HDM
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Lecture in CSM:

Application of advanced MAKOM cyclic plasticity model in ANSYS

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ABSTRACT

This guest lecture provides an overview of advanced computational and experimental workflows in cyclic plasticity and structural fatigue, bridging experimental material characterization with non-linear finite element analysis (FEA).

The presentation first introduces VSB–Technical University of Ostrava and the advanced research infrastructure at the Faculty of Mechanical Engineering. Key testing facilities will be showcased, including monotonic and cyclic testing systems, as well as industrial additive manufacturing capabilities at the Protolab 3D printing center.

Next, the lecture highlights ongoing activities within the EU COST Action FABER (CA23109), focusing on the international benchmark competition FABEST in LCF and the follow-up Training School organized at the end of July 2026 in Ostrava. Serving as a practical bridge between the competition and finite element modeling, the advanced MAKOM (Modified AbdelKarim-Ohno with Memory) cyclic plasticity model—implemented as an ANSYS user-material subroutine (USERMAT) and recently released to the public—will be introduced.

The core of the lecture is dedicated to a practical case study: the numerical simulation of force-controlled ratcheting in additively manufactured maraging steel (SLM MS300). The predictive performance of the MAKOM model in capturing non-linear kinematic hardening and cyclic accumulation of plastic strain will be demonstrated. Finally, the newly prepared user documentation, including implementation guidelines for the MAKOM subroutine, will be presented, providing researchers and students with a structured manual for calibrating and deploying advanced constitutive models in ANSYS.