



3D-Printing enables Distributed Production in a Digital World

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3D-Tage-Nord
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Agenda

→ Distributed Production

AM Production Optimization

Holistic Process Verification

→ Dr. Marius Lakomiec
Team Manager
Digital AM Solutions

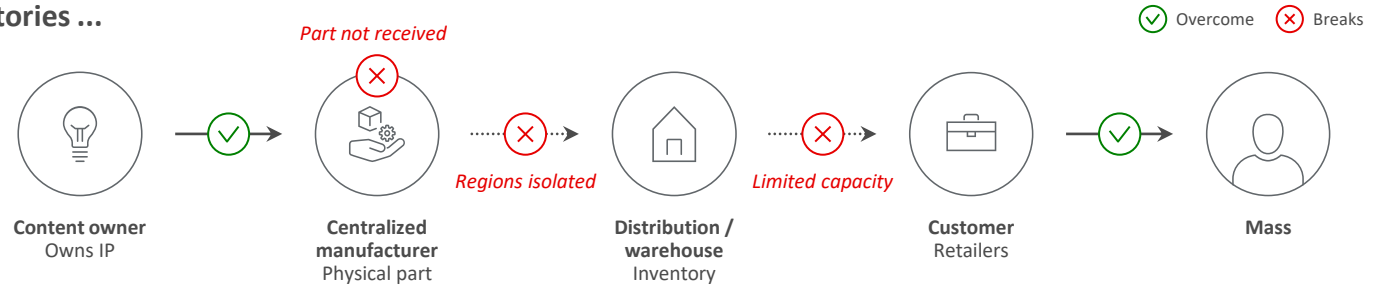
→ Application Specialist
Polymer Programm

How distributed production can overcome breaks in the global supply chains during global crises



From large centralized factories ...

Mega scale
Global trade
Physical goods



From large centralized factories ...

Micro scale
Local trade
Digital designs



Industry Example:

Medical mass production of certified 3D-printed nasal swabs



Challenge

- Locally develop and manufacture cost-effective and reliable nasal swabs for PCR test kits to meet the surge in demand for COVID-19 test kits

Solution

- Manufacture with EOS PA2200 and EOS Polymer AM systems to fulfill the requirements of class IIa Medical Devices
- AM & medical knowledge to accelerate from design to production

Results

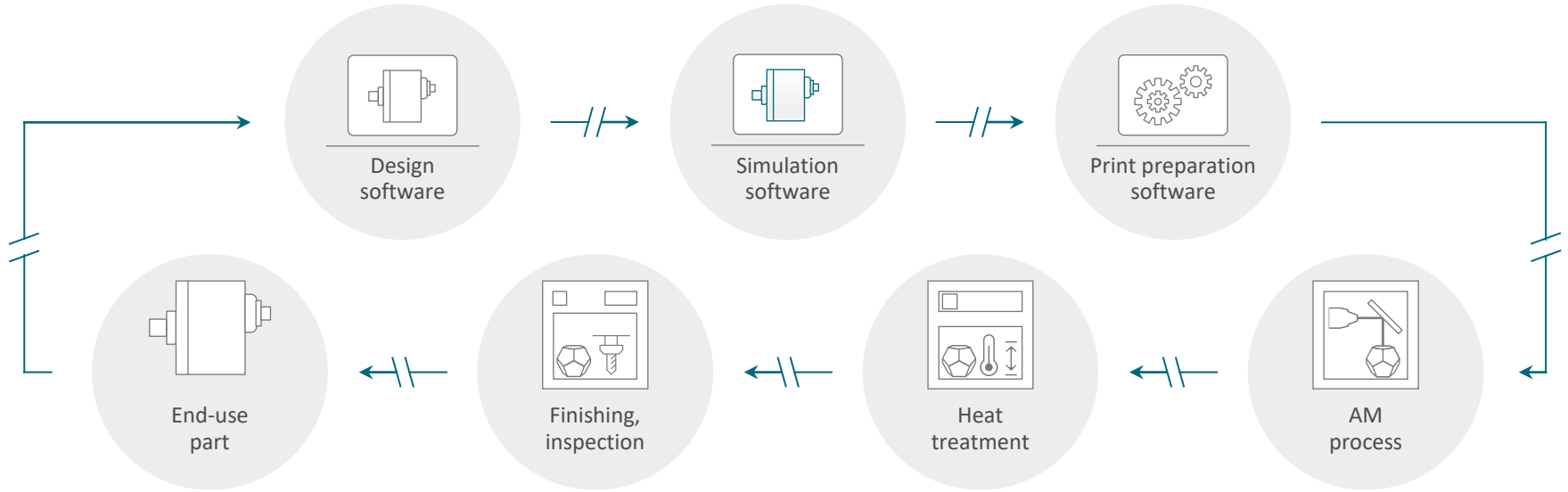
- Nasal swabs certified by the Spanish Health Authority
- Up to 40,000 swabs printed per day
- Decentralized on-demand production in Europe and North America



Nasal swabs with porous-specific activated surface on the head plus highly flexible sticks



Today's barriers to industrializing additive manufacturing: Status quo in the current market



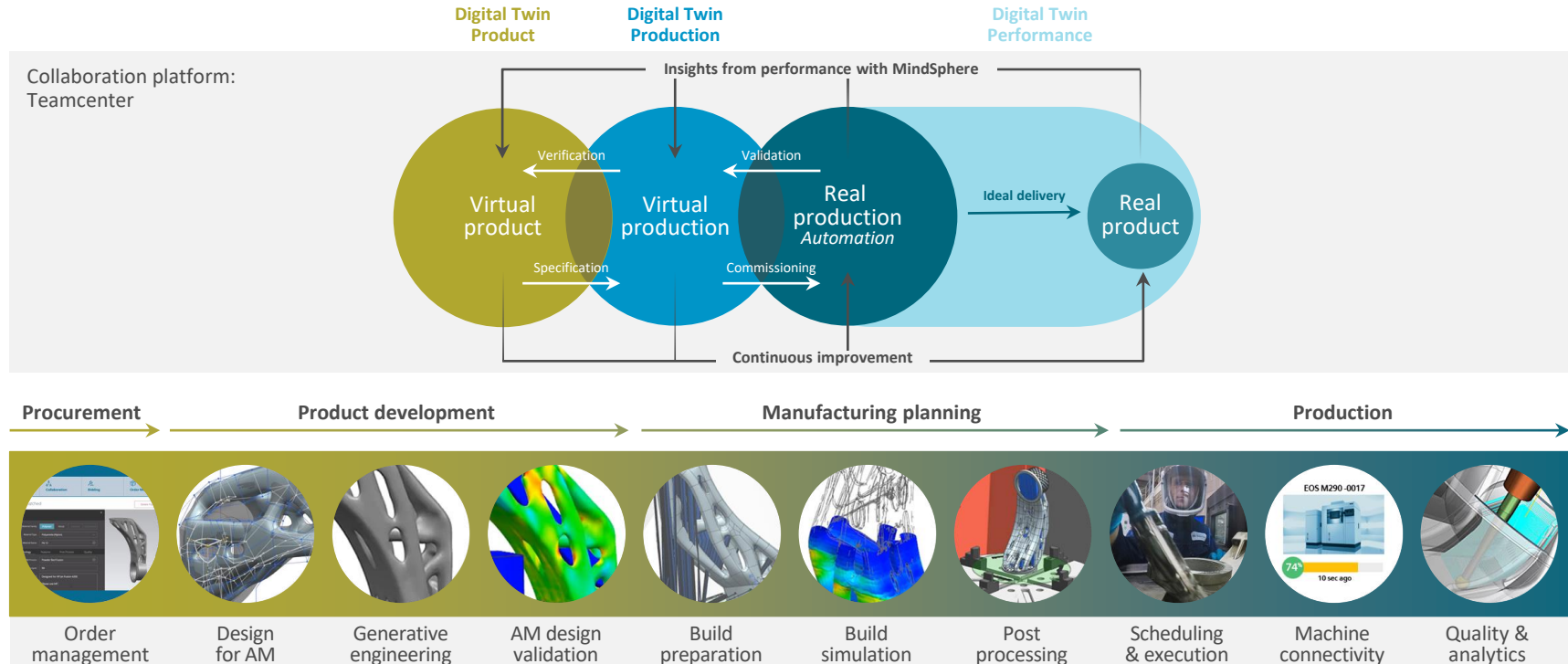
Conventional thinking

Disconnected process chain

Multiple file conversions

Uncontrolled workflow

The future of Digital Additive Manufacturing: Siemens & EOS end-to-end AM Solution



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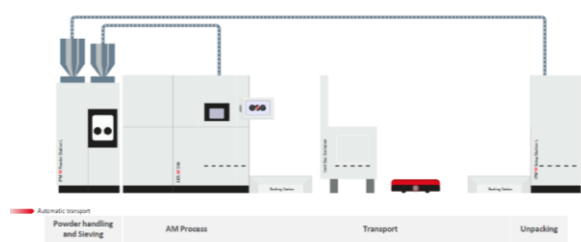
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Introduction Digital Production

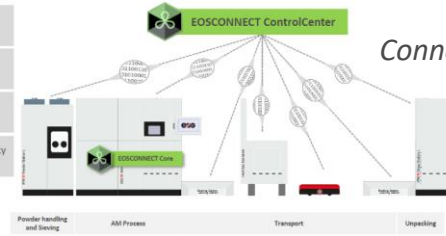


Validating manufacturing with Industry 4.0 ready AM cell

Automation



- ✓ Automated order execution & tracking
- ✓ Process stability
- ✓ Productivity insights
- ✓ Reports on productivity & throughput



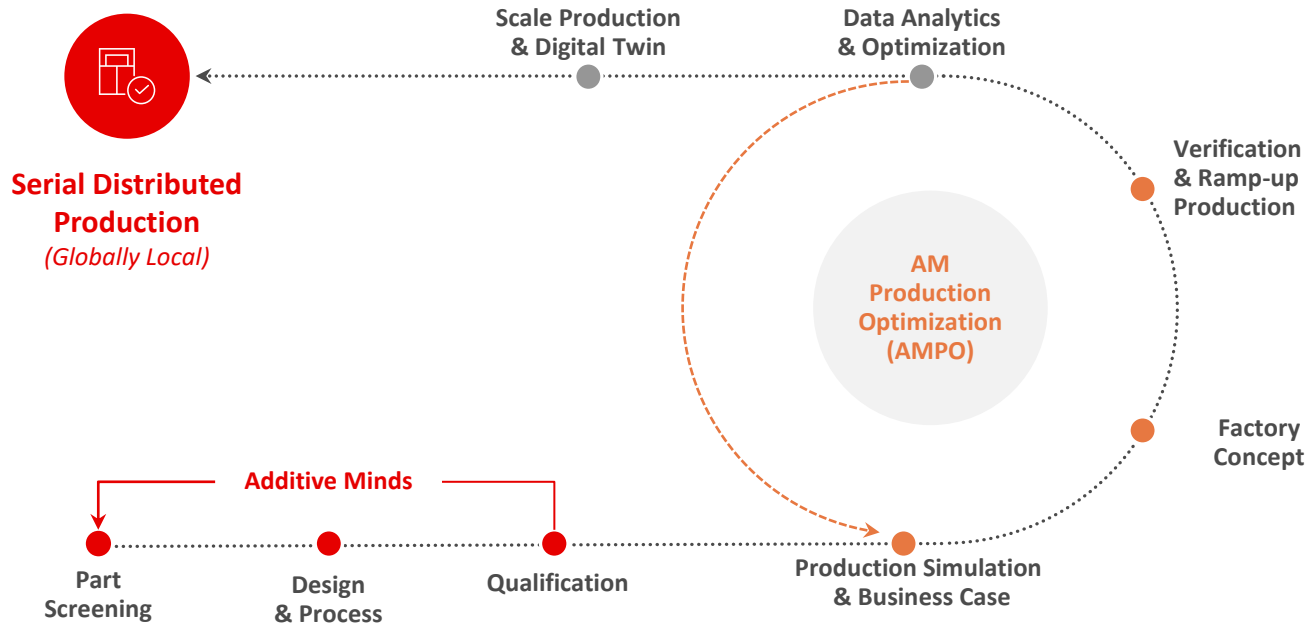
Connected software



Your journey to become a Digital AM Production Champion



Project Execution



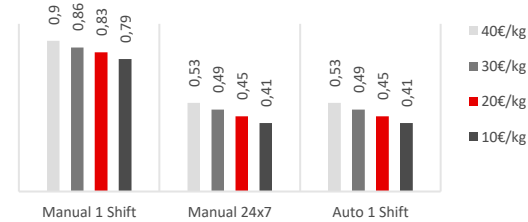
Verification & ramp-up digital production @EOS



Simulation to validation of whole AM process chain

(€/cm³) vs Material cost

Simulation



Data



Validation



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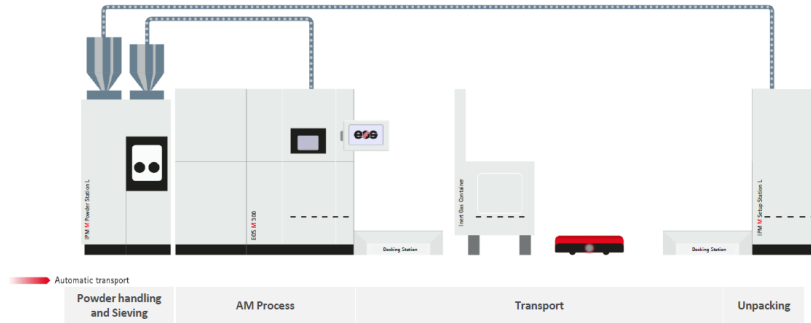
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Testing and running automated production facility @ EOS Maisach with appropriate partners



Optional with
Lifting Trolley!

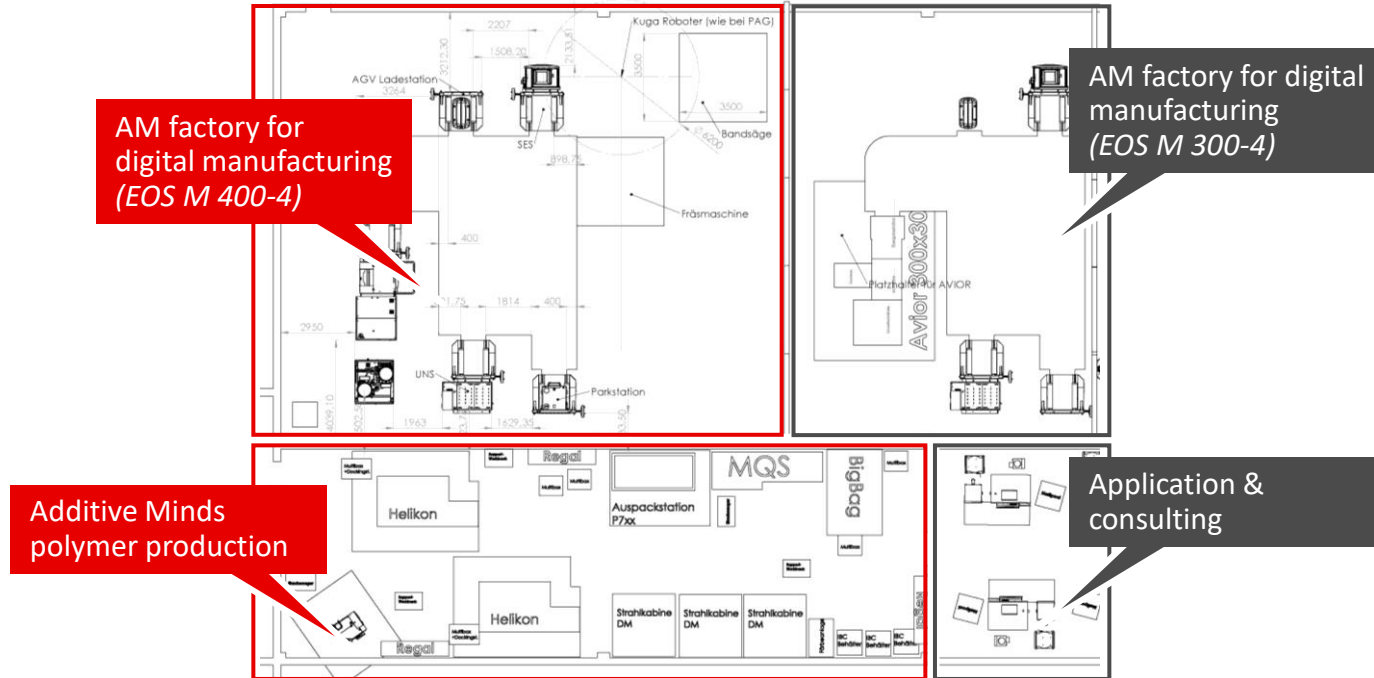


SIEMENS

KUKA


GRENZEBACH

Testing and running automated production facility @ EOS Maisach for factory operation planning insight's



Process verification metal production: EOS internal grid nozzle production for EOS M 290 system



The screenshot displays the EOSPRINT 2.7 software interface. The top navigation bar includes icons for IMPORT, PLACEMENT, SEGMENTATION, EXPOSURE, PREVIEW (active), and EXPORT. On the left sidebar, there are icons for Color Options, Building Time (active), and Collision Check. The main 3D view shows a grid of six blue internal grid nozzle components arranged on a build platform. A 'BUILDING TIME' dialog box is open, displaying the following information:

- BUILDING TIME** (Title)
- Start date: Wednesday, October 09, 2019 8:22:41 AM
- End date: Thursday, October 10, 2019 10:38:02 AM
- Building time:**
- Exposure time: 23:26 h
- Recoating time: 2:48 h
- Total:** 26:15 h (highlighted with a red circle)
- Progress: 100% (with a green checkmark)
- Start button

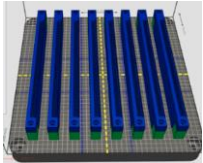
On the right side of the 3D view, a small 'Top' view indicator is visible. Below the 3D model, a text box provides material and parameter details:

Material: AlSi10MG
Parameter: 30μm

Process verification metal production: Production setup – automated version



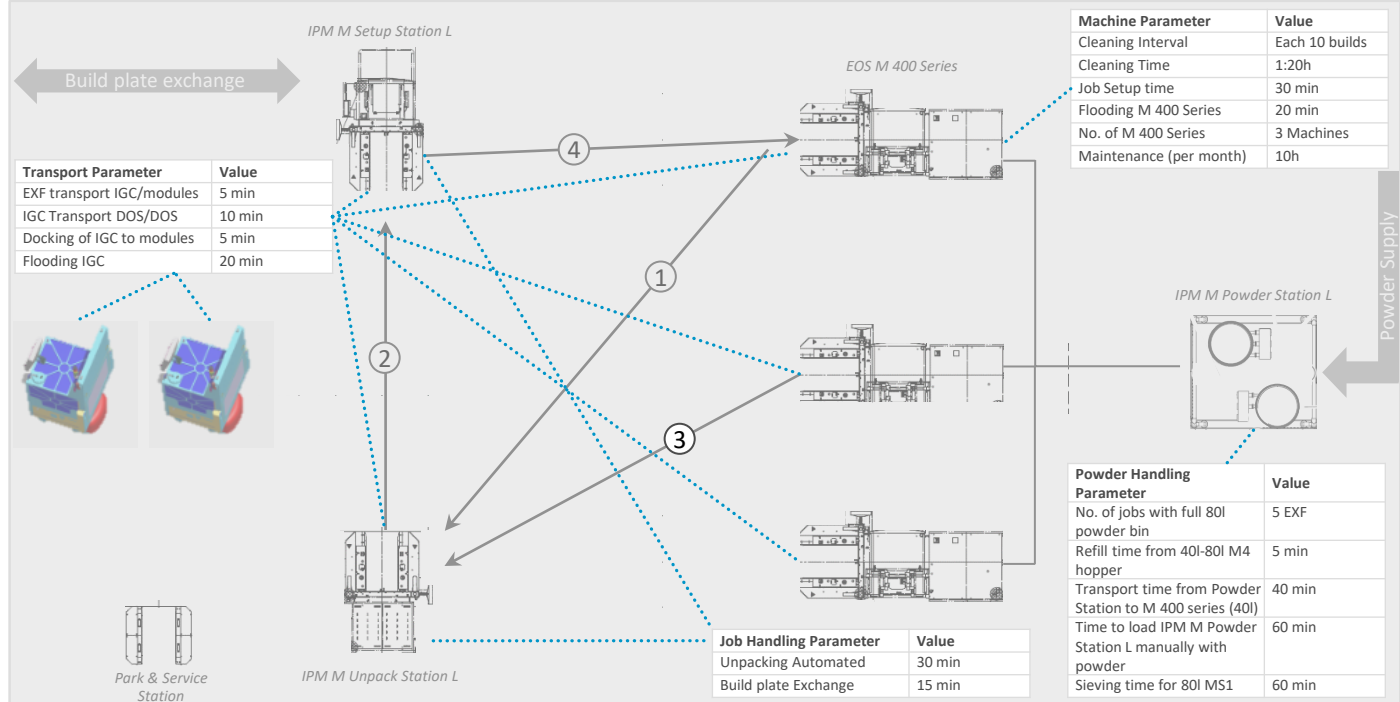
Build Job	Value
M290 Nozzle	8 per building plate
Material	AISI10MG
Process Parameter	30µm
Build Time	26:15h



Initial Start Setup:

- EOS M 400 equipped with full exchange frame
- Powder bin 40/80l full
- Powder supply in parallel to unpacking/building possible
- Lifting trolley also possible

General Parameter	Value
No. of Operators	1
[No. of Operating Shifts	1 shift

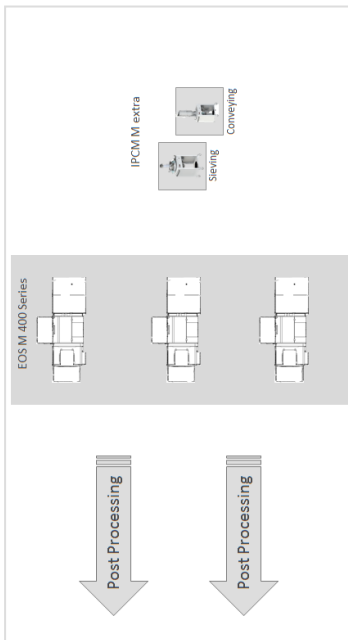


Process verification metal production: Build job calculation (26 hours)



Inline

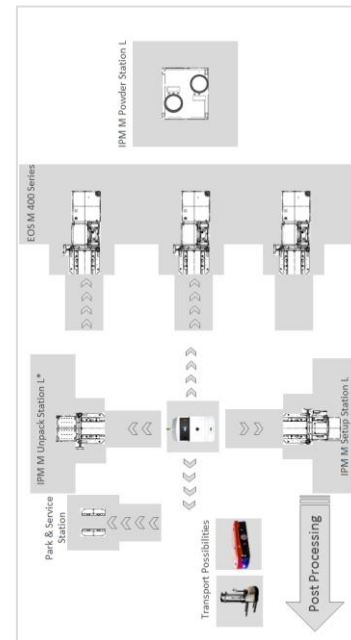
Description	Result
Utilization 3x M400-4	46% (4000h/machine)
Jobs per year	465
Investment costs	100% - base investment
No. of shifts	1 (Mon-Fri)
Workers	1



Machine cost:
325€/part
Pay back period
2.65 years

Semi-/Automated

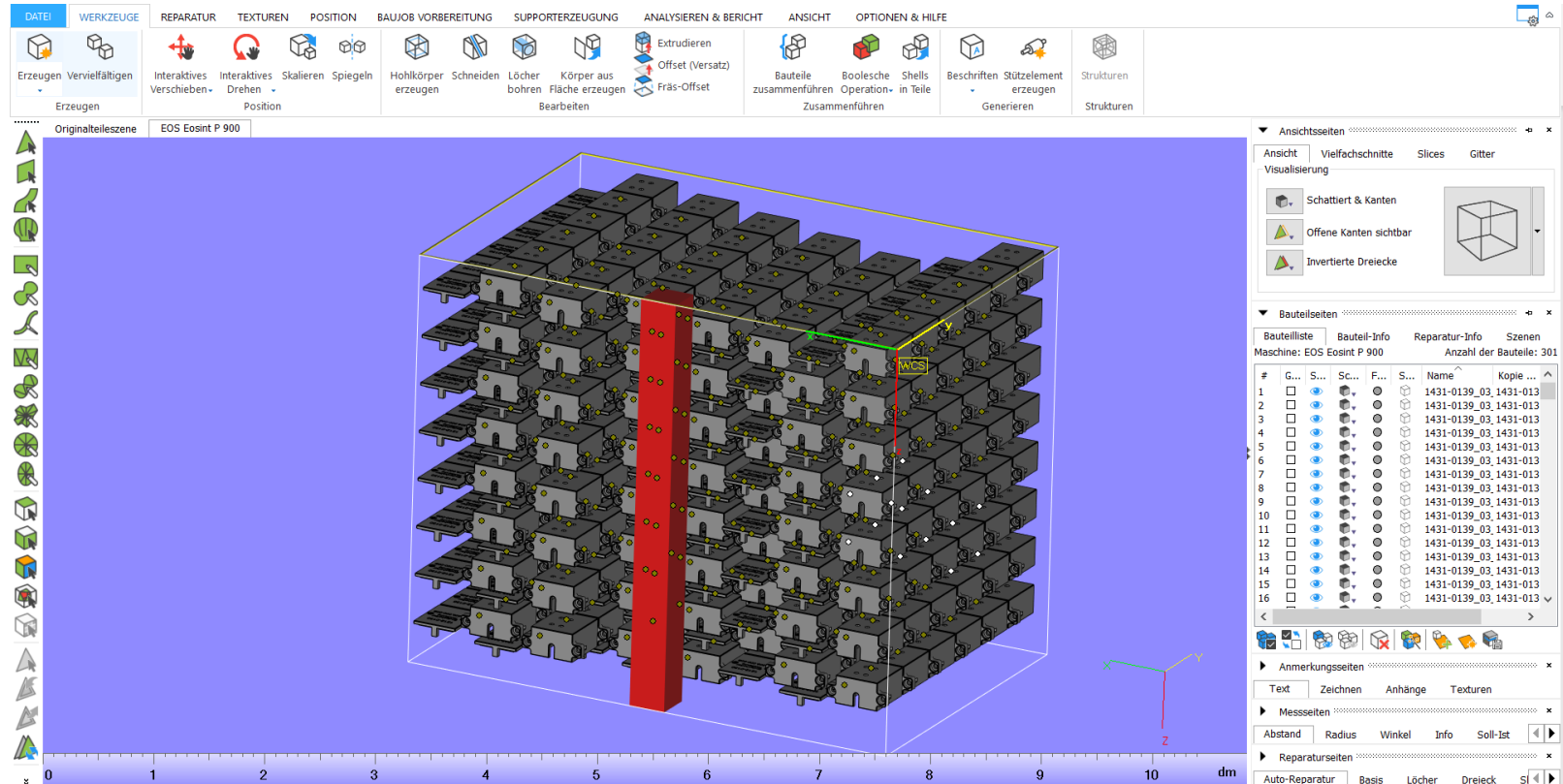
Description	Result
Utilization 3x M400-4	79% (6900h/machine)
Jobs per year	800
Investment costs	+ 22% to 1)
No. of shifts	1 (Mon-Fri)
Workers	1



Machine cost:
200€/part -38%
Pay back period
1.89 years

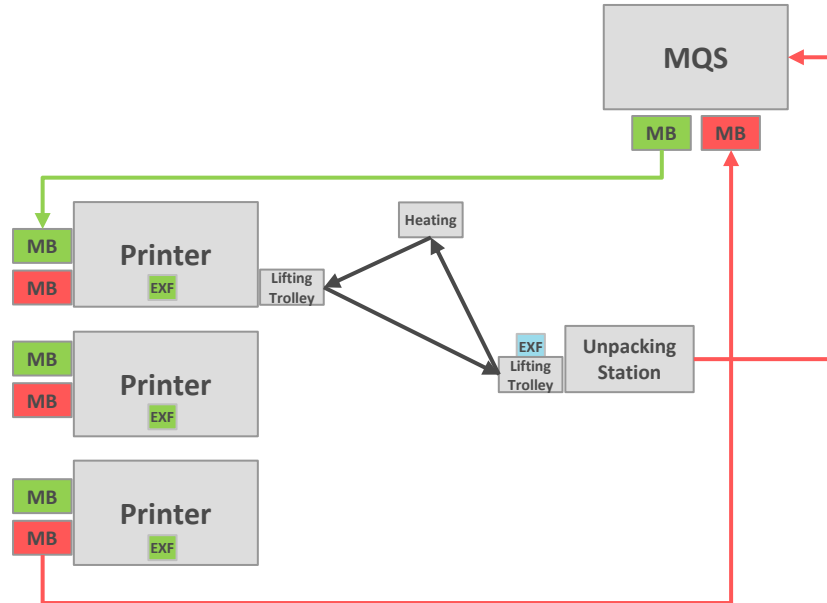
*Best case simulation and for demonstration only.

Process verification polymer production: EOS internal production parts “Etikettenhalter”





Standard Setup EOS 2021

EOS P500 vs. LaserProFusion



Scenario 1

	EOS P 500	LaserProFusion
Total Parts	251.740	633.040
CPP	8,72 €	5,92 €

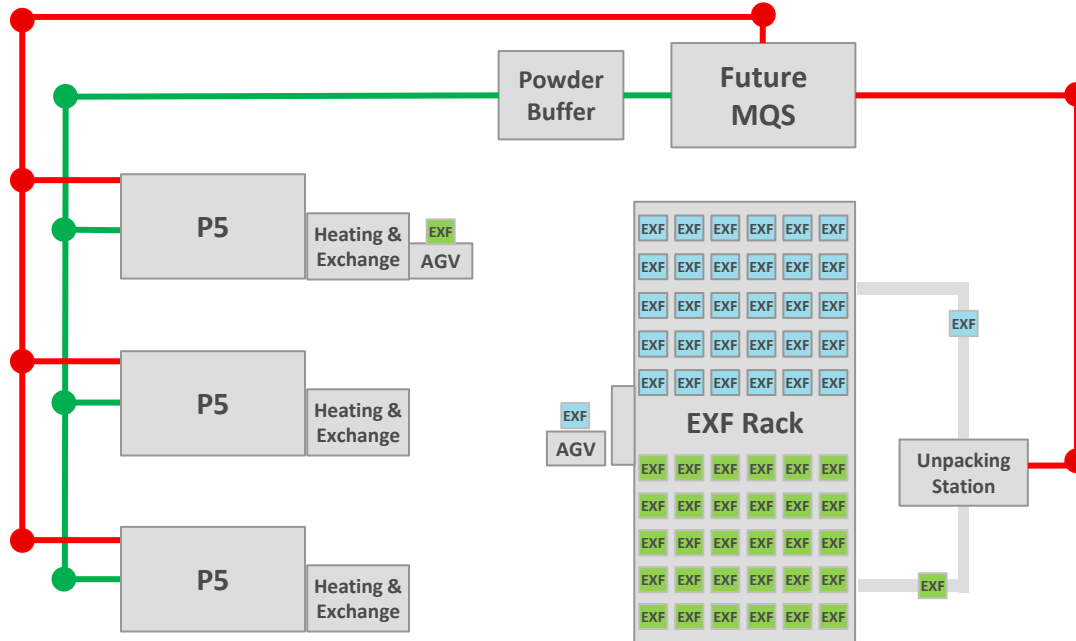
 = Sieved Powder MultiBox
 = Used Powder MultiBox



	EOS P 500	LaserProFusion
Total Parts	533.410	1.817.940
CPP	5,43 €	2,53 €

EXF = Empty Exchange Frame
EXF = Finished Job

Future Setup with highest uptime and central EXF rack and powder management



EXF = Empty Exchange Frame
EXF = Finished Job

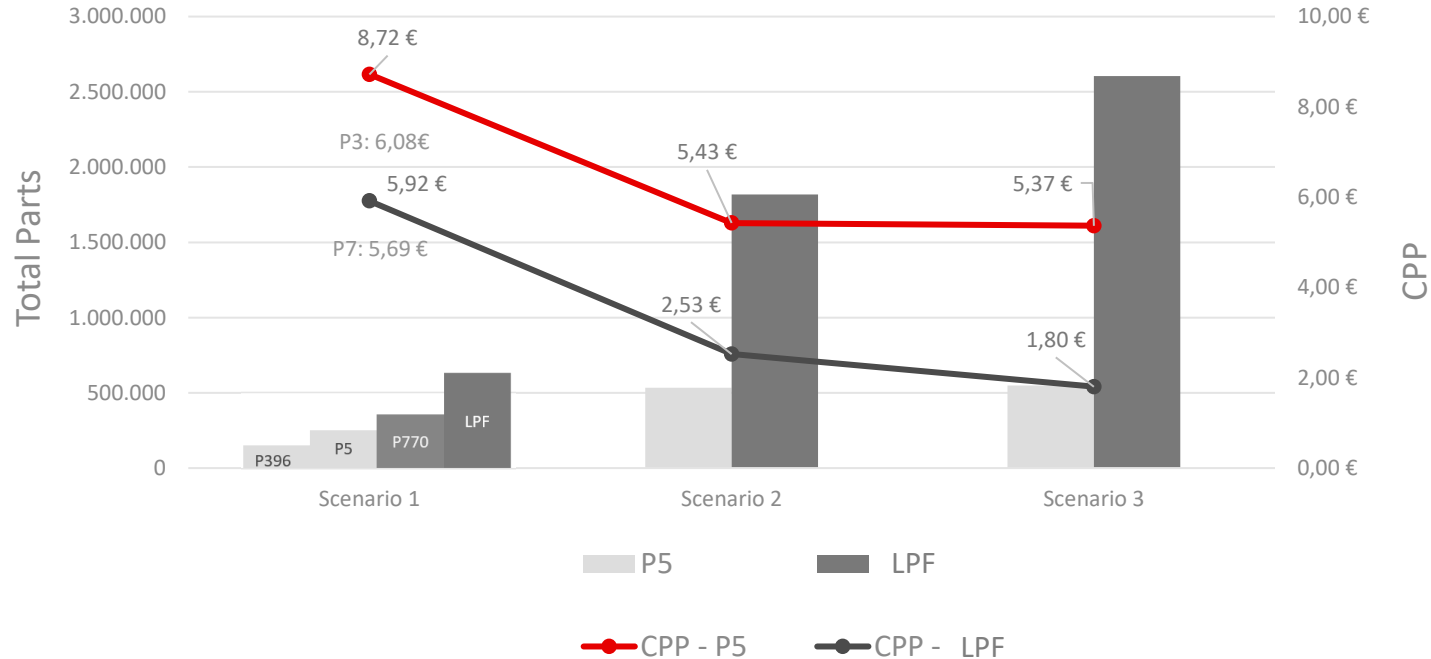
Scenario 3

	EOS P 500	LaserProFusion
Total Parts	548.580	2.603.910
CPP	5,37 €	1,80 €

Productivity and CPP comparison for 3 Setup Scenarios



EOS P500 vs. LaserProFusion



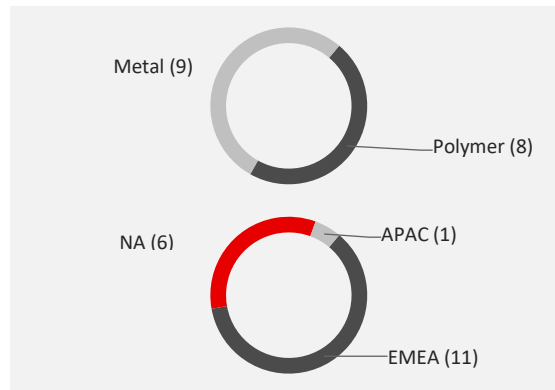
AM production optimization 2020 in numbers



Projects by region and technology

The request for polymer or metal analysis is equally asked for with a slight trend to metal, but a strong focus on EMEA.

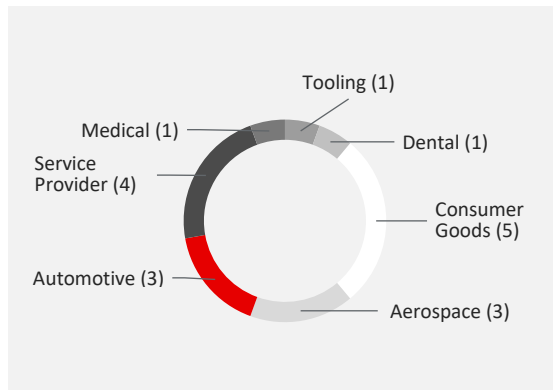
Highest grow in NA



Projects by industries

Interesting push from consumer goods industry, aerospace still dominant.

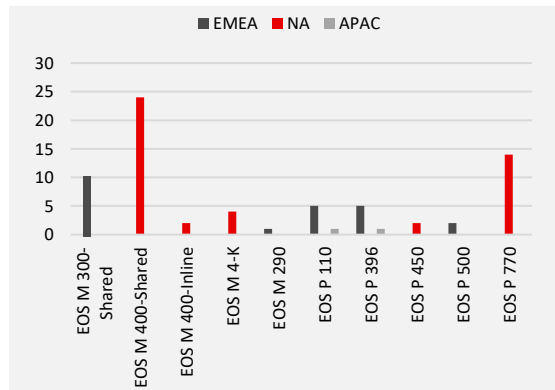
Possible explanation: comparatively high risk of entering the AM market and therefore a thorough calculation is key for a promising transition.



Trends & key takeaways

Strong request on systems with potential for automation.

Metal Industry shows highest demand, automation is mandatory – not an option – for both M & P.



EINLADUNG:

Gemeinschaftsarbeitskreis Digitalisierung

DIN

Aufgabe:

Normen und Standards zu den Informationstechnischen Aspekten der additiven Fertigung zu erarbeiten

Themen:

Datenformate, • digitale Daten, (geometrie- prozess- und qualitätsrelevante Daten) • Schnittstellen • Softwarearchitekturen • Domänenspezifische Anforderungen an den Einsatz aufkommender digitaler Technologien wie Blockchain, Distributed Ledger Technologies, Künstliche Intelligenz, Cybersecurity.

Veranstaltungen:

Öffentlicher Workshop
am **30.11.2021**
zu digitalen
Technologien in der
additiven Fertigung

Anmeldung bis 20.11.2021
bei der Geschäftsstelle

Sitzungsturnus:

Halbjährlich, nächste
Sitzung 30.11.2021

Kontakt:

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Questions?



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A large, abstract, circular graphic on the left side of the slide. It features a bright, glowing orange and yellow ring around a dark, textured blue and purple center, resembling a celestial body or a stylized eye. The graphic is set against a dark, textured background.

Thank you for your
attention.

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