

Potentials of Additive Manufacturing: An Approach to Increase the Flexibility of Production Systems

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Abstract : The task of flexibility planning and design, just like factory planning, for example, is to create the long-term systemic framework that constitutes the restriction for short-term operational management. This is a strategic challenge since, due to the decision defect character of the underlying flexibility problem, multiple types of flexibility need to be considered over the course of various scenarios, production programs, and production system configurations. In this context, an evaluation model has been developed that integrates both conventional and additive resources on a basic task level and allows the quantification of flexibility enhancement in terms of mix and volume flexibility, complexity reduction, and machine capacity. The model helps companies to decide in early decision-making processes about the potential gains of implementing additive manufacturing technologies on a strategic level. For companies, it is essential to consider both additive and conventional manufacturing beyond pure unit costs. It is necessary to achieve an integrative view of manufacturing that incorporates both additive and conventional manufacturing resources and quantifies their potential with regard to flexibility and manufacturing complexity. This also requires a structured process for the strategic production systems design that spans the design of various scenarios and allows for multi-dimensional and comparative analysis. A respective guideline for the planning of additive resources on a strategic level is being laid out in this paper.

Keywords : additive manufacturing, production system design, flexibility enhancement, strategic guideline

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