Aalto University
School of Engineering

School of Engineering
Department of Mechanical Engineering

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3D printing of end-use components

Title of the dissertation	Assessment of additively manufactured end-use components – Current state and incremental improvements in design, materials, and decision making
Contents of the dissertation	3D printing is gaining traction since the fabrication of highly complex designs are more attainable than ever before. This applies not only for prototyping and tooling applications, but also for end-use components incorporating functional requirements. This dissertation is investigating the current situation of end-use components from a techno-economical perspective and applies design methodologies and new materials to further benefit from the opportunities 3D printing offers. As a result, a software-based decision support system was established which imitates the main steps of the 3D printing build process for metal components to estimate manufacturing costs enabling to screen for potential use-cases. Furthermore, a survey was conducted to identify existing technical barriers, opportunities, and threats from an industrial perspective when using 3D printing technologies. To further improve the obtained state, a bio-composite material was developed, and a process modification was successfully integrated to enhance material extrusion. Finally, traditional design methodologies were applied and tested in the context of 3D printing design requirements. Thus, approaches to analyze the current state of 3D printing, new 3D printing materials as well as applied design methodologies were presented. This knowledge may not be only relevant for mechanical engineers, but also for business consultancies, designers and material scientists.
Field of the dissertation	Production engineering, 3D printing
Doctoral candidate	Niklas Kretzschmar, M. Sc. Born in Muehlacker (Germany), 1988
Time of the defence	20.03.2020 time 12:00
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Opponent	PhD Eujin Pei, Brunel University London, U.K. Professor Carolyn Seepersad, The University of Texas at Austin, U.S.A.
Custos	Professor Jouni Partanen, Aalto University, Finland
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A doctoral dissertation is a public document and shall be available at Aalto University, School of Electrical Engineering, Maarintie 8, main hall at the latest 10 days prior to public defence.