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VIRTUAL LAB – CENTRAL DATA STRUCTURE ACCORDING TO THE AM PROCESS CHAIN

Task

In the Fraunhofer lighthouse project futureAM, the expertise of four Fraunhofer institutes was combined to achieve technological leaps along the entire additive manufacturing process chain. These institutes have broad and deep technological know-how as well as unique technical equipment in the field of additive manufacturing. The project aimed to make this know-how digitally available via a central data structure and to enable efficient cooperation between the institutes. To this end, they accelerated the development of a »Virtual Lab«.

Method

Based on the requirements, a distributed system was implemented, consisting of the Virtual Lab itself (centralized) as well as several database instances internal to each institute (decentralized). The back end of the Virtual Lab is based on a comprehensive data model; the front end on so-called dashboards according to the core competencies of the four participating institutes: part management and design (Fraunhofer IAPT), process and machine condition monitoring (Fraunhofer ILT), powder and material characterization (Fraunhofer IWS), and post-processing and acceptance (Fraunhofer IWU).

Results

Each entity (machine, part, etc.) is assigned a digital image and links to other entities. Thanks to the Virtual Lab, it is possible to assign parts to machines (e.g. depending on machine utilization), to adjust relevant process parameters in the production flow (e.g. process route depending on machine availability) as well as to take product (surface quality etc.) and production targets (lead times, delivery times) into account. Thus, an internal product memory has been realized, whereby required master and transaction data are mapped along the product life cycle. Live data (e.g. sensor data) are queried during the manufacturing and post-processing processes using OPC-UA and published in the Virtual Lab via the institutes' database instances.

Applications

The Virtual Lab can be used as a central platform to manage and transfer data along the entire AM process chain and forms the basis for efficiently planning and monitoring production processes.

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1 Physical part.

2 Digital part storage.