New CD Lab at TU Graz to Research Safe, Lightweight Rail Vehicles

The new Christian Doppler (CD) Laboratory for Structural Integrity in Rail Vehicle Design aims to boost energy efficiency and cut life cycle costs in production and operations.

Falko Schoklitsch

Rail vehicles are exposed to extreme operating stress: strong dynamic forces and frequent load changing leave their mark during every journey. While lightweight design approaches, energy efficiency and resource conservation are increasingly important considerations, continued compliance with the strict safety requirements for rail transport still has to be assured. Officially opened today at Graz University of Technology (TU Graz), the Christian Doppler Laboratory for Structural Integrity in Rail Vehicle Design will focus on these challenges, as well as developing scientific principles for the next generation of rail vehicles.

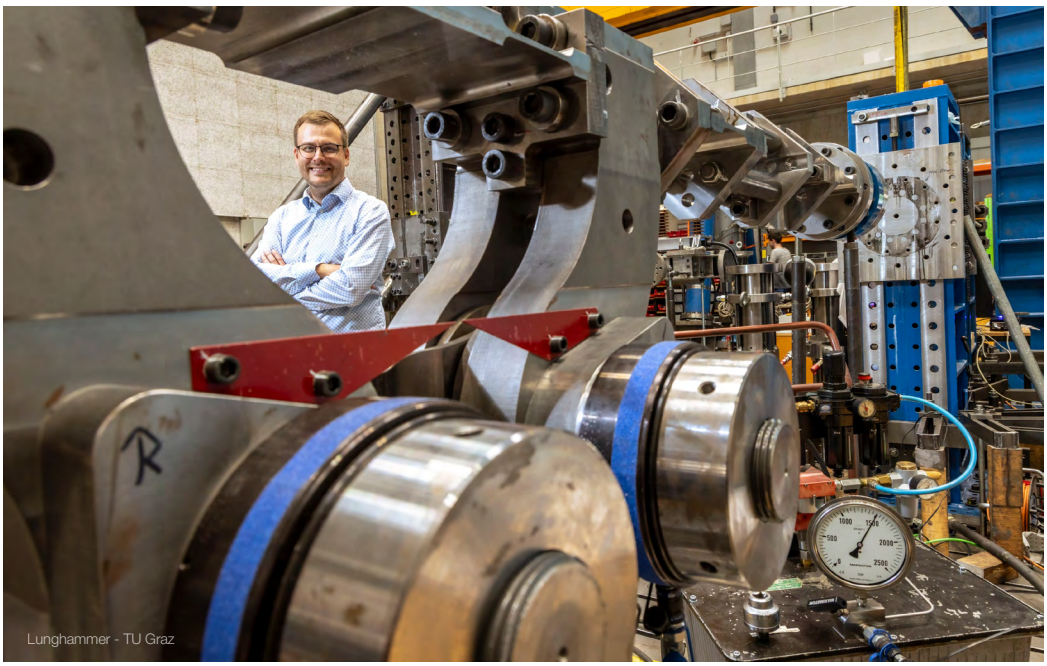
TWO MODULES WITH DIFFERING PERSPECTIVES

The CD lab is split into two research modules. The first will focus on the fatigue strength of welded steel structures, which are used in vehicle frames, various types of superstructures, and lightweight wheelset axles. Taking current standards and regulations as their starting point, the research team will examine how the choice of materials, as well as production and post-treatment processes influence component service life. They will also carry out systematic analysis of real-life load scenarios – from a range of different load types through to complex multiaxial stresses. The aim is to translate findings from lab-based experiments and the resulting design methods effectively into real-world vehicle structures.

TESTING ON STATE-OF-THE-ART TEST RIGS

The second module at the CD lab will concentrate on the structural integrity of selected components and systems. One of the focuses will be on the dynamic behaviours of brake systems, especially in connection with friction-induced vibrations. Besides detailed simulations, the researchers will perform experiments on the brake test rig at TU Graz's Campus Inffeldgasse – which is one of the most advanced in this field. These experiments will serve as the framework for analysis and validation of new design approaches. The focuses of both modules will be linked by way of a final assessment of structural durability using the methods devised to examine vibration fatigue.

Additionally, the laboratory will investigate fatigue and wear processes caused by contact between the wheels and rails, as well as in friction braking systems. Thanks to the roller test rig developed within the CD lab, the research team is able to analyse wheel-rail interaction using experiments performed under realistic conditions. Follow-up analysis of disc and block brake systems will also lay the foundations for innovative design and evaluation methods for these components.



Martin Leitner at the test bench of the Institute for Structural Durability and Railway Vehicle Technology at TU Graz.