



Innovative Aerospace and Space Structures made by Additive Manufacturing

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ABSTRACT

Additive manufacturing of metals is currently paving its way into industrial applications at high pace. While in medical applications there is already a widespread use of AM for customized solutions, the strongest innovation boost in AM is coming from aviation industry, followed by the energy sector, automotive industry, space and toolmaking industry. The focus of this keynote lecture is on aerospace and space applications that have recently attracted major attention, some of the already being in series production.

Using powder bed-based and nozzle-based (wire and powder) AM processes a large variety of customized solutions is feasible, ranging from micrometer-size parts with filigree features to the meter scale of large-size components. With regards to the processing requirements either high accuracy or high productivity can be achieved, whereas a combination is difficult. Among others, examples of industrialized solutions of micro-AM structures for aeroengine use will be given as well as a demonstrator component for space applications with a total diameter of 3 meters.

The presentation will highlight recent developments in AM related to different processes, metal alloys and part sizes/geometries. Unlike any other manufacturing technology, AM of high quality parts requires an in-depth understanding of the close relationship between the AM process, the material and the resulting component properties. As a matter of fact, customized hardware, online diagnostics and control systems are required for robust processing of AM parts. Moreover, the effects of defects on part quality must be studied in detail. Some of the results presented are derived from a 80 Mio. Euro research project on AM, initiated and coordinated by the presenting author.