increase productivity in the Metal 3D Printing industry

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3D Valley Conference, Aachen
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Agenda

1. Introduction Materialise
2. Costs M3DP
3. Metal Competence Center
4. Actual research programs
5. Results
6. Outlook
Bremen - 1989
Leuven - 1990
Bremen - 2016
Europe’s Largest Single-Site Factory for 3D Printing

- 51x Laser Sintering
- 45x Stereolithography
- 38x Fused Deposition Modeling
- 10x Metal 3D Printing
- 8x MultiJet Fusion
- 5x Polylot
Growing Our Expertise, Worldwide

24 offices in 19 countries

+210 patents granted
+165 patents pending

+1800 employees
Creating innovation and competitive advantage across industries

>> Delivering premium software, engineering and 3D printing services
3D printing of Aluminum
Demands of Future Cost Developments

- Visionary outlook on costs with evolutionary development in powder bed technologies

- **start scenario**
  - 4.500 - 2.000 €/kg

- **today**
  - 2.000 - 700 €/kg

- **vision 2025**
  - 500 €/kg

- **vision 2035**
  - 100 €/kg

- Powder cost 30 €/kg
- Machine cost 1/3
- Increased built rate factor 10
- Process automation

- Powder cost 10 €/kg
Cost structure metal 3D printing today 500, - EUR/kg Aluminium 2025?

Potentials cost reduction M3DP

- Automatic data preparation
- PRE check of printing data
- Faster printing by min. 100%
- In Situ quality control
- Automated post processing
Metal Competence Center (MCC)

**Consulting**
- Internal & external customers
- Hard- & Software topics
- Design & engineering

**R&D**
- New processes
- Materials / new alloys
- Quality in metal AM

**Test & Validation**
- Materialise products in metal production
  - e.g. e-stage for metals, Streamics, Inspector, metal build processors

**Materialise**
-innovators you can count on
Funded metal projects started in 2017

- InSensa
  In-prozess Sensorik und adaptive Regelungssysteme für die additive Fertigung

- Add2Log
  Die Plattform für dezentrale Produktion auf Basis additiver Fertigung und agiler Logistik

- Proceed
  Ariane space consultancy for 3D printing of structural components in Ariane 6

- ESA AO8273
  Understanding of production requirements for space hardware

- Orbitallander
  Entwicklung, Fertigung und Test einer Schutzvorrichtung für eine landende Raumsonde

- AddAll
  Additive Manufacturing for Aluminium Launchers Structures
The results are part of the project „In-process sensors and adaptive control systems for additive manufacturing (InSensa)“ funded by Federal Ministry BMBF with funding ID 02P15B076.
Advanced process quality assurance

1. MCP

2. New sensors

3. Part and error database as information pool

4. Intelligent control algorithms

5. Process adaptation based on error detection

Process errors
New sensor integration

- Self designed on axis sensor unit
- Self printed/milled customized components
- Modular sensor usage
  - One-click de/installation
- Possibility to integrate
  - Pyrometer
  - IR camera
  - Topology sensor
The platform for a decentral production based on additive manufacturing and agile logistics

- Increasing productivity
- Faster certification cycles
- Effective usage of capacities for cost reduction
- Fundamentals for standardisation organisations
- Development of new market models for AM industry
# Add2Log – Partners and Funding

<table>
<thead>
<tr>
<th>Companies</th>
<th>Role</th>
<th>Tasks</th>
</tr>
</thead>
</table>
| Software AG        | Developer Software platform   | • Software development  
                                         • Implementation of platform                                      |
| Research Center    | Business model development    | • Development of logistics concept  
                                         • Development of business models                                 |
| Fraunhofer ILT     | Research Center Additive      | • Definition of a specification for building up a data chain in the  
                                         decentralized additive manufacturing  
                                         • Validation of solutions within a Use-Case (new parts business) |
| Additive manufacturer |                | • Linking the Hub with the basic technology                            |
| Logistician        |                              | • Development of logistics concepts  
                                         • Integration in existing process chain                            |
| Manufacturer       |                              | • Validation of solutions within a Use-Case (spare parts business)     |

“Digital technologies for the economy (PAiCE)“

Project term: 01.03.2017-29.02.2020
Project duration: 36 Months
The Add2Log platform forms a centralized coordination structure that connects all participants and improves the performance of the whole supply chain.
Printing parameter machine transfer

Input from ILT lab machine
- Energy density framework
- Layer thickness
- Laser power
- 2 alloys: IN718, 316L

Validation on R&D machine
- 1 job
- 24 parameter sets
- 90% success for main KPIs

Transfer to industrial machine
- 1 job to usable parameter
- 2 high productive parameter sets
- 99% success on main KPIs
# Metal Competence Center (MCC)

<table>
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</tr>
</thead>
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**Materialise magics 3D print suite**
Metal AM: main errors

- Support Failure
- Recoater Collision
- Shrinkline
- Overheating
- Unknown reasons
- Other reasons

79% of all Build Failures
Magics simulation module: Build Risk Assessment

- Support Failure
- Recoater Collision
- Shrinkline
- Overheating
- Unknown reasons
- Other reasons

64% of all Build Failures

Thermal Simulation: Expected in the next release
Magics Simulation Module

- High-end AM simulations brought to production environment
- Ease of use: Simulation or AM expertise is not required, the software will guide you
- Affordable listprice to enable large scale adoption in production space
- Very fast and robust simulations on normal workstation
Thank you for your attention