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ROBOT BASED LASER METAL DEPOSITION WITH CAD/CAM COUPLING

Task

As part of the Fraunhofer Innovation Cluster »AdaM« (Adaptive Production for Resource Efficiency in Energy and Mobility), a robot-based plant consisting of a six-axis articulated robot with a tilt-and-turn module has been constructed and used to repair and manufacture turbomachinery components. With it, geometrically complex turbine blades, for example, should be repaired. Robot paths should be created on the basis of CAD data from the software developed at Fraunhofer ILT, »LMDCAM2«.

Method

The robot has been successfully commissioned. Simple movements can be programmed very quickly by a teach-in operation via the robot controller. However, if robot paths are generated based on CAD data, appropriate CAD/CAM software must be used. With »LMDCAM2«, both the 3D models of the components to be repaired or manufactured as well as the robot model including the definition of the kinematics can be read and animated graphically. This way, robot paths can be created according to the respective welding strategy. Preliminary robot movements can be simulated on the computer in order to avoid possible collisions of the robot.

Result

For the additive manufacturing of demonstrator components with Laser Metal Deposition, »LMDCAM2« has successfully been used to generate robot paths based on CAD data. The demonstrator components are geometrically complex shapes, which can be produced through different angles and orientations of the processing optics thanks to the robot's flexibility.

Applications

Due to its high flexibility, the robot is principally suitable for all types of repair and manufacturing applications in various industries (e.g. aviation, turbomachinery, tooling). Thanks to its greater freedom of movement as compared to Cartesian systems, it can be particularly interesting for applications where accessibility to the processing site is severely limited.

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3 Robot model in »LMDCAM2«.

4 Laser Metal Deposition process
   on a demonstrator component.

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