

InTribology1
Excellence Centre of Tribology

Program: COMET – Competence
Centers for Excellent Technologies

Funding Line: COMET-Centre K2

Type of project:
Safety and lifetime of drivetrain
components
04/2020 – 03/2024
multi-firm



EFFICIENT TRANSMISSIONS FOR E-MOBILITY

INNOVATIVE METHODS FOR OPTIMISING GEARBOXES FOR E-AXLES

E-axle: Innovative drive for e-mobility

E-axle systems are an innovative solution for the electric drive of battery-electric vehicles and hybrid applications and are therefore an essential component of the future of electric mobility. E-axles integrate the electric motor, power electronics and transmission into a compact unit that drives the vehicle axle directly. This combination enables efficient conversion of electrical energy into mechanical energy. Their flexibility allows them to be used in a wide range of vehicle types. The high overall efficiency leads to efficient utilization of electrical energy and can both increase the range and reduce the required battery capacity. It also helps to reduce costs and optimize the weight of the drivetrain. The compact design results in high power and torque densities. This leads to higher loads on the gearbox and its

gears. This creates the need for innovative methods to evaluate the wear and efficiency of the gearboxes.

Progress in reducing wear in e-axle drives

As part of a multi-firm project, significant progress has been made in investigating the wear behaviour of gears under realistic driving conditions. A specially equipped test rig enables the precise analysis of wear mechanisms under various load conditions that simulate typical driving scenarios such as city traffic, motorway and overland driving.

The aim of the current research is to minimize transmission wear and thereby optimize the entire e-axle system. By identifying critical wear conditions, targeted measures can be developed to improve system performance.

SUCCESS STORY

By using the Radio-Isotope Concentration (RIC) method, an innovative wear measurement method based on radioactive tracer isotopes, precise data on the wear progress of the gears in the nanometer per hour range was determined. Due to the continuous recording of wear using this special method, the effects of running-in and stationary operation can be differentiated in a dynamic parameter field and analyzed with regard to wear mechanisms and targeted wear minimization.

Contribution to sustainable e-mobility

The successful minimization of wear in e-axle drive systems makes a significant contribution to the further development of electromobility by significantly improving the reliability and durability of these systems.

This progress impressively demonstrates the importance of continuous research and innovation in tribology for a sustainable and efficient future of e-mobility.



Left: Test bench with set-up of a transmission of the e-axle drive;
Right: RIC measuring system with detected critical wear behaviour (Photo: AC2T research GmbH)

Projektkoordination (Story)

Dipl.-Ing. Dr. Martin JECH
Projektleitung
AC2T research GmbH

T +43 (0) 2622 81600 139
martin.jech@ac2t.at

K2-Zentrum InTribology1

AC2T research GmbH
Viktor-Kaplan-Straße 2/C
2700 Wiener Neustadt
T +43 (0) 2622 81600
office@ac2t.at
www.ac2t.at

Project partner

- Robert Bosch GmbH,
Germany
- AC2T research GmbH,
Austria

This success story was provided by AC2T research GmbH and by the mentioned project partners for the purpose of being published on the FFG website. InTribology1 is a COMET Centre within the COMET – Competence Centers for Excellent Technologies Programme and funded by BMK, BMAW and the federal states of Niederösterreich and Vorarlberg. The COMET Programme is managed by FFG. Further information on COMET: www.ffg.at/comet