

TRIBOLOGY COMPETENCE

in Ausbildung, Forschung und Wirtschaft

Tribology deals with friction, wear and the use of lubricants. Those who control them can increase the quality of equipment, machinery and facilities, and improve their reliability and efficiency by reducing losses. At the Technopol Wiener Neustadt, a high concentration of competence in this field of technology has been created.

The figures speak for themselves:

3 research facilities

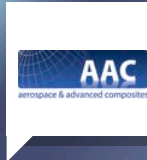
7 areas of expertise

104 employees



Foto: AC2T

The research institutes at the Technopol Wiener Neustadt have successfully applied their expertise in the Tribology technology field in many applications. In the following pages, we present some examples.



- **Analysis and examination** of materials and components for extreme operating conditions
- **Development** of composite materials and components for specific abrasion systems

TRIBOLOGY



- **Development** of innovative electrochemical processes for customized functional high-tech coatings via puls and dispersion separation



- **Analysis and optimization** of lubricants and exploration of their interaction with component surfaces. Examination of lubricant and fuel parameters. Design and implementation of measure and sensor systems for lubricants
- **Exploration** of wear mechanisms and development of wear prognosis models as well as manufacturing and analyzing of metalpowder based coatings with tribologically optimized characteristics
- **Exploration** of tribological parameters and processes as well as designing application-specific optimized abration systems. Design and implementation of measuring and sensor systems for recording tribological characteristics. Characterization and test of materials and surface pairings in terms of optimized friction and wear behavior
- **Exploration and design** of experiment supported, scale independent calculation models for simulating and model assembly of tribological components and systems including specific characteristics



Technopol Wr. Neustadt
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· Forschung
· Ausbildung
· Industrie

Application example
**Inspection and testing of materials
for the aerospace industry**



In the aerospace industry, materials and the components made from them often have to withstand extreme loads. In this regard, AAC can provide its expertise in the field of material testing and the possibilities of the ESA-certified Space Materials Testhouse. Thus, the thermomechanical properties of fibre-reinforced ceramics are examined when these – as in outer space – are used at 2500 °C and in reduced oxygen atmospheres. Materials were also tested that are used to prevent galling in outer space. ■

Analysis and examination of materials and components for extreme operating conditions

Application example
**High-performance
ceramic composite tools**




AAC provides its materials and tribology expertise for solving industrial tasks as well. For example, high-performance full tools for DCIs based on ceramic composites were developed. With these, the efficient and cost-effective machining of high-performance materials is possible, entailing an efficient process for the substantial reduction of process times in the production of near-net-shape DCI blanks. ■

Development of composite materials and components for specific abrasion systems



"ACC develops light and composite materials for aerospace and industry".

Dr. Norbert Gamsjäger
CEO of AAC



Analysis and optimization of lubricants and exploration of their interaction with component surfaces. Examination of lubricant and fuel parameters. Design and implementation of measure and sensor systems for lubricants

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Application example

Forecast of higher base numbers of marine engine oils through IR



Marine engines are usually operated on the high seas with heavy oil. The high sulphur content leads to significant acid build-up for which reason high-basic engine oils are used. At the AC²T, a method was developed to allow for the quick, local determination of the total base number (TBN) of marine engine oils. An indirect determination by infra-red spectroscopy and chemometric modelling is used here.

The research activities were based on artificial oxidative ageing, with which heavily aged oils with high oxidation, acid content and an increase in viscosity were produced. With the analysis data collected, chemometric models for predicting the TBN from IR spectra were produced. ■

Application example

Thermal stability and particle formation of turbine oils



Modern turbine oils should enable the longest possible operating times without shut-downs of the equipment involved. To prevent the formation of oil-soluble and insoluble ageing products, they must be characterised by high resistance to oxidation. At the AC²T, a method for artificial ageing was developed to describe the tendency towards particle formation as close to reality as possible. The research was carried out on various commercial turbine oils. It was shown that a high oxidation resistance does not necessarily mean a high resistance to sludge and deposit formation. Application-specific assessment methods thus lead to better oil selection.. ■

Application example
**Laser cladding of
tribological components**



For the design of wear-resistant surfaces, cost-effective thick-film applications and surface modifications by means of thermal spraying, plasma and high-power laser technologies are used. Through the use of an industrial 8 kW direct diode laser, at AC²T, it is possible to learn about technologically advanced wear protection solutions, research them and employ them in a targeted manner. The layout of the facility periphery makes it possible to produce prototypes and sample parts for industrial use. Through customised and controlled process management, high deposition rates with optimised application properties can be achieved. ■

Application example
**Tribological parameters
in technical and biological systems**



At the AC²T, reference is made to the analysis of complex tribological processes in technical systems at the micro, meso and macro levels and the identification of significant influence parameters. This includes the continuous and nanoscopic measurement of wear and friction through which the model and real systems are compared with each other and findings are merged. An example of this is the contact between the piston ring and the cylinder in the internal combustion engine. But the expertise can also be used for research on biomedical tribological systems (e.g. the friction of biologically active cartilage) to determine causes for their failure and implement improvement measures. ■

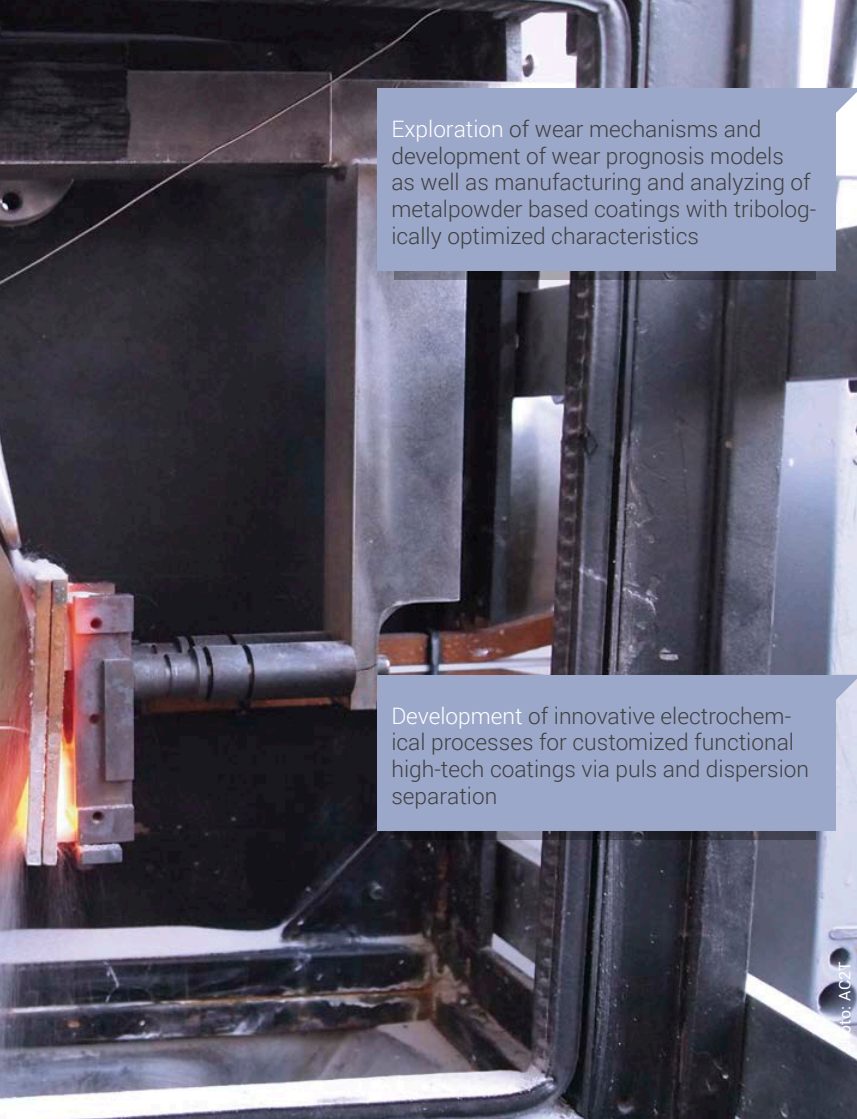
Exploration of wear mechanisms and development of wear prognosis models as well as manufacturing and analyzing of metalpowder based coatings with tribologically optimized characteristics



"The AC²T Centre of Excellence acts as a central node for national and international research activities in tribology".

DI Dr. Andreas Pauschitz
CEO of AC²T Research GmbH

Exploration of tribological parameters and processes as well as designing application-specific optimized abrasion systems. Design and implementation of measuring and sensor systems for recording tribological characteristics. Characterization and test of materials and surface pairings in terms of optimized friction and wear behavior



Exploration of wear mechanisms and development of wear prognosis models as well as manufacturing and analyzing of metalpowder based coatings with tribologically optimized characteristics

Development of innovative electrochemical processes for customized functional high-tech coatings via puls and dispersion separation

Application example Computer-assisted multi-scale tribology



The research department "Computer-assisted Multi Scale Tribology" at the AC²T also supports all research projects in the Centre of Excellence through the development of algorithms and provision of adequate software tools. Examples of the implementation of this expertise:

- Calculation of tribologically stressed components (wheel-rail contact, gearing contact, etc.)
- Modelling of lubrication conditions in slide bearings and transmission components
- Modelling of the lubrication gap when rolling sheet metal
- Modelling of sheet metal forming processes

Application example Coating systems for various requirements



At Happy Plating, complex coating systems are analysed on the basis of a profound understanding of basic interactions between electrochemical processes, electrolytes, particles, materials and work pieces. Based on this, the team of experts develops coating systems depending on the functional requirements on the surfaces (corrosion resistance, hardness, density, layer uniformity, etc.) for all size dimensions – from micro system components to large machine parts. ■



Technopol Wiener Neustadt is characterised by the five fields of technology, shown below, in medical and material technologies. The focus here is on the integration of research, education and business:

- Material ■ tribology (friction, wear, lubrication)
- Medical engineering ■ sensor-actuator ■ surfaces

The Technopol figures speak for themselves: e.g. 500 researchers, 3500 students, 17,500 m² of office and laboratory space, 4 COMET competence centres for tribology, electro chemistry, medical engineering and bio-resorbable implant materials, Fotec GmbH as a research company in the nearby University of Applied Sciences, the Centre for Integrated Sensor Systems of the Danube University at Krems, the business unit "Biomedical Systems" of the AIT - Austrian Institute of Technology, the Department of "Surface Engineering" of the OFI, as well as MedAustron, the cancer research and treatment centre, which is still under construction, AAC, Happy Plating, Attophotonics, FIANOSTICS and many others. NOSTICS und viele andere mehr.

- Concentrated competence ■ Successful collaborations
- Excellent education

The Technopol manager, active on-site, supports the development of the site as part of the Technopol programme.



This brochure is also available as an e-paper. Simply scan the QR code or download it at:

www.tfz-wienerneustadt.at

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In this brochure, all person-related statements apply equally to women and men. It is merely for the sake of simplicity that the masculine form was selected in the text.