

Maker3D Formlabs Roadshow 2023

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Etteplan A growth company

Rapidly growing and developing engineering services company

Our customers are global machine and equipment manufacturers

We stand out by the high-level competence and service attitude

Founded 1983 | Nasdaq Helsinki Ltd

300.1 **REVENUE, EUR MILLION 2021**

Revenue and operating profit (EBITA), % 300.1 263.3 259.7 Revenue, EUR million 2019 2020 2021



Revenue and revenue growth, % 300.1 263.3 259.7 Revenue, EUR million Revenue growth, % 2019 2020 2021



- Operating profit (EBITA), %

Revenue by geographical area 2021 (2020)



tteplan

Etteplan global presence

> 80 offices in Finland, Sweden, the Netherlands, Germany, Poland, Denmark, USA and China





China 450



Number of offices

ETTEPLAN IN AM VALUE CHAIN







Increased performance

Lead time /

spare parts

BMW i8 roof bracket

Complex structures

Sustainability

Mass customization

Advanced materials

Part consolidation

Mini blinker

Man Constanting

Typical challenges in many organizations

Knowhow & Awareness

Technology develops fast, hard to keep up Lack of wide competences Finding the right applications for AM No design capabilities Knowhow of material properties

Top management commitment

AM not specified in technology roadmaps
No dedicated funding for AM
Technology not seen as business enabler
Unseen risks and conservatism
Need for a business case to justify the funding

Technology limitations / bottlenecks

Demand for cost efficiency Lack of competences, tools, and workflow Relatively slow build rates Limited component size Manufacturing process



Cost development of AM in the past

Note! Data on this chart is from narrow field of applications and operators. It shouldn't be generalized but indication of cost development can be seen





"3D printing is so cheap that everyone should do itAt least in prototyping"



Why Formlabs as office printer is awesome?

Component related

- Quick realization of design
- Superb surface quality
 - Injection mold comparable
- Wide range of materials
 - Even clear resin!
- End use parts possible



User related

- Plug and play
- "Just press print"
- Simple print prep software

AM strategy related

- Easy access
- Driving AM mindset into people
- Similar rules need to be followed with metal AM



How to begin with designing for AM?





Basic rules of thumb with metal AM

- Avoid bulky structures and big changes in cross section area
- Try to avoid <45° overhangs
- Supports are allowed
 - ... but remember that in most of the cases they are nasty to remove
- Post-processing needs consideration
 - e.g. machining needs fastening surfaces
- Consult your service operator









Design levels in metal AM

- Conventional
 - Print as is
- Adaption of AM (AfAM)
 - Make small changes to print easier / adding lattice structures
- Design for AM (DfAM)
 - Make better parts by utilizing new degrees of freedom (incl. topology,) and/or parts consolidation
- AM NPD (DfAM)
 - New product development based on additive manufacturing technology













Case: Hydraulic Block for John Deere Forestry Oy

- Pressure drop reduced by 40%
- Mass reduced by 60%
- Channel design created with printability in mind
- Works well with high velocity flow & in both flow directions
- Improved ease of assembly for surrounding components





Simulation-driven design approach



Initial design evaluation



Channel concept creation



CFD analysis & comparison



Fine-tuning chosen concept (flow)



Component design



FEM validation & fine-tuning (strength)



Print process simulation



Documentation & order



AM design workflow



Humans are visual beings living in a 3D world It is natural to us to understand objects better when holding them in our hands





Weight driven design



Case: Tooling for Wärtsilä

- Time from when starting data was set to final design sent to be printed < 1 week!
- Manufacturing costs below budget (<1000 €)
- Safer design





Case: Wärtsilä, Andritz – motor bracket 31 kg -> 23kg







Additive Manufacturing Design Documentation Guide





TEAMWORK NEEDED!









Contacts

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Hit me up in LinkedIn!

Pro AM training 2023





