

Science and Engineering Research Program 2020 Project Proposal

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institute: Institute of Assembly Technology (match)

project title: Disassembly in the regeneration process of complex capital goods (CRC 871)

project description: Disassembly is a fundamental difference between new production and the regeneration of complex capital goods. In order not to cause additional damage to the components, resulting in a higher repair effort or, in the worst case, in scrap, disassembly has to be performed as carefully as possible. An adaptable disassembly process is used to achieve a maximum component protection, despite an unknown product condition. In contrast to assembly, where joining tolerances are known and therefore joining forces can be determined, disassembly does not allow the limitation of the required disassembly forces due to product stresses during operation, such as thermal or mechanical loads. Particularly, the high-pressure turbine considered in the research project, works with high stress during operation. Thus, after operation the connection between the turbine blades and disk is solidified to an unknown high degree. For disassembly planning, unknown disassembly forces mean that disassembly times and dimensions of the tools can not be accurately estimated.

A method for determining the disassembly forces is developed based on experimental and numerical investigations. Disassembly planning parameters such as tool forces or process time can be derived from the forces. Based on a mechanical modeling of an assembly connection, disassembly forces are handled in a learning process and assigned to product properties such as operating hours, geometric properties and operational loads. On the basis of mechanical modelling, the design properties of a product are decoupled, so disassembly forces can be used for product variants, which leads to an efficient and flexible disassembly planning.

required skills: Applicants should enjoy doing research and become acquainted with new tasks. Experience in working with MATLAB, Abaqus and Solid-Works is helpful but not explicitly required.

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