COMPETENCE INDUSTRY MANUFACTURING 4.0

ADDITIVE MANUFACTURING PILOT LINE

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ADDITIVE MANUFACTURING INTRODUCTION



Additive Manufacturing



3D printing, or additive manufacturing, is the construction of a three-dimensional object from a CAD model or a digital 3D model. The term "3D printing" can refer to a variety of processes in which material is deposited, joined or solidified under computer control to create a threedimensional object, with material being added together (such as plastics, liquids or powder grains being fused together), typically layer by layer. *Wikipedia*

Additive Manufacturing Global Market

Other Architectural and GIS 2.5% Motor vehicles 4.8% 17.5% Government/military 6.5% Academic institutions, Aerospace 8.6% 9.6% Medical/dental 14.7% Industrial/business machines Consumer 11.7% products/electronics 24.1%

 The value of the global additive manufacturing market in 2019 was estimated around 12 billions \$

Wohlers, A., Wohlers Report 2019. 3D Printing and Additive Manufacturing State of the Industry. Annual Worldwide Progress Report. 2019: Associates + CIM Wohlers. Wohlers Report 2019. Wohlers Associates, Inc.

Additive Manufacturing Automotive Market



+CIM

4.0

SmartTech Report on Automotive Additive Manufacturing Market, 2018 (hiips://www.smartechanalysis.com/reports/automotive -additive-manufacturing/)

Additive Manufacturing Tecnologies and materials

Fused Deposition Modelling (FDM)



Materials: ABS & termoplastics (carbon or glass filled)



Stereolithography (SLA)



Materials: Epoxy resins



Multi Jet Fusion (MJF) & Selective Laser Sintering (SLS)



Materials: poliammides (PA)



Selective Laser Melting (SLM)



Materials: Stainless steel, aluminum alloys, titanium, nichel alloys



Metalli

Direct Energy Deposition (DED)



Materials: Stainless steel, nichel alloys, titanium





Polimeri

ADDITIVE MANUFACTURING OPPORTUNITIES



Additive Manufacturing Opportunities





Additive Manufacturing Opportunities Design Complexity



- + The geometric complexity is evaluated based on the number of production steps required.
- + The surface-volume ratio allows to have a first estimate of the geometric complexity.

+ Conflux heat-exchanger



+ Audi hotforming tool with conformal cooling channels



+CIM

4.0

Additive Manufacturing Opportunities Low volume production + No tooling for complex conventional parts €/Unit and multiple design & test loops allowed + Consolidation of sub-components to Economic improve quality and durability Advantage Additive Manufacturing + Lighweithing and performance increase for hystorically critical components (complex **Traditional** brackets) Manufacturing Targets matching through performance **Break-even** Production Volume + point optimizations allowed by AM only Economic advantage for small production batches +CIM

4.0

Use Case General Motors: a lighter and more efficient future of automotive part design

Generative Design & Additive Manufacturing



8 components into 1 part - 40% lighter - 20% stronger



Additive Manufacturing Limitations



CIM4.0 ADDITIVE MANUFACTURING PILOT LINE



CIM4.0 Additive manufacturing pilot line





CIM4.0 Additive manufacturing pilot line

CIM4.0 Additive manufacturing pilot line

CIM4.0 Machinery

Prima Industrie Print Sharp 150

SPECIFICATION

- + Volume: Ø 150 mm, H 160 mm
- + 250WSingle Laser Fiber
- + 8kW
- + Tolerance 0,1 mm

Materials:

- + Aluminum
- + Steel
- + Titanium
- + Nickel based alloys

Prima Industrie Print Genius 250

SPECIFICATION

- + Volume: 262*262*350 mm
- + 500W double Laser Fiber
- + 10kW
- + Tolerance 0,1 mm

Materials:

- + Aluminum
- + Steel
- + Titanium
- Nickel based alloysl

SPECIFICATION

- + Volume: 400*400 mm
- 400W 4 Laser Fiber
- + 22 kW
- Tolerance 0,1 mm

Materials:

- + Aluminum
- + Steel

+

- Titanium
- Nickel based alloys

DIRECT ENERGY DEPOSITION

Prima Industrie Laserdyne 811

SPECIFICATION

- + Volume: 1100*800*600 mm
- + 3000W Single Laser Fiber
- + 35 kW
- + Tolerance 0,2 mm

Materials:

- + Steel
- + Nichel based alloys

Additive Manufacturing pilot line Main activities and services

- + New applications development
- + Product development (DfAM)
- + Process parameters
 - development
- + Material caracterization
- + Product/process qualification
- + Pre-series production
- + Training

Support

Strategical

- + Demonstrations and orientation activities
- + Technological scouting
- + Intellectual Property Analysis
- + Analysis of financing sources for investments
- + Business growth planning
- + Business support

Operational

- + Design & Engineering
- + Prototyping & POC development
- + Industrial research projects
- + Testing of products and technologies (HW / SW)
- + Training on the job
- + Cost analysis

Implementation

How to develop an I4.0 adoption process

Thanks for your attention!

+ COMPETENCE INDUSTRY MANUFACTURING 4.0