Tecnologie additive per la produzione: applicazioni nel ciclo di vita del prodotto

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Organizzato da

Today’s Manufacturing scenario

Subtractive Manufacturing (SM)

Formative Manufacturing (FM)

Additive Manufacturing (AM)

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Different rules, different approaches

Subtractive Manufacturing
(e.g. milling & CNC machining)

Removes material to produce the desired shape

- Produces strong parts with good tolerances and repeatability
- Best suited to high volumes and simple geometries
- Intricate shapes difficult to achieve
- Relatively fast process
- Major initial investment
- Generates higher levels of waste

Formative Manufacturing
(e.g. injection molding)

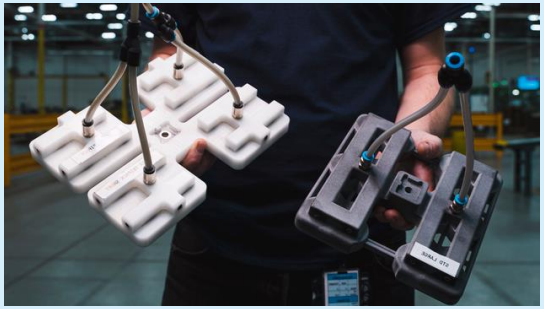
Forms the material into the desired shape

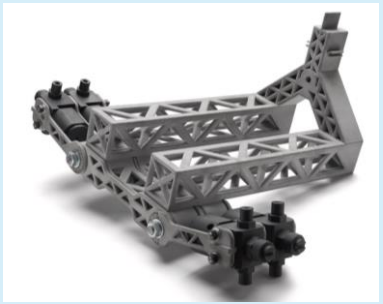
- Produces high quality parts at low cost per part
- Best suited to high volumes
- Requires specific tooling
- Longer lead times (tooling design)
- Major initial investment
- Imposes design constraints, i.e. wall thicknesses, weight, porosity

Additive Manufacturing
(e.g. Multi Jet Fusion)

Builds up the desired shape by adding material layer by layer

- Achieves complex geometries, no assembly required
- Short lead time: quick time-to-market.
- No additional tooling required – no initial investment
- Allows design modifications on-the-fly
- Simple operation
- Ease of customization





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COVID-19 PPE Face shields example

PPE: Face shields

Our customers are printing thousands per day

Avid Product Development

smile DIRECT CLUB

AERECO

...and many others

Application Development In progress

Saturday PM

Monday AM

Monday PM

San Diego office

Friday PM

Deployed at local and in use at local hospitals

Today

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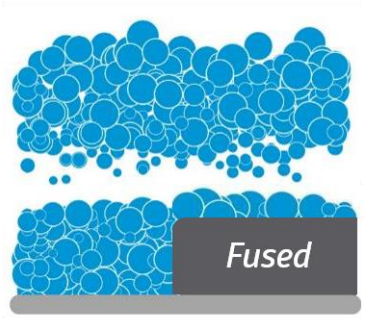
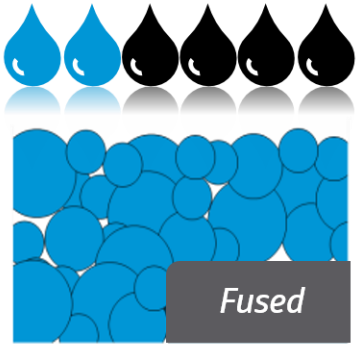
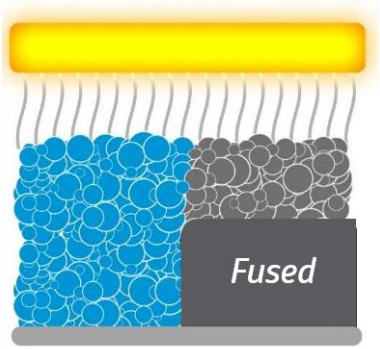
HP Multi Jet Fusion Technology (MJF)

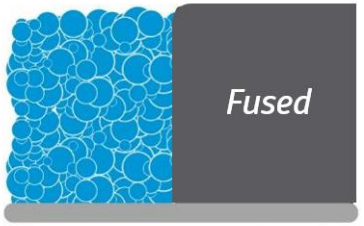
How it works

Material coating | Apply agents | Apply energy | Fusion









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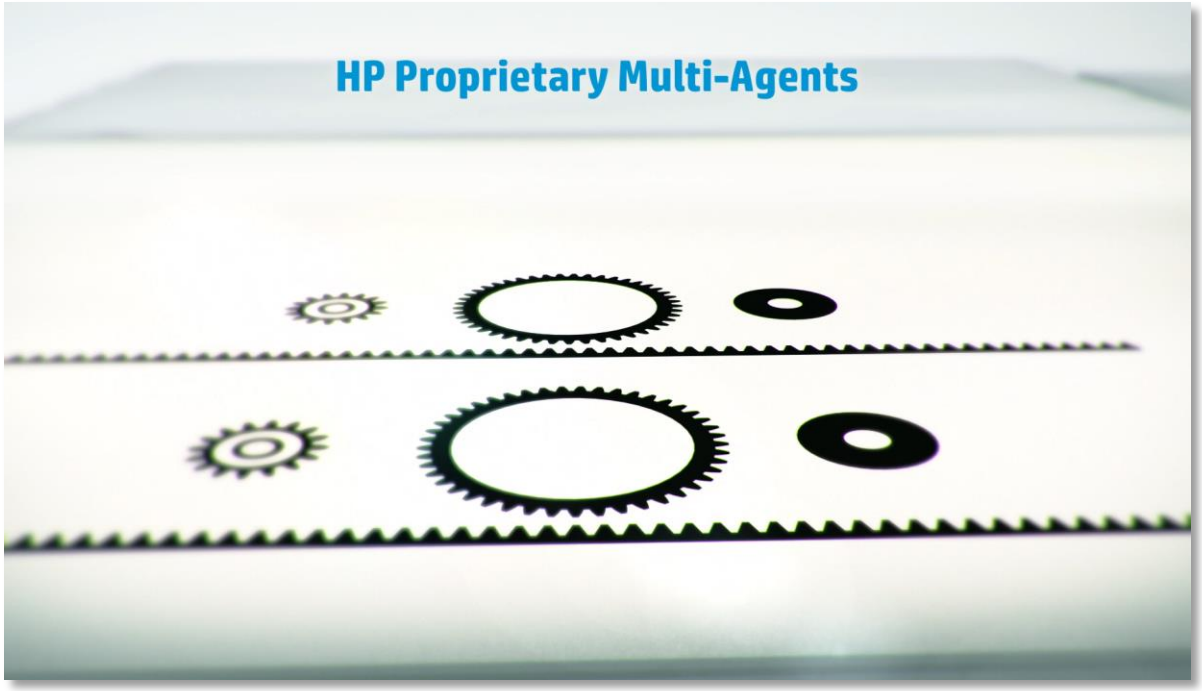

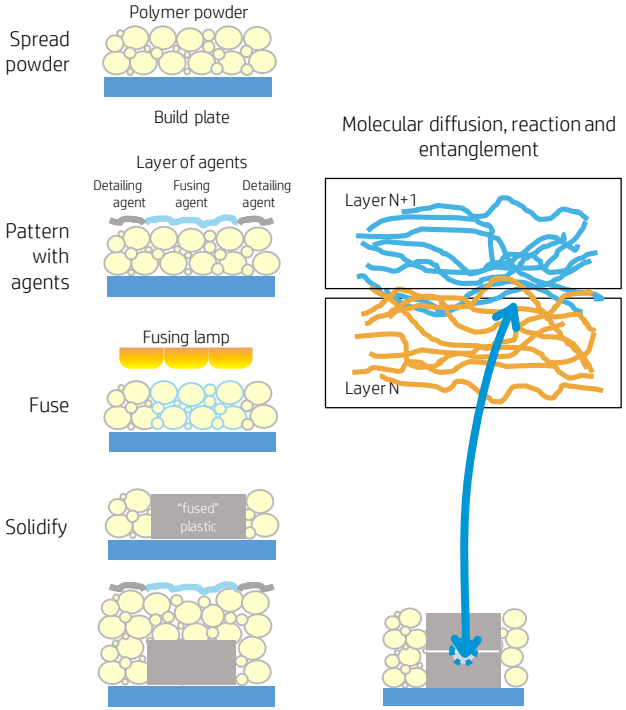

With Multi Jet Fusion technology, the material is **fully fused**, creating **fully dense parts** with high mechanical properties

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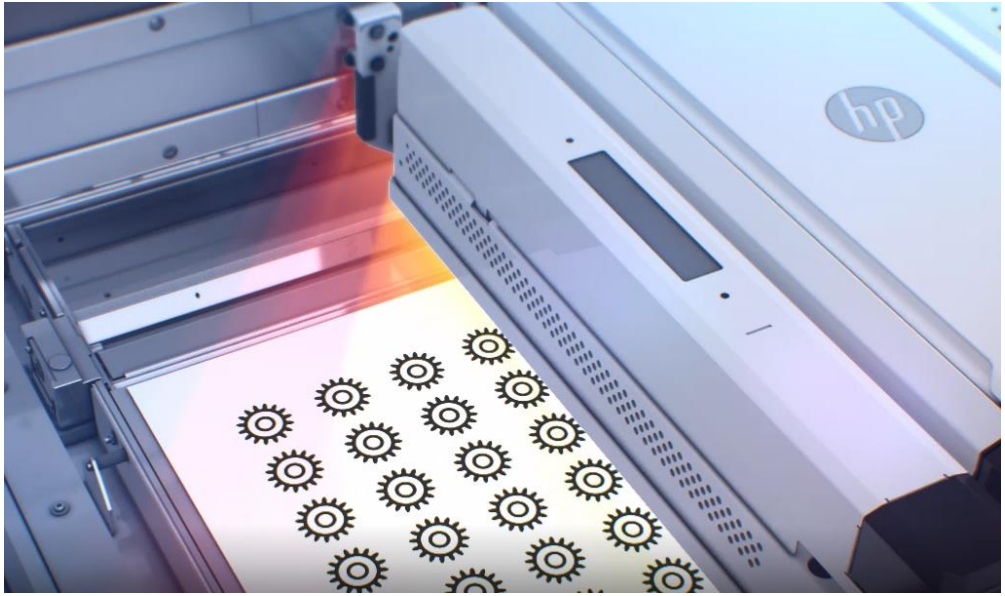

With Multi Jet Fusion technology, it takes the same time to print a layer full of gears as a layer with one gear

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Materials

5200 series

HP 3D High Reusability PA 12

Strong, low cost quality parts

HP 3D High Reusability PA 12 GB

Stiff, low-cost, quality parts

HP 3D High Reusability PA 11

Quality, functional parts with impact resistance and ductility

BASF Ultrasint™ 3D TPU01

Flexible, functional parts

Certified for HP Jet Fusion 3D printers

HP 3D HR PP enabled by BASF

Excellent chemical resistance, welding capabilities, low moisture absorption

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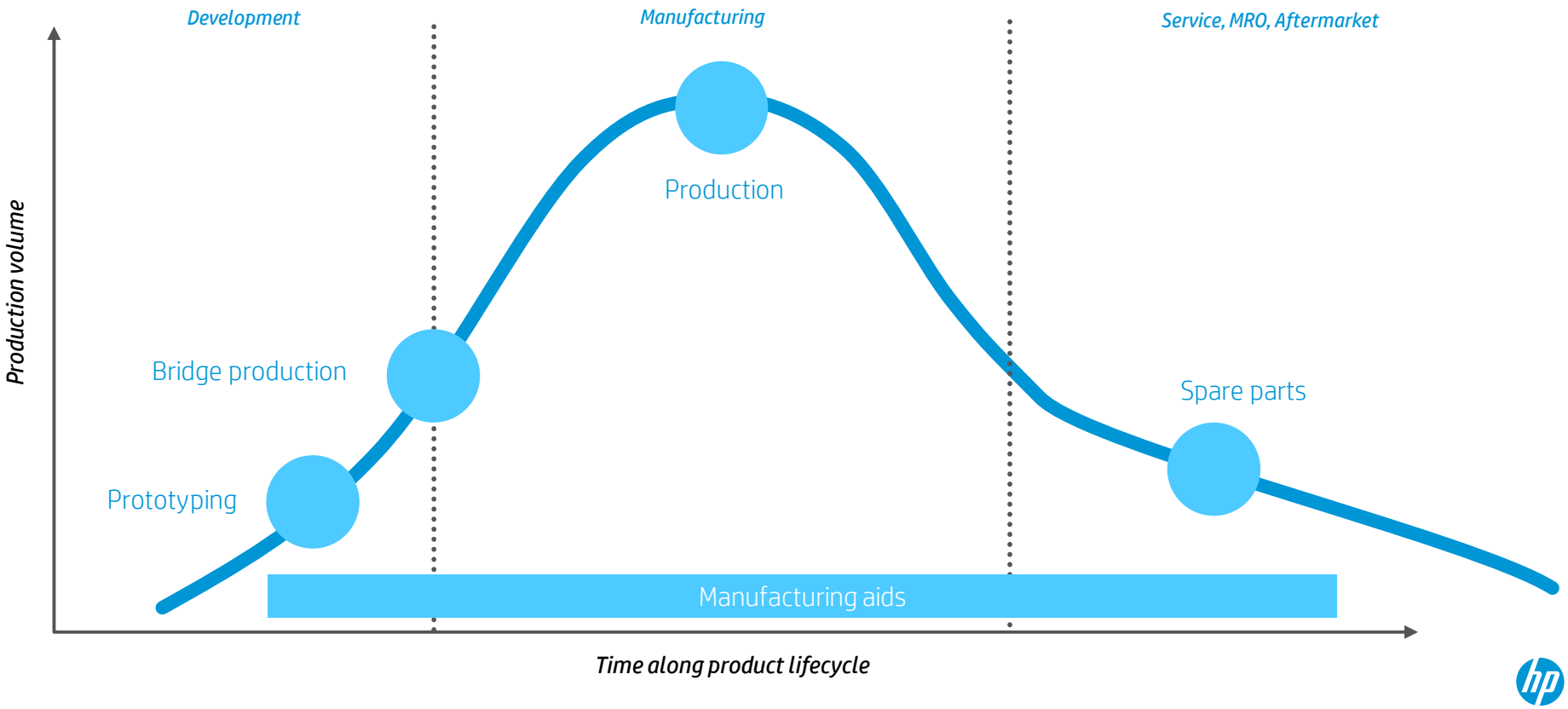
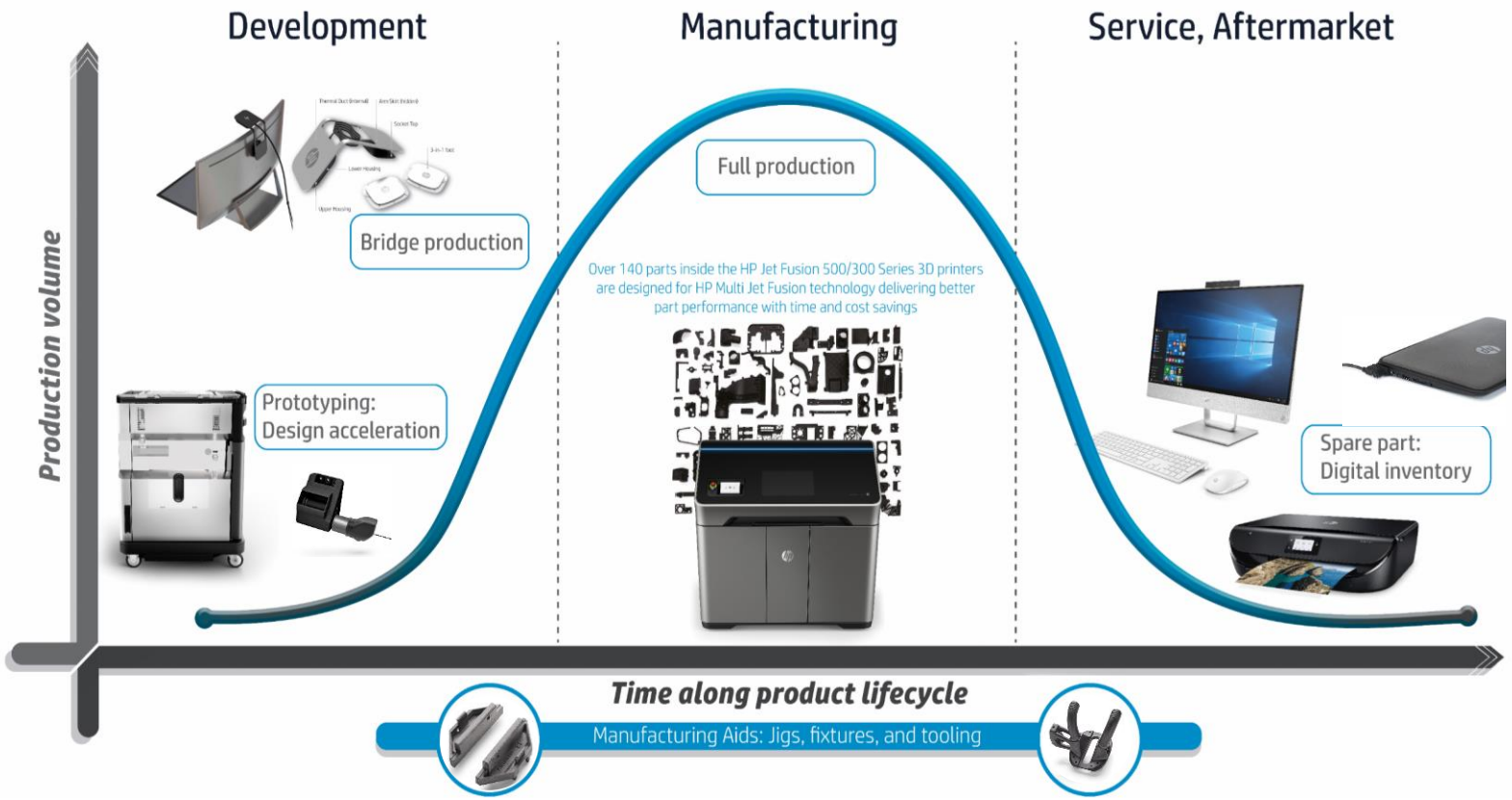
The product lifecycle applications



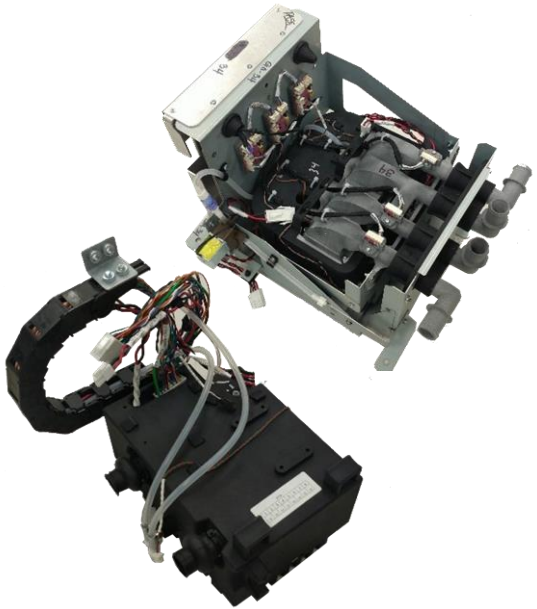
The product lifecycle applications

HP on HP



Accelerated subsystem development

Two new subsystems required



Design for 3D guiding principles

Design strategy

- Commodity and custom parts
- Simple sheet metal
- Minimize custom tool parts freeze and commit early
- Complexity and design changes in Multi Jet Fusion parts

Design for functionality in Multi Jet Fusion only

- Don't design to be tooled later
- Complexity through integration
- Change in Multi Jet Fusion

Enables focus on "how it works" not "how to make"

Results

Schedule enablers

No design for plastic tooling	***4 - 6 weeks***
Internal MJF vs outsourced 1 day vs. 5 day turn for testing	***2 - 3 weeks***
Avoid tooling and tooling changes	***5 - 7 weeks***
Ramp with tested design	***0 - 6 weeks***
Mfg lead time 2 weeks vs 5 weeks	***2 - 4 weeks***
Total savings	***13 – 26 weeks***

Enables focus on integration testing

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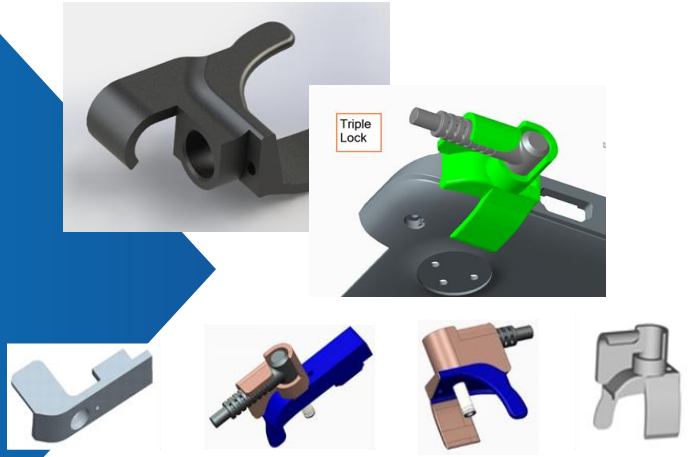
3D Printing for customer support

- Tailor made parts based on customer feedback
- Reduce the iteration process to weeks instead of months
- Rapid mass production of 79,000 MJF parts with HP's Multi Jet Fusion technology
- Reduction of $millions on replacement and supply chain costs
- Improved user experience

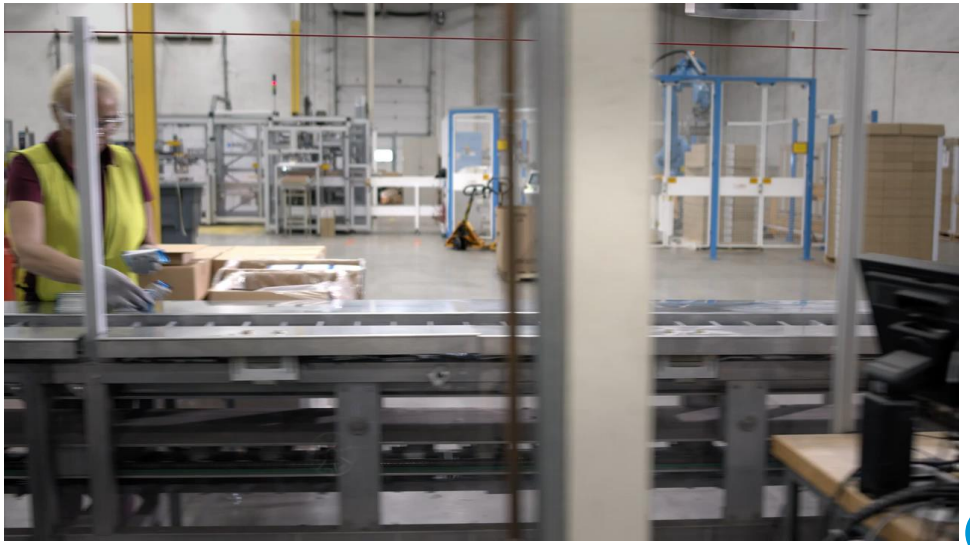


HP Chromebook 11 G5 EE charging cable accessory developed with HP's own Multi Jet Fusion technology

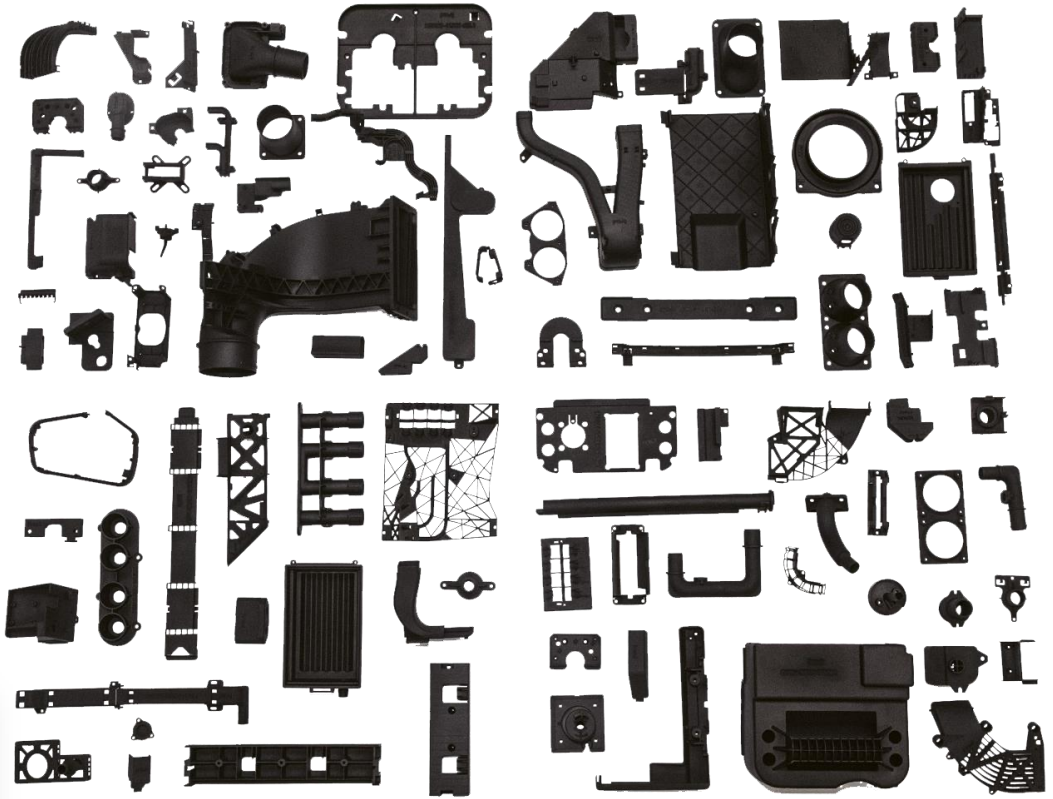
Improving production agility in production lines

Americas Product Completion Center- Packaging HP supplies

- 5K printed parts
- LT reduction 13 weeks to 2 weeks
- 80% cost reduction



HP Jet Fusion 300/500 3D printer



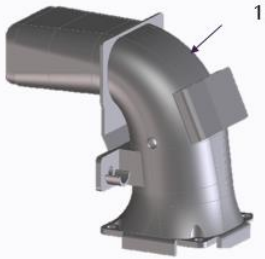
> 140 unique parts 3D printed that met threshold of superior price or price & performance

HP Jet Fusion 300/500 3D printer

MJF enables focus on “how it works” not “how to make”

Injection Molded

Multi Jet Fusion



>30%
total cost reduction

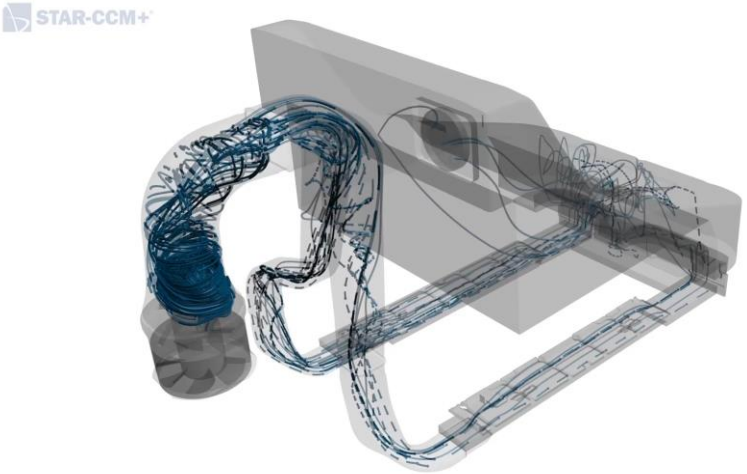
>$190k
in capital expense avoided

Invented by: Samuel Jeong

- No tooling spend or assets to manage
- No assembly / testing required
- Simplified supply chain and qualification
- Time savings for designer

Injection Molded	HP MJF Part Consolidated	HP MJF Part Optimized

Parts: Six Flow: 0.0022	Consolidation in just one part	22.3% Flow improvement



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Possibility of hybrid supply chains

3D Print Lifecycle

Much less cash in inventory

Design → Develop & Validate → Bridge Production → Upside Production → EOL

Faster time to market
Low Investment

Release Checkpoint

Upside use cases
Spare Parts
Forecast variation or Seasonality
Custom

Injection Mold Lifecycle

Design → Make tool & First Article → Mold parameter tuning → Center dimensions & Validate → Stable Production

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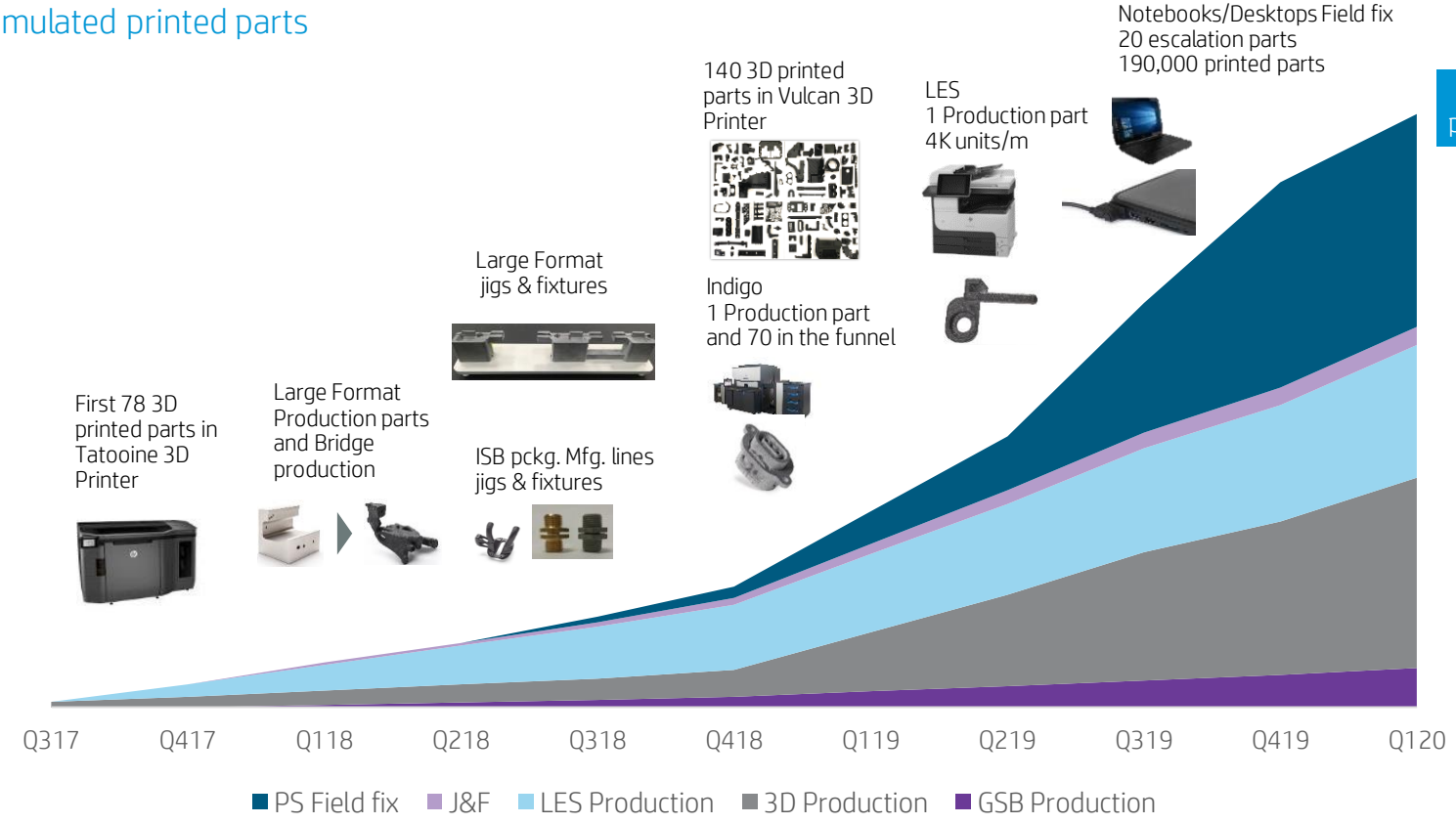
HP on HP 3D printed parts evolution

Accumulated printed parts



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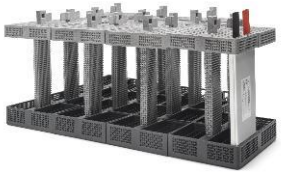
MJF Applications

Transportation

Data courtesy of Heli Racing, printed by Zigg Zagg NV



Data courtesy of Motospirit UPC

Data courtesy of CAF

Industrial

Data courtesy of Ficep S3

Data courtesy of Sag Tubi

Data courtesy of IAM 3D Hub

Medical

Data courtesy of nivellispo

Data courtesy of iOrthotics

Data courtesy of Hulotech, Invent Medical, Crispin

Consumer

Data courtesy of Ballast

Data courtesy of Kupol and Horizons Optical

Data courtesy of New Rock and Wiivv

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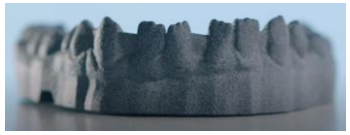
Smile Direct



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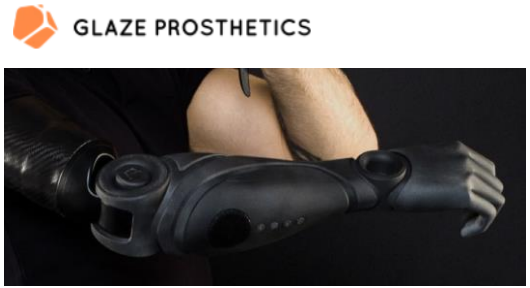
Prosthetics and Orthotics

Pesonalized production

Data Courtesy of iOrthotics

Data courtesy of Invent Medical

Data courtesy of Chabloz Orthopédie, group Ottobock



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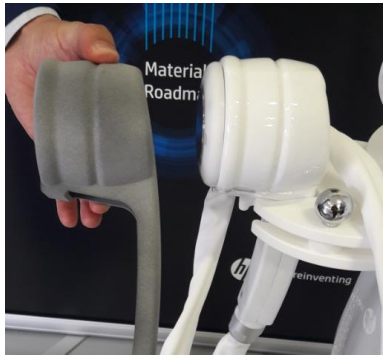
Medical equipment

Rapid development and small batches production



Data courtesy of Leitat/HP
Printed with HP 3D High Reusability PP enabled by BASF

Data courtesy of Everex s.r.l

Data courtesy of Biotec Italia

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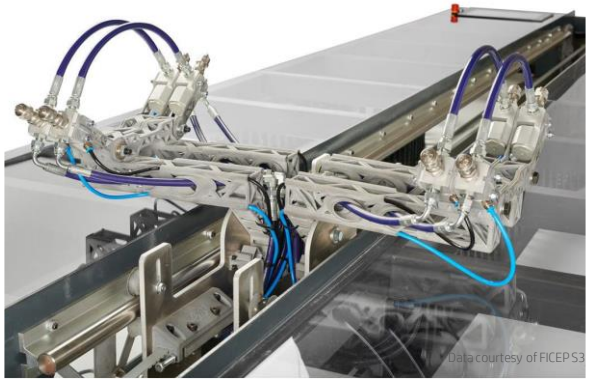
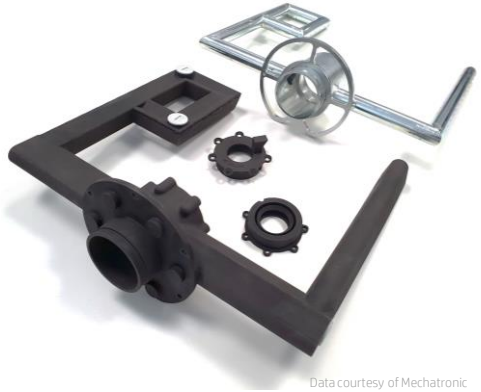
Machinery and Automation

Rapid development and small batches production

Data courtesy of Goglio SpA printed by Elmec 3D



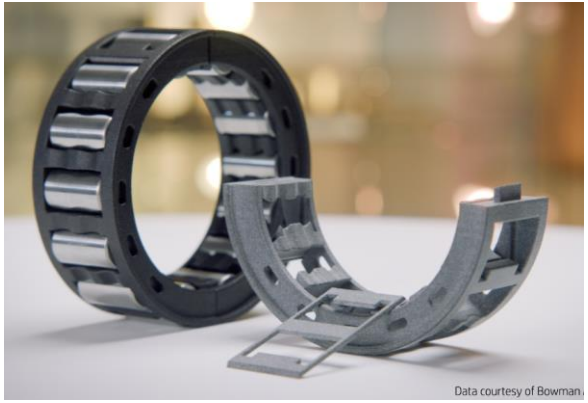
Data courtesy of FICEP S3



Data courtesy of Mechatronic

Data courtesy of Biesse

Data courtesy of Gimatic



Data courtesy of Bowman

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Automotive

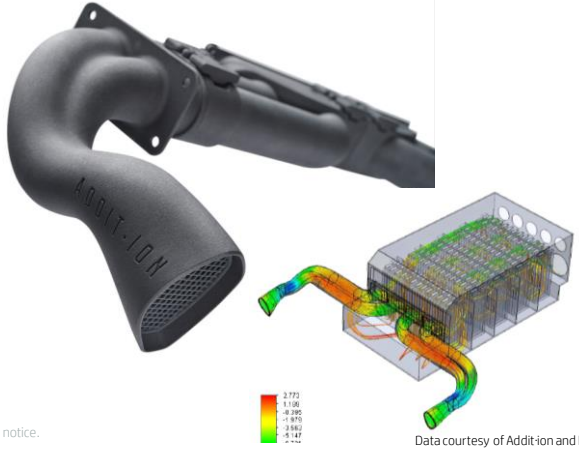
Prototyping, jigs and fixture, innovation

Car bumper printed with HP Multi Jet Fusion technology

Data courtesy of IAM 3D HUB

Data courtesy of BMW

Data courtesy of Extol
Printed with HP 3D High Reusability PP enabled by BASF



Data courtesy of Addit-ion and E-tech racing

Data courtesy of BASF
Printed with BASF Ultrasint™ 3D TPU01

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Design freedom

New shapes and business models

Data courtesy of XYZBAG

Data courtesy of Meidai

Data courtesy of FreshFiber

Data courtesy of Addit-ion

Data courtesy of RP2 B.V.

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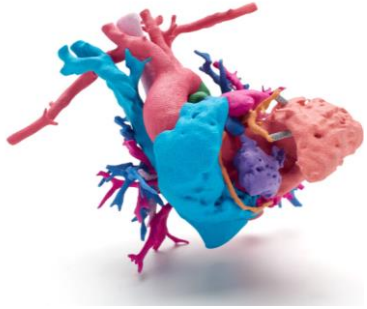
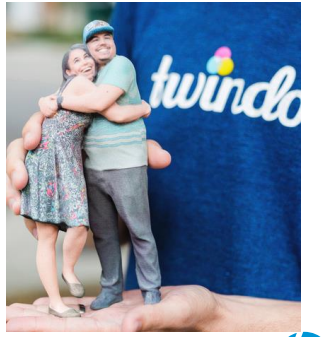
Color capability





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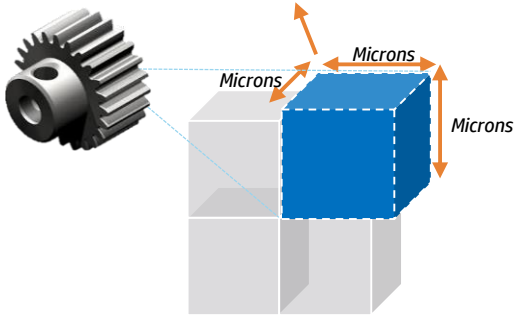
Future possibilities with Voxel control

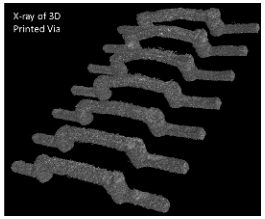
Control of physical properties at the voxel level

- Color
- Texture
- Mechanical properties
- Electrical properties
- Optical properties
- other

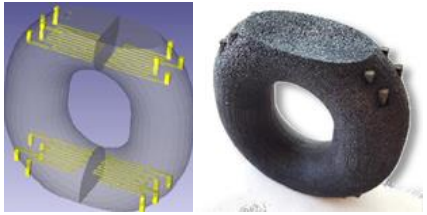


Voxel control providing radical changes

- Conducting tracks



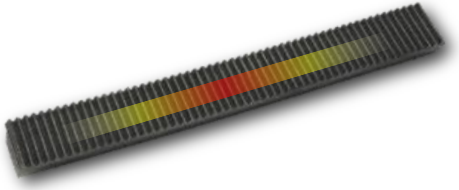
- Gauges



Functional color pieces: Wear indicators

- New rack

- Worn rack



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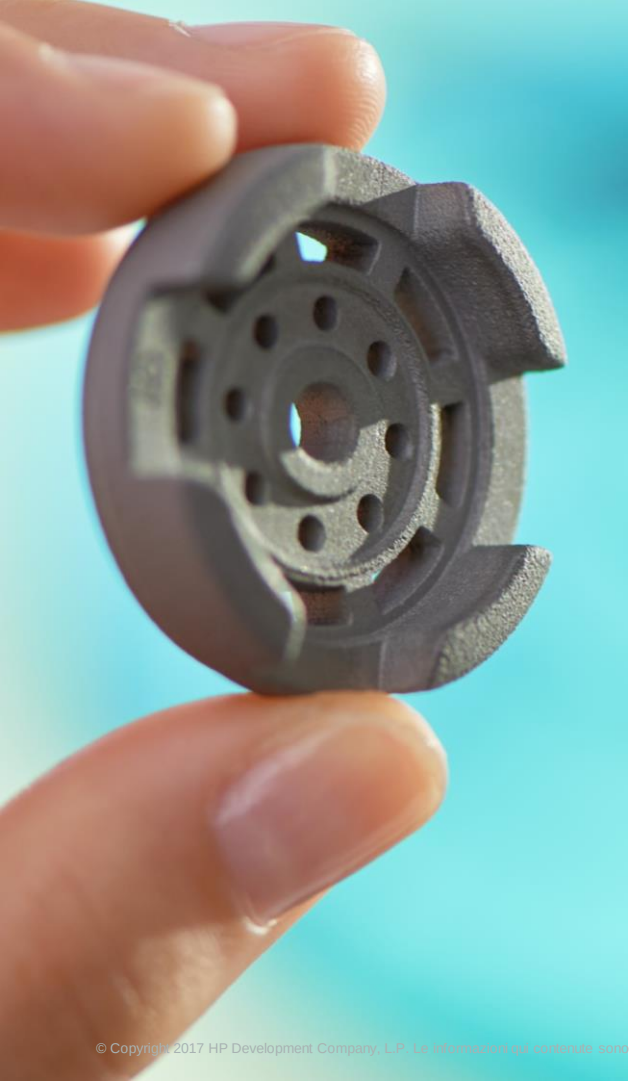
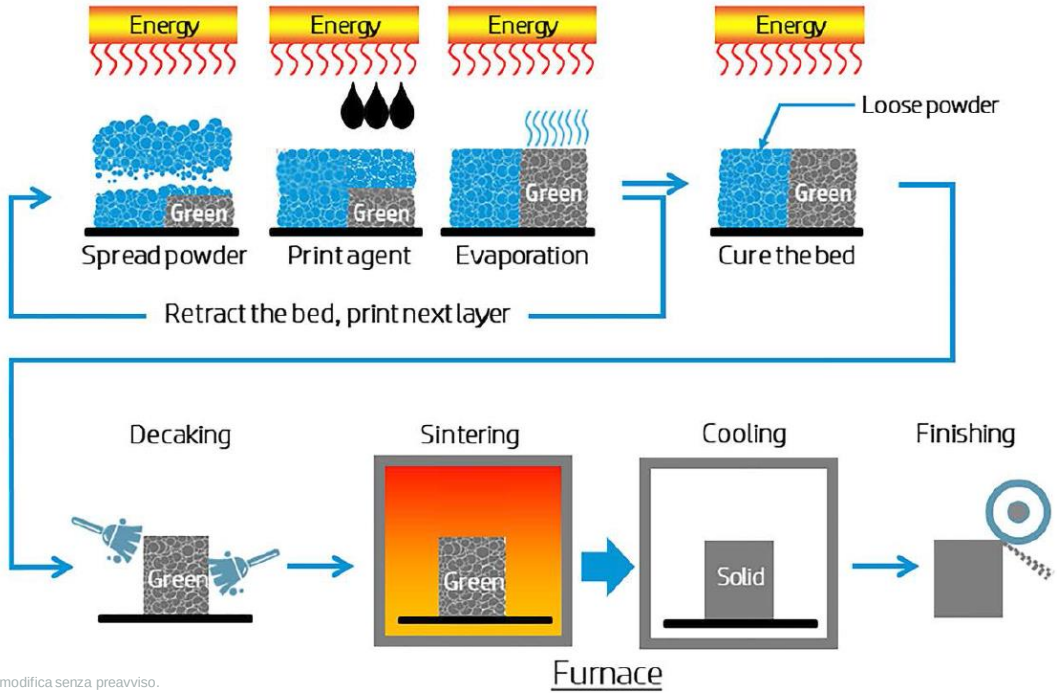


HP Metal Jet technology



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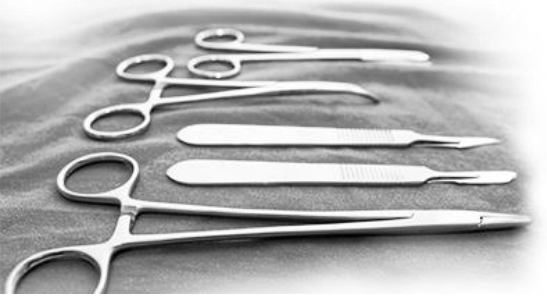
HP Metal Jet

PARMATECH
An ATW Company

OKAY INDUSTRIES

Primo Medical GROUP



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Grazie

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