Optimizing 3rd Generation Quenching and Partitioning (Q&P) and medium-Mn steels to attain improved in-use properties and foster their widespread deployment in the automotive industry

The **Sup3rForm** project is **implementing a multiscale material testing and modelling approach to identify the main damage and deformation mechanisms of these new generation steels** and comprehensively understand the intrinsic relationship between their complex microstructures and critical in-use properties, such as formability, fracture toughness, fatigue and crashworthiness.

Start-end date:
1st July 2023 – 31st December 2026

Duration:
42 months

Funded under:
RFCS programme of the European Union

Sup3rForm

Contact info:
Eurecat, Spain – Project Coordinator

eurecat.org/en/portfolio-items/sup3rform

sup3rform.project@gmail.com

Consortium:

eurecat · ALBA · voestalpine ONE STEP AHEAD. · ArcelorMittal · CRF CENTRO RICERCHE FIAT · MA · LULEÅ UNIVERSITY OF TECHNOLOGY · Aalto University

This project has received funding from the European Union's Research Fund for Coal and Steel (RFCS): project num. 101112540.

Sup3rForm

Exploiting the full potential of **3rd Generation Q&P** and **medium-Mn steels** with superior formability for **lighweight structural applications** in future mobility

Generating a comprehensive understanding on the relationship between microstructure and mechanical performance of Q&P and M-Mn steels.

Sup3rForm develops advanced experimental and numerical methods which will contribute to accurately predicting in-use properties and part performance at early design stages, reducing thus the time to market of new high-performance steel products.

Sup3rForm will demonstrate the industrial viability of Q&P and medium-Mn steels for manufacturing high added-value automotive parts at low cost and with a lower carbon footprint over the vehicle life cycle (anticipated environmental benefits are linked to the reduced component weight by downgauging, up to 20% weight reduction compared to current steel solutions).

Formability of Q&P and M-Mn steels

Investigating the global and local formability of new Q&P and M-Mn steels, and determining the main damage and deformation mechanisms.

Fracture toughness

Performing investigations to better understand the deformation and fracture mechanisms of Q&P and medium-Mn steels.

Fatigue

Providing further knowledge on the influence of microstructure on the fatigue resistance of Q&P and medium-Mn steels.

Weldability

Investigating different experimental and numerical methods for an accurate description of the spot weld performance of Q&P and medium-Mn steels under both quasi-static and dynamic loads.

Crash resistance

Generating relevant insights about the crashworthiness of Q&P and medium-Mn steels and the influence of microstructure on crash ductility.

Microstructural modelling of AHSS

Developing high-resolution digital microstructural models with dislocation-based crystal plasticity to represent the complicated microstructure of Q&P and medium-Mn steels and the underlying mechanisms.

Edge fracture and crash modelling

Boosting a fracture-energy criterion to predict the energy absorbed at crack nucleation and propagation.

Expected outcomes

- Relevant scientific knowledge
- New 3rd generation Q&P and M-Mn steels
- Successful automotive part demonstrator
- New microstructural predictive models
- New experimental and modelling characterization techniques for AHSS

Sup3rForm outcomes will pave the way for the implementation of these new advanced steel grades in the automotive sector and will help to consolidate the role of steel as a cost-effective lightweight solution in future mobility.