Additive Design and Manufacturing @ Continental
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3D-Print……what is it?

3D-model -> slicing

2D-vector-arrangement build up in layers eg. with laser

0.06 - 0.25 mm
3D-Print......what is it?

2D-vector-arrangement
Presentation of Continental

founded: 1871
employees: 235,000
headquarter: Hannover

Automotive Group
- Chassis & Safety
  › Advanced Driver Assistance Systems
  › Hydraulic Brake Systems
- Interior
  › Intelligent Transportation Systems
  › Instrumentation & Driver HMI
- Powertrain
  › Engine Systems
  › Fuel & Exhaust Management
  › …

Rubber Group
- ContiTech
  › Air Spring Systems
  › Benecke-Hornschuh Surface Group
  › …
- Tires
  › Commercial Vehicle Tires
  › Original Equipment PLT
  › …

Competence Center ADaM

Competence Center ADaM founded: 1871
employees: 235,000
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Continental Engineering Services (CES)
Product Solutions

Prototypes, samples & parts
› design samples
› prototypes
› A/B/C-samples
› technology consulting
› fairs & events service

Small series manufacture
› Manual and semi automated assembly of:
› automotive and industrial (niche) products
› Spare parts

Additive Design & Manufacturing

Prototypes, samples & parts

Small series manufacture

Additive Design & Manufacturing

Markus Schnell, © Continental Engineering Services, Product Solutions
Idea of Additive Design and Manufacturing (ADaM)

› Idea: group-wide competence center for additive manufacturing
  › concentration of the common procedures on a location
    › SLM, SLS, SLA, FDM, 3D-Scan
  › production
  › design (construction & topology optimization)
  › development
  › reverse engineering
  › consulting
  › research projects with universities and colleges

planning: 06.2016
construction: 08.2017
business: 02.2018
Idea of Additive Design and Manufacturing (ADaM)

area: 560 m²
humidity: 40 %

temperature: 24 °C
Additive processes @ ADaM
Stereolithography (SLA)

area: plastic

- machine: ProJet 6000 HD from 3D-Systems
- build size: 250 x 250 x 250 mm
- materials: photopolymers

process:
- layered resin
- hardened with uv-laser
Additive processes @ ADaM
Fused Deposition Modeling (FDM)

area: plastic

- machine: Fortus 450 mc from Stratasys
- build size: 406 x 406 x 355 mm
- materials: ABS, Ultem, etc. (generally thermoplastics)

process:

- molten plastic filament
- extruded and melted traces
Additive processes @ ADaM
Selective Laser Sintering (SLS)

area: plastic

› machine: ProMaker P4500 from Proadways
› build size: 400 x 400 x 450 mm
› materials: PA6, PA11, PA12, etc.

process:

› layered powder
› fused with fiber laser
Additive processes @ ADaM
Selective Laser Melting (SLM)

area: metal

› machine: TruePrint 3000 from Trumpf
› build size: cylindrical D = 300 x 400 mm
› materials: AlSi10Mg, 1.4404, etc.
   generally: weldable

process:

› layered powder
› welded with fiber laser
Additive processes @ ADaM
3D-Scan

area: metal & plastic

› machine: Space Spider from Artec
› resolution: 0,1 mm
› point accuracy: 0,05 mm

process:
› Picture triangulation
Where do we want to go?

Product life cycle

- use of additive manufacturing in series production
  - there are promising approaches
  - both in the plastic and in the metal sector
- not yet a proven system
  - costs
  - quality
  - automation
Implementation in the Product Life Cycle (PLC) Strategy II

The goal was to operate the remaining areas of the PLC.

what we have achieved

› demonstration models

› prototypes
  › A-samples
  › B-samples
  › C-samples

› tools and devices

› spare parts
Practical examples for touching Brake fluid reservoir (B-sample)

› process: SLS  
› material: PA12  
› advantages: functional samples without injection mold
Practical examples for touching turbo pipe (demonstration model)

› process: SLM
› material: 1.4404
› advantages: first samples from 10 weeks to 1 week

CAD-model

finished component
Practical examples for touching Fuji nozzle (reverse engineering & tooling)

- Process: SLM
- Material: AlSi10Mg
- Advantages: saved 1000 € spare part with out CAD-data
Practical examples for touching plug strip (B-sample)

- **process:** FDM
- **material:** ultem
- **advantages:** B-Sample without injection mold
  100 % usable
Practical examples for touching brake calliper (topology optimization)

- process: SLM
- material: AlSi10Mg
- advantages: weight savings

CAD-model → finished component
Practical examples for touching brake caliper

- process: SLM
- material: AlSi10Mg
- advantages:
  - first samples from 14 weeks to 1 week
  - up to 30% higher strength
Practical examples for touching brake caliper

first printed street legal caliper
questions & distractions

contact: markus.schnell@conti-engineering.com