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INDUSTRY NEWS

SA strengthens position in aeronautics space

South Africa has become a significant contributor to the aeronautics industry with the development by the CSIR and aeronautical engineering company Aerosud of a large 3D printer for titanium parts, as part of Project Aeroswift.

Titanium is the material of choice in the aerospace industry, where the quest for lighter aircraft continues and, by developing technologies to manufacture titanium products, the country can become a significant contributor to the global aerospace market, according to the CSIR's Hardus Greyling.

The world's two biggest aircraft manufacturers, Boeing and Airbus, are developing aircraft using composite material. Greyling says the composition of aircraft is changing from aluminium-based materials to composite-based fuselage structures. Both the Airbus 350 and Boeing 787 have significantly lower weight due to the use of composites in their structures.

The challenge with composite materials is that it cannot be joined to aluminium because this results in galvanic corrosion. Titanium, which does not have this problem, is a possible replacement material.

Project Aeroswift started in 2008 when Aerosud and the CSIR demonstrated a new approach to laser-based metal powder fusion, which could potentially be applied to the 3D printing of metal components for various industry sectors.

Aerosud was looking at new technologies which would afford the aeronautics company a competitive advantage. The CSIR had already been involved in laser-based manufacturing, having just started to explore additive manufacturing as a new manufacturing technology which relies on laser-based technologies.

Joint work on a concept and a feasibility study has started to demonstrate the proof of concept. In 2009, engineers demonstrated that they could significantly increase the consolidation rate of titanium powders in both the processes of full laser melting and selective laser melting, to produce components.

The key in this process was the manipulation of the laser beam by using significantly higher laser powers as well as by employing technologies to pre-heat the powder.

The consortium approached the Department of Science and Technology (DST) with the concept of a high-speed, large-area additive manufacturing system, Aeroswift. The proposal was to design and develop a system which could produce large components with a length of up to 2 m.

The Aeroswift platform demanded new technology developments. Any optical system requires laser switching and beam delivery technologies, but with the Aeroswift platform, various additional factors came into play, such as how engineers handle large amounts of materials and powders; how they protect the optics inside the processing environment; how they handle generated heat and the stresses induced during the melting of the powder, and how they prevent oxidation of the powder during the printing processes.

Aerosud and CSIR engineers designed, developed, tested and implemented a range of new technologies to cater for all these factors and built demonstrators to verify processes, culminating in the full Aeroswift platform at the end of 2014.

The Aeroswift project team, which consists of members of CSIR National Laser Centre and Aerosud ITC.

The team of engineers working on the project demonstrated successfully the platform's increased metal build rates, which are higher than commercial powder-bed fusion systems.

Engineers have since started with the project's second phase, which looks at process development and optimisation. Processes must be developed for producing different parts. The DST and industry put in place a titanium strategy for South Africa, aligned to the Titanium Centre of Competence to ensure that it exploits the whole value chain, which looks at the development of titanium powders and metals from raw material.

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Call for papers: DuE conference, March 2016

The Domestic Use of Energy (DUE) conference will be held from 29 – 31 March 2016 at the Cape Peninsula University of Technology (CPUT) Cape Town campus.

Delegates wishing to present papers should submit provisional titles of their presentations now and the full papers by 29 January 2016. Abstracts of about 200 words may be sent by email or be submitted on the website, http://energyuse.org.za/due/.

The core theme of all DUE conferences is "Energy efficiency in the home" and, in 2016, renewable energy for the domestic sector will be given extra prominence. The conference will also host a workshop to discuss challenges and opportunities for small-scale embedded generation and the use of renewable energy in the domestic sector. The Industrial Use of Energy (ICUE) conference will be held in Cape Town from 15 to 17 August 2016.

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