3D-tulostus – ketteristä kokeiluista kannattavaan liiketoimintaan 3D printing – from agile experimentations towards profitable business

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30.10.2018 VTT - beyond the obvious

VT1

Opportunities in the world of huge challenges





https://www.vttresearch.com/3d-printing

Application Services

Competitive products & new business models



3D printed optimized hydraulic valve block

- Critical component of hydraulic cylinder (offshore)
- Small series, customized products
- Optimized mass: 489 g (compared to original mass 1.446 kg) → 66% reduction
- Lower footprint
- No drilling => no pluging => no leaking!
- Better fluid flow due to optimized fluid channels





hydraulics



NURMI

75 % weight reduction 1/2 size dimension

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3D printed metal mold inserts

- Internal structures and cooling channels can be designed for better performance – complexity without extra costs
- Optimal cooling/tempering enables shorter cycle time and better release from mold => cost savings



Smart shaft informs about using condition

Successful Proof-of-concept of 3D printed smart shaft, which has acceleration sensor embedded inside the structure.

- Sensor and wiring embedded in 3D printed component during the manufacturing
- Wireless data transfer from the component to cloud
- Approach can be utilized in different components sensors (e.g. thermocouples, Acoustic Emission sensor)
- Potential benefits:
 - More accurate in situ measurements
 - Sensing solution well shielded against harsh environment
 - Applications e.g in Condition Based Monitoring, tracking, digital ID, in various industrial domains



Production Services

Increased productivity & quality

VTT pipe case

- Follow-up to large study for creation of SLM design guidelines
- Designed for assessment of printability and geometric accuracy (before and after machining)





Actions

- Monitoring:
 - Time-lapse video
 - FLIR thermal imaging
- After manufacturing:
 - FARO laser scanning for geometric accuracy measurements => comparison to CAD file
 - Process simulations with various commercial software





Test print result

Distortions due to damaged recoater



Print ID 171

VTT



Successful print – effective thermal conduction at collar support

Knowledge sharing









SIEMENS

Ingenuity for life

Automation and integration

- AM machines are designed as a stand-alone machines. This is changing and integration features are becoming more important.
- Integration AM to factory automation is under development
- Technology exists already, but not utilized in full extent. Customer need is the driver.
- No standards yet, co-operation with machine manufacturers essential.
- Control systems consist of common industrial components, which are widely used in other industrial applications (Siemens SIMATIC, Beckhoff, Bosch, Schneider)



Material Services

Increased quality & material performance

SLM process optimization

Creating the experimental designsPrinting samples and measuringUsing D-optimal design of experimentsdensity using image analysis

Fitting a numerical model and calaculating the optimal parameters



Material development: soft magnetic materials

- Gas atomized Fe-Co powder (the highest known saturation magnetic flux density) was prepared at VTT.
- Suitable SLM printer parameters for processing Fe-Co powder were searched
- Topology optimized rotors of a switched reluctance machine and various test specimens were printed successfully
- Components were analysed
- The results that we have obtained are promising, i.e. the key characteristics mainly fulfil the requirements of commercial electrical

machines







Some remarks

from agile experimentations towards profitable business

Paradigm change does not happen in one night – case GE





National 3D printing strategy & roadmap

- Finland would clearly benefit from national 3D printing strategy
 - Where we could have joint efforts for benefits of all?
 - Encouragement by sharing experiences and knowledge
- Idea initiated at Turku 24.-25.5.2018 by 3DStep, Koneteknologiakeskus, LUT and VTT
- How to proceed?





Final remarks

- Agile experimentations are needed to illustrate opportunities and give ideas.
- Companies need to have boldness to take the next step to transfer experimentations to profitable business
- Adaption of technology takes time opportunity to create competitive edge and IPR still exist – but not forever
- Finnish 3D printing ecosystem has started to grow but is still fragile – right actions and support are needed to make it to shine



Thank you!