

# KnowAM

The project KnowAM deals with the processes of cost efficient design and planning regarding the use of Additive Manufacturing technologies. Costing structures of AM technologies and planning tools for early phases of the product development are part of the research. Based on best practices from product development case studies, a methodology for cost efficient design and planning is derived.

## 1. Objectives

The following goals are targeted in the project:

- Enhancement of costing framework developed in the Project CoA2MPLY (1)
- Achievement of comparability between machines and technologies regarding costing aspects and particularly building rates (2)
- Development of an scalable IT-System with a costing calculation module, an AM Database and a presentation of advantages of the Additive Manufacturing technology (3)
- Derive best practices for cost efficient design and planning (4)

## 2. Procedure

Enhancement of the SLM costing framework:

The costing framework developed in the project CoA2MPLY focuses Selective Laser Melting (SLM) with its specific characteristics. Objective (1) comprises an adaption of the costing model to the Laser Sintering (LS) process and to Fused Deposition Modeling (FDM) as well, to provide cost calculations for the three most common Additive Manufacturing processes. This work will enhance the existing framework for costing analysis to be utilized by OEMs.

AM machines and technologies:

Objective (2) addresses the comparability between different types of machines and technologies. At the moment machine manufacturers

measure the building rate in different ways and even specify these rates in different units – for instance  $\text{cm}^3/\text{h}$  or  $\text{mm}^3/\text{h}$ . The aim is to achieve comparability and transparency for potential customers facing a make or buy decision.

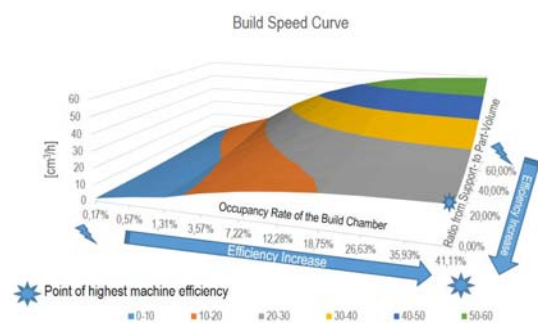


Figure 34: Build speed curve with regards to occupancy rate of the build chamber and the support ratio

Therefore, a proposal for standardization of measurement and specification of building rates will be elaborated starting with the determination of material properties that have to be one of the reference parameters. Different technologies will be compared with regards to the specified methodology.

Development of an IT System for costing calculation:

This objective (3) is meant as development and implementation of a scalable IT-System concept. Due to web access to the IT-System no software will be needed for calculation. The enhancements stated in objective (1) will be considered so that users and potential customers will be able to compare costs in additive and traditional manufacturing. Thus, utilization of building chamber of the specific machine as well as the part orientation and the concrete part geometry can be considered in the calculation. Another module of the IT-System will be used to monitor build jobs and to gather process knowledge regarding cost data, material properties and quality aspects. The concept has to be developed with respect to prospective maintenance effort that has to be low. The IT-Tool is now

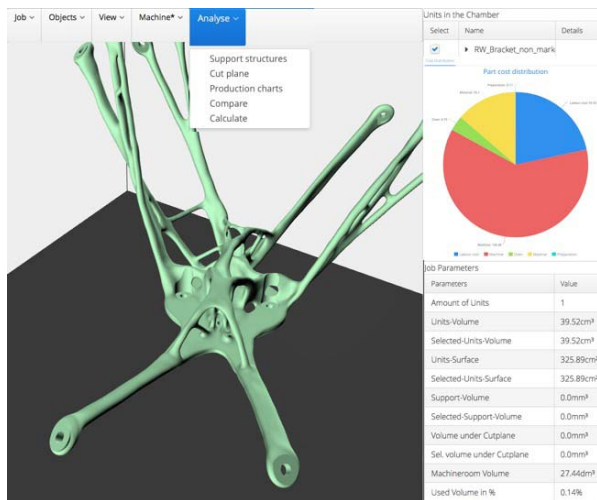


Figure 35: ReactionWheel bracket in the KnowAM-Software Tool

capable of implementing marking as proposed in the 3P-Project.

Derive best practices for cost efficient design and planning:

The overall results of the projects will help to define rules for the costefficient utilization of Additive Manufacturing and therefore help to foster the growth of the technology. Furthermore, the out-

comes will enable end users to compare different technologies or design alternatives with regards to building speed and cost-efficiency. Also, best practices and a methodology for AM part candidate selection will help the designer to industrialize the AM technology.

### 3. Latest results

Build speed test with Laser Sintering, Fused Deposition Modeling and Selective Laser melting have been performed with multiple material and multiple layer thicknesses. The productivity of these processes can now be compared with regards to productivity and build up rates. A common terminology for build speed and productivity was implemented.

### 4 Outlook

As final report the project results are documented in the report "Cost efficient Design for Additive Manufacturing". The report contains rules for cost efficient design and planning, case studies, application examples and material data. Lifecycle costing guidelines and tools as well as build speed results are published in this report.

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