

MULTI-TARGET-OPTIMIZED PRODUCT DESIGN FOR ADDITIVE MANUFACTURING (OptiAMix)

The overall objective for OptiAMix is to develop various methods and tools for the introduction and use of additive manufacturing in the industrial environment. These include the development of a software for automated and multi-target-optimized component design, methods for the strategic-technical component selection, the derivation of design rules and component identification as well as a general integration methodology for additive manufacturing into companies.

PROJECT OVERVIEW

DURATION



01/2017 – 06/2020

PARTNER



- UPB (C.I.K.; KAt; LiA; HNI-PE)
- Krause DiMaTec GmbH
- EDAG Engineering GmbH
- INTES GmbH
- Hirschvogel Umformtechnik GmbH
- WP Kemper GmbH

FUNDED BY



Federal Ministry of Education and Research (BMBF)

RESEACHER



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Federal Ministry of Education and Research

General Situation

Due to high constructive freedoms, additive manufacturing processes are gaining increasing interest in industry and research. For example, the VDI confirms that the technology is of outstanding importance for Germany as a business location: additive manufacturing processes promote the implementation of the Industry 4.0 strategy, secure jobs, shorten transport routes and offer opportunities for new business models. At the same time, the industrial applicability of additive manufacturing processes has so far been rather low due to various limiting factors. For the industrial application of AM knowledge within the strategic product planning, software for AM-compliant design as well as methods for interdisciplinary cooperation in product development, which take a holistic view from the idea to the products as well as the entire process, are missing.

Solutions within OptiAMix

Addressing these problems, the aim of the project “OptiAMix” is the multi-target-optimized and fully automated component development for additive manufacturing processes throughout the product development process. In order to be able to carry out a multi-target optimization with regard to diverging factors, such as low costs or a load-oriented design, a new software tool is developed for AM-compliant design in terms of technology, post processing, load and cost and combined with known software tools. Thus, the increasing product complexity can be mastered and a high level of data security can be guaranteed. At the same time, methods will be developed and consolidated to generate and use the relevant information; these include, for example, the potential estimation of additive manufacturing processes, design guidelines as well as process and material parameters, which are needed for the requirement-oriented, automated design and thus considerably shorten the design time. The process chain itself is also considered within OptiAMix, a standardized and optimized solution is developed together with the project partners, and a methodology for the integration of additive manufacturing into the existing processes of the companies is developed.

Latest results

In the first year of the project, promising progress has been achieved in all the sub-objectives of the project. In the sub-goal “Method for strategic-technical part selection”, the researchers of the C.I.K. developed the already existing trade-off methodology for cross-industry application. The branches automotive, food technology and plant and mechanical engineering represented in the project were focused on this objective.

In the target areas “Method for deriving design guidelines” and “Tool for automated and target-optimized component design”, the chairs KAt, LiA and CIK initially developed, produced and tested test specimens for the development of design guidelines for load-, post-processing, cost- and production-oriented design. These methodically derived design guidelines serve as the basis for the optimisation software. The KAt-researchers validated guidelines using the project-accompanying demonstrator and implemented them in a database that can be accessed by the software tool developed by INTES GmbH. In addition, the methodically derived design guidelines were recorded in design catalogues and prepared graphically.

In the development of a methodology for the “Integration of additive manufacturing in companies”, the product development processes of all project partners were analyzed and partially optimized. From this, an “ideal AM process” was derived, which in the future should serve as a component in the field of process integration. Already integrated in this process are the results from the “Method for strategic-technical part selection” as well as the “Method for Part Marking”.

Outlook

The developed methods and the software tool for design verification are finalized and will be validated on further demonstrators until the end of the project. The results will be documented and made available to a broad public through publications.

Project information

Within OptiAMix five companies are working together with the Paderborn University on various methods and tools for the industrial application of additive manufacturing since the beginning of 2017. The project is funded with € 2.4 million by the BMBF and is managed by the DMRC industrial partner Krause DiMaTec and coordinated by the C.I.K. Other participating chairs are KAt, LiA and HNI-PE.

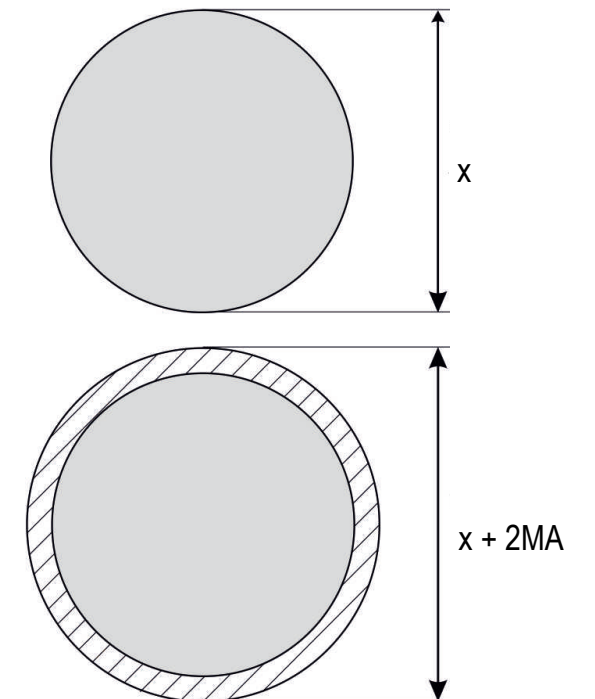


FIGURE 1 Design guideline turning



FIGURE 2 Rear wing bracket