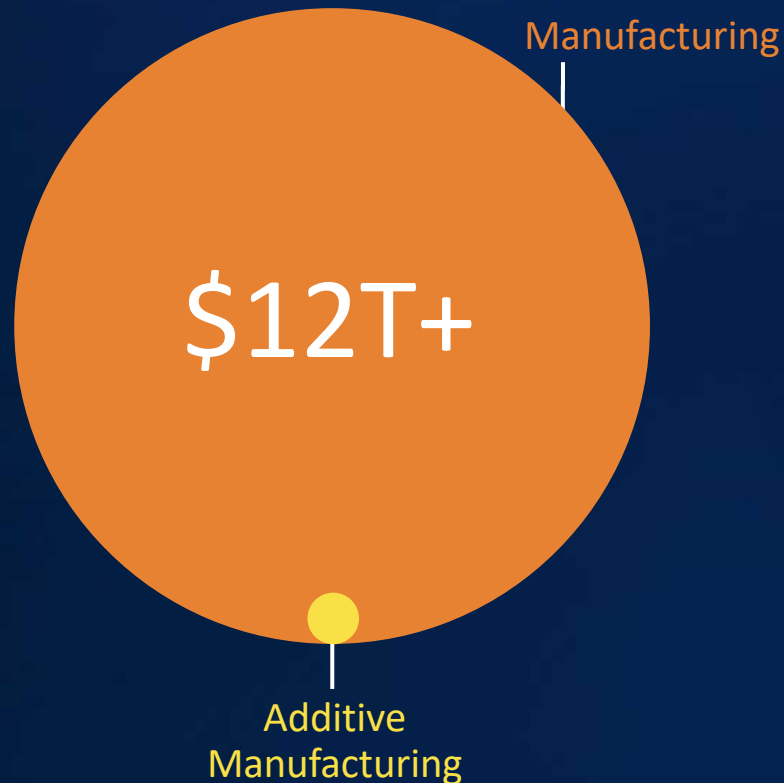
Repeat
disruptive value proposition
of Multi Jet Fusion

Drive new **applications**
and larger **available market**

SIX LEVERS FOR DISRUPTING THE \$12T MANUFACTURING SECTOR

MANUFACTURING SECTOR OFFERS
GREAT POTENTIAL FOR 3D PRINTING

SIX KEYS TO TRANSFORM
THE \$12T MARKET



Product
capabilities



Material
price



Material
selection

Unlock



Design for
additive



New supply
chain



Standards
and Policy

Accelerate



THANK YOU