

ADDITIVE MANUFACTURING 3D PRINTING

in education, research and business

Additive manufacturing, including the finishing of surfaces and the examination of components that have been created, is an interdisciplinary topic located at the interface between the following fields of technology: materials, surfaces, medical technology, tribology and sensors. In these fields of technology, the Technopole Wiener Neustadt enjoys a high concentration of expertise, with partners in industrial and scientific projects benefiting from close networking and cooperation among the institutions and companies based there. The Technopole Wiener Neustadt thus becomes a one stop shop for additive manufacturing:

- 6 research institutions
- 18 competences
- 50 employees



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TECHNOPOL
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FOTECH GmbH's production equipment for metal and plastics processing was funded as part of the FTI programme of the state of Lower Austria jointly with the Lower Austrian Chamber of Commerce and the University of Applied Sciences Wiener Neustadt.



ADDITIVE MANUFACTURING, METAL

- **Functionally suitable design** of functional prototypes made of metallic materials by means of 3D-CAD and simulation-based topology optimisation, taking account of the additive manufacturing conditions
- **Additive manufacturing** of functional prototypes made of metals using
 - Laser metal fusion from metal powders
 - Laser surface cladding
- **Thermal tempering** of metal components

- Development of additively manufactured **wear protection** solutions, functionalised surfaces and corrosion protection
- Individualised **material and process development** for additive manufacturing



Application example
Thread mounted onto piping



By means of additive manufacturing, a thread for a screw conveyor was applied to a pipe at AC²T. This was done using a robotized five-axis 8 kW high-power diode laser. This equipment is used, for example, to produce metallic (powder-based) thick-coatings containing hard phases for the production of corrosion and wear protection layers as well as for tempering. ■



Application example
Structural component that is subject to stress for satellites



FOTEC is able to cover the entire additive process chain, starting with component design through manufacturing from metal or plastic up to the taking of optical and tactile measurements. For additive manufacturing, the company has three state-of-the-art laser fusion machines as well as laboratory infrastructure for powder and component characterisation. On behalf of the European Space Agency (ESA), a dynamically and statically stressed motor support for solar modules of satellites was created by means of additive manufacturing. The aim was to produce a support that is now one monolithic component, whereas it had previously comprised five components. Furthermore, a 20% weight reduction was achieved, without having to suffer any loss of mechanical load capacity. ■



Application example
Sensors for medical applications



AIT develops prototypes for the medical technology sector, focusing on functionality, handling, and the design and integration of special functions such as sensors. One example is the integration of a high-precision dose sensor which will support doctors, and patients undergoing complex therapies via an electronic fill-level measurement. On-site 3D printing offers a wealth of advantages in the whole development process, such as very rapid prototype cycles and the creation of new types of sensors for the benefit of our customers. ■

ADDITIVE MANUFACTURING, CERAMICS AND PLASTICS

- **Functionally suitable design** of functional prototypes made of ceramic materials by means of 3D-CAD design and simulation-based topology optimisation, taking into account of the additive manufacturing conditions

- **Additive manufacturing** of functional prototypes and medical phantoms from ceramic materials using
 - Lithography-based ceramic manufacturing (LCM)

- **Functionally suitable design** of functional prototypes made of plastics by means of 3D-CAD design and simulation-based topology optimisation, taking into account of the additive manufacturing conditions

- **Additive manufacturing** of functional prototypes made of plastics using
 - Fused deposition modelling
 - Polyjet technology
 - Laser fusion of plastic powder

- **Development and integration** of electronic sensors and connectivity into the plastic prototypes



Application example
Tailored medical instruments



In the area of additive manufacturing, ACMIT has been focusing on the 3D printing of ceramic parts for new types of medical instruments, and in particular on their application in personalised treatment procedures. The aim is that this new manufacturing technology will not only be used for patient-specific drilling and incision templates, but also for the development of surgical instruments to be manufactured for a specific intervention. Ongoing work in the field of ceramic 3D printing is concentrated on the development of a holding device for an implant, as well as a prototype of an all-ceramic controllable gripping tool for minimally invasive interventions. ■

- **Enhancement** of surfaces of additively manufactured components
- Electrochemical **polishing**, smoothing of microroughness
- **Structural formation** and functionalisation of additively manufactured metallic surfaces



TEST, EXAMIN & FINISH

- Mechanical and optical **characterisation** of additively manufactured components, e.g. using a coordinate measuring machine, surface profiling
- **µ-CT scanning** of additively manufactured components
- **Customer-specific tests** of additively manufactured components, e.g. of fatigue strength under extreme ambient conditions (-269°C to 2,800°C)
- **Tests and analyses** for all material classes in line with the respective standards from the starting material through to the additively manufactured component using specialised test rigs
- **Examination** of stress corrosion cracking and corrosion resistance for additively manufactured materials in combination with examinations of the microstructure and non-destructive testing



Technopol Wr. Neustadt
www.ecoplus.at/technopol



Application example Test house for materials



In AAC's ESA-certified test house, 3D-printed metal materials are created, which are then tested by customers for their stress cracking-corrosion properties using a wide variety of additive manufacturing processes. The materials are finally analysed in the HR-SEM by means of microstructure examination. ■

Application example Development of novel electrolytes for surface finishing of printed components



Electrochemical surface-finishing methods play an important role to improve the quality of additively manufactured components. In electrochemical polishing, CEST is developing novel electrolytes for efficient and environmentally-friendly processes as well as for a certain anodic passivity. By this it is possible to tailor the appearance, the surface structure (e.g. roughness) as well as the functionality of the surface to meet particular needs. ■



Actively learning about 3D printing and integrating it into your own company as a manufacturing competence: This is achieved quickly and inexpensively through participation in cluster cooperation projects. ■

TECHNOPOL WIENER NEUSTADT



Medical and material technologies are a priority for the Technopole Wiener Neustadt, which specialises in the following five fields of technology. The focus here is on networking between research, training and business:

- Materials ■ Tribology (friction, wear and lubrication)
- Medical technology ■ Sensors/actuators ■ Surfaces

The technopole's key figures speak for themselves: e.g. 500 researchers, 3,600 students, 17,500 m² of office and laboratory space, three COMET competence centres for tribology, electrochemistry and medical technology, Fotec GmbH as a research company for the nearby university of applied sciences, the Centre for Integrated Sensor Systems of the Danube University Krems, the biomedical systems division of the AIT - Austrian Institute of Technology, the Surface Technology department of the OFI, the Ion Therapy and Cancer Research Centre MedAustron, AAC, Attophonics, FIANOSTICS and many others.

- Concentrated competence ■ Successful partnerships
- Excellent training

The on-site technopole manager supports the development of the location within the framework of the technopole programme.



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