

Title: Low-CO₂ High-Strength Steels in Future Transmissions: Digital Concept Exploration to Test-Bench Verification from ExCEED

Speaker & Co-Authors

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Summary

The ExCEED consortium—funded by the UK Advanced Propulsion Centre—brings together JLR, ZeBeyond, Newcastle University and other partners and suppliers to advance sustainable drivetrain design. ZeBeyond's ePOP software was used for concept exploration of next-generation drivetrains. Enabling rapid comparison of different steel grades and transmission architectures, balancing performance, manufacturability, and embedded CO₂ eq. emissions. Among the materials explored, Ovako's low-CO₂ high-strength steel delivered outstanding potential for weight reduction and sustainability improvement. ePOP calculated that integrating this grade into transmission shafts and gears could achieve significant mass and package size savings while also achieving a smaller carbon footprint / kg of steel.

Subsequent hardware testing at Newcastle University confirmed these software predictions: test-bench results demonstrated that the mechanical strength of Ovako clean steel outperformed industry standards, allowing the gear downsizing predicted in the software models. These findings illustrate how integrating digital concept tools with experimental testing provides a robust framework for sustainable powertrain development.

The presentation will outline the ExCEED approach, showcasing the digital–physical workflow for generating gear and transmission concepts across diverse materials, key findings from material design exploration, and test-bench results validating model predictions. The results demonstrate a scalable path toward lighter, cleaner, and more efficient propulsion systems using low-impact steels and advanced concept-development methods.

Degree of Innovation

1. Direct integration of material sustainability data into early drivetrain concept evaluation.
2. Closed-loop validation linking digital predictions to measured bench results.
3. Demonstration that low-CO₂ steels can be designed-in, not merely substituted, to deliver concurrent strength and emissions benefits.

Program Brochure

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- ExCEED project partners: JLR, ZeBeyond, Newcastle University.
- Digital concept exploration using ZeBeyond's ePOP toolset.
- Ovako low-CO₂ clean steels show weight and CO₂ reductions verified on test bench.
- Demonstrates a repeatable method for sustainable drivetrain design.

Publications on Topic

- JLR – ExCEED – Excellence in Conceptual Evolution of Electric Drives - [link](#)
- ZeBeyond: Design For Circularity with ePOP - [link](#)
- ZeBeyond: Optimising and De-risking the Selection of Electric Drives - [link](#)
- Ovako: How Clean is your Steel? - [link](#)