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Dresden's high-tech from the 3D-printer

Together with Technische Universität Dresden the Fraunhofer Institute IWS Dresden runs the Center for Additive Manufacturing Dresden. This internationally attention-attracting institution is the biggest center of competence in Eastern Germany for the development of high-tech parts via 3D-printing. From here, AGENT-3D, the biggest in Europe research program in the field of additive manufacturing, is being managed as well. Currently, allowances from the project executing organization Forschungszentrum Jülich GmbH worth of 5.3 Million Euro are available for the Fraunhofer Institute IWS for strategic, management and technology projects. Numerous enterprises take part in the program as well.

Additive manufacturing technologies allow the manufacturing of parts on the basis of digital construction data by composing them layer by layer. Often this process is referred to as 3D-printing. In contrast to conventional production methods, here no such tools as casting molds or forging dies are necessary. This makes the additive manufacturing technologies ideally suited for the manufacturing of complex parts in small- or medium-sized quantities.

The specialists from Dresden rely on a wide range of materials and technologies. "It is our unique feature to offer best possible technical and cost-efficient solutions to our industry customers and research partners, because we have all additive manufacturing technologies currently relevant for industrial applications under one roof", as Professor Leyens explains the strategic orientation of the center. "Also according to the number of different materials which can be processed we occupy a leading position: from high-performance metallic to synthetic materials, ceramics and multi-material-systems, for every particular case of application we offer a suitable solution. Furthermore, the number of the available materials is being extended constantly". The materials scientist is head of the application-oriented research and development activities in the field of additive manufacturing at Fraunhofer IWS. Simultaneously, Professor Leyens investigates with his team at Technische Universität Dresden fundamental materials science questions in the field of 3D-printing.

German, European and worldwide enterprises use this accumulated expertise together with the Dresden researchers for the development of novel parts. "In Dresden we develop today already the products of tomorrow", says Professor Beyer, head of the Fraunhofer Institute IWS and also a professor at Technische Universität Dresden. "Our customers receive everything from one source, from process development to quality test of parts". Driving markets in this field are the aerospace, energy and medicine industries as well as the automotive and tool design and construction sector. High-tech from Dresden has found its way into the newest generation of jet engines of modern aircrafts, has shown that it can work under pressure in rocket propulsions in the astronautics and offers cost-efficient solutions for the construction of power stations.

Alongside the typical additive manufacturing technologies for manufacturing of parts in a powder bed, in which metal powder is melt by a laser or an electron beam to compose a solid body layer by layer, the scientists from Dresden focus on processes, in which a powder or a wire are supplied locally and are melt by a laser beam. Thus, not only complex forms can be implemented in the powder bed, but big parts can be manufactured too. Currently, the scientists work meticulously on a part with a diameter of three meters,

which is simultaneously printed and milled by a robot system: this is an ultimate uncharted waters, but if the experiment proves successful, it would mean an enormous saving in time in comparison to the conventional milling process of a part and would lead to substantial cost savings.

Not always do the new manufacturing technologies work error-free. In order to detect even small fissures or voids which would lead later in the ready-made part to quality problems, a computer tomography scanner and highly dynamic radioscopy equipment for nondestructive testing stay available at the Center for Additive Manufacturing Dresden. Thus, in combination with detailed material examination and testing, a precise image of the manufacturing process and of the features of the part is generated. Only with the right quality the parts can be cleared for implementation. By a tight interlocking of process and materials knowledge the specialists from Dresden manage to work out customized solutions suitable for industrial implementation also for materials which are difficult to handle.

An overview about the stage of development and potential implementation areas of additive manufacturing technologies offers the 2. Symposium for Additive Manufacturing, taking place on February 8. and 9. in Dresden. Alongside process and systems solutions the symposium also offers the topics of quality inspection and assurance as well as market development and business concepts. Further information can be found on www.isam.network.

The market for additive manufacturing technologies and additive manufacturing products is rapidly growing. The number of enterprises interested in this new concept is rising correspondingly. In the scope of the project "AGENT-3D" funded by the Federal Ministry for Education and Research (BMBF) in the program "Twenty20 – a Partnership for Innovation" the Fraunhofer Institute IWS leads a consortium with more than 100 partners, predominantly from small and middle-sized enterprises from Eastern Germany, whose task is to sound collectively the potentials of additive manufacturing, to overcome existing technological and economic boundaries and to create economic growth. Until 2020 the Federal Ministry for Education and Research (BMBF) is going to make available up to 45 Million Euro of subsidies, which are to be replenished by about the same amount by contributions from the industry. A pivotal point for this so far unique and biggest in Europe research – and development program is the Center for Additive Manufacturing Dresden, which not only coordinates the project, but promotes significantly the development of additive manufacturing technologies in Germany as an important strategic and technological initiator.

Contact:

Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS Dresden
01277 Dresden, Winterbergstr. 28
Germany

Prof. Dr. Christoph Leyens
Phone: +49 351 83391-3242
Fax: +49 351 83391-3300
E-Mail: christoph.leyens@iws.fraunhofer.de

Public Relations

Dr. Ralf Jäckel

Phone: +49 351 83391-3444

Fax: +49 351 83391-3300

E-Mail: ralf.jaeckel@iws.fraunhofer.de

Internet:

<http://www.iws.fraunhofer.de> and

http://www.iws.fraunhofer.de/en/pressandmedia/press_releases.html



A planetary gear, created in one process step (without joining)

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Large-scale surface structures

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An additive manufacturing process with a laser beam onto an extruder screw made from stainless steel

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