International Conference on Advanced Optical Technologies
University of Erlangen-Nürnberg, March 13th – 15th 2019

Development of an assessment scheme for the identification of potential applications for additive manufacturing

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Technologies for Additive Manufacturing (AM) such as Laser Beam Melting (LBM) and Laser Metal Deposition (LMD) provide new possibilities for enhancing product functionalities due to their high degree of design-freedom. For example, the temperature control of a product can be improved by integrating close contour structures, which cannot be manufactured conventionally. Nevertheless, not every product is suited for the production by AM, as only a generated added value would justify the high fabrication costs. However, there is still a need of systematic approach in identifying these applications. On the one hand, a manual screening of the product portfolio by AM-experts appears very promising as potential products can be identified. On the other hand, these AM-experts need to be familiar with the investigated products, wherefore education programs in advance are indispensable.
Currently, almost no systematic and transferable assessment schemes for a fast and simple evaluation of a company's range of products are available. Although there are first approaches for the determination of application fields in aerospace, these assessment schemes mainly consider the potential of reducing weight. Therefore, these schemes tend to neglect further functionalities which could possibly be integrated by AM. On this account, these schemes are barely transferable to other industries, e.g. tooling applications, as a reduction of weight as a primary objective is not necessarily justifying the fabrication of a product using AM technologies. Thus, an expanded approach for the evaluation of functional potentials such as cooling and part integration needs to be developed.
Therefore, an approach for a transferable systematic scheme for the assessment of products presented. First, the different functions of the product are identified and rated based on a pairwise comparison. Second, an estimation of the resulting fabrication costs by AM is provided. This estimation is based on simple product parameters such as volume and material. Third, the potential of integrating additional product functions is evaluated based on a questionnaire. Hereby, potential functions, which could be added to a product using AM, are queried based on a hierarchical structure reducing the time necessary for exercising the assessment scheme. Finally, the technological potential of the applications for AM is returned. The developed scheme is validated on several products covering different fields of application.