

ELEMENT22

An FFG supported project together with RHP Technology as project leader.

ABSTRACT

In the recent years, the application of titanium alloys in aerospace has increased significantly, especially the use of Ti6Al4V. Airbus is very interested in the possibilities for the manufacture of components by additive manufacturing. Processes such as laser or electron beam processes have already been established to a certain extent. The proper technology for the production of large-scale components with "high deposition rate" methods is still in the selection phase.

The additive manufacturing process, such as plasma metal deposition (PMD), shows a great potential in contrast to conventional technologies (e.g. machining or forging) due to the near-net-shape production process. Not only raw material but also costs and machining time can be saved. Furthermore this technology allows to build up large components (> 0.5 m) with high build-up rate (> 10kg / hour).

The combination of the PMD process with new material developments allows RHP to expand its USPs. In addition, the project results can lead to a development partnership with Airbus or other aviation companies for the production of prototypes or functional structures of the new alloys. The successful cooperation with aviation companies can result in the set up a production center for aviation components.

Today's aircrafts require approx. 120-140 tons of Titanium alloys as sheets, plates of semi-finished parts. Using subsequent secondary processing (including machining) finally 25 tons of the material is used as final components. So the ratio between the bought raw materials and the final product is approx. 6:1.

As a consequence there is a strong trend towards the use of additive manufacturing techniques. Laser or electron based processes use most of the time the well known Ti6Al4V alloy for fabrication of parts up to approx. 500 mm. New alloy developments for this process are expensive due to the severe requirements for the powder grain size, purity and morphology. For manufacturing of large parts with size of >500 mm high deposition rate techniques are of interest.

RHP has made an installation within the past years of a Plasma Metal Deposition (PMD) process. This technology is similar to a welding process but has the advantage, that we can obtain high building rates in comparison to the powder-bed process. Additionally we can use various powders from different suppliers since the PMD process is not that sensitive to the particle size. Goal of the project is to apply the PMD process for the development and assessment of 5 different Titanium alloys and composites. The PMD can be operated by using powders or wire and even a combination of both is possible. Various influence parameters such as raw material purity, morphology, welding parameters etc will be investigated followed by analysis of the test structures by using microstructural analysis.

The project is a success, if we manage to identify and demonstrate a new Titanium Material concept which has a 20% higher tensile strength. Additionally two case studies/test parts will be build allowing an analysis of the process. Within the manufacturing of the case studies a demonstration of a building rate of >10kg/hour is also foreseen.

Your contact at AAC: [Mr. Nils Stelzer](mailto:Mr.Nils.Stelzer)
Head of inorganic composites group
T +43 (0) 2622 90550-230
F +43 (0) 2622 90550-99
nils.stelzer@aac-research.at
<http://www.aac-research.at>