



ADDITIVE MANUFACTURING OF THRUSTERS FOR SATELLITE ENGINES

Task

Thrusters that can develop up to 400 N are used to position satellites in space. In order to achieve low fuel consumption and hence longer operating life, combustion temperatures need to be as high as possible. Platinum-based alloys are ideal for fulfilling the mechanical-thermal requirements placed on the thrusters as a result of the high temperatures. These materials are cast; machining proves to be extremely expensive owing to the high cost of the material. Thus additive processes such as selective laser melting (SLM), which conserve resources, are ideal for manufacturing thrusters from platinum alloys.

Method

In a research project funded by the European Space Agency (ESA), a range of additive processes are being investigated jointly by EADS Space Transportation, EADS Innovation Works and Fraunhofer ILT to establish their suitability for processing a selected platinum alloy. The processibility of the platinum alloy using SLM is being investigated at Fraunhofer ILT. To this end a suitable process window for manufacturing defect-free test specimens with a density of approx. 100 percent has been determined and the generated microstructure subjected to metallurgical analysis. Tensile strength properties for static and dynamic loading at the relevant operating temperatures

are then determined on test components manufactured using SLM. Finally, once the required mechanical properties have been obtained, a thruster will be additively manufactured and tested under operational conditions.

Result

The initial results of the investigations conducted to date show that the selected platinum alloy can be processed using SLM to create defect-free components with a density of approx. 100 percent. Further investigations to determine the mechanical properties at temperatures up to 1500 °C will soon be conducted on the test components that have already been manufactured.

Applications

If the test results prove successful, thrusters made from platinum alloys can be manufactured resource-efficiently using SLM, and hence much more cost-effectively than before.

Contacts

Dipl.-Ing. David Becker
Phone +49 241 8906-568
david.becker@ilt.fraunhofer.de

Dr. Konrad Wissenbach
Phone +49 241 8906-147
konrad.wissenbach@ilt.fraunhofer.de

1 Thruster in the combustion chamber test, source: EADS ST.