Boosting the implementation of Additive Manufacturing with optimal surface integrity

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

Duration:
42 months

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The **SuPreAM project** is developing **new predictive and optimization models for surface finishing operations** to drive Additive Manufacturing in the industrial steel sector and **reduce defects and manufacturing costs**.

SuPreAM has the objective to **optimise the surface integrity** of Additive Manufactured and Machined steel components minimising the **number of re-processing loops** during finishing operations.

The excellence of SuPreAM relies on the integration of all the factors affecting surface integrity generation over Additive Manufactured workpieces to provide machining strategies solutions in the design stage, prior workpiece finishing aiming to produce defect free components.

SuPreAM

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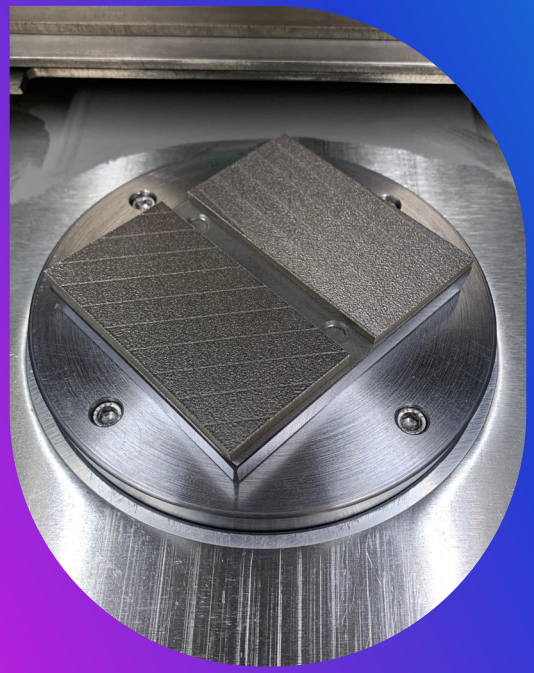

Consortium:

eurecat · Luleå University of Technology · CIMNE · DRT · IDONIAL · GSC Grupo Sevilla Control · ArcelorMittal

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SuPreAM

Predictive simulation of finishing operations of Additive Manufactured steel components for optimal surface integrity

Optimising surface finish in Additive Manufacturing in the steel industry to reduce defects and manufacturing costs

SuPreAM pillars

1 Surface integrity prediction of machining/cutting/finishing processes

Integrating the influence of steels, of manufacturing technologies and of machining strategies in the development of the predictive models.

2 Modelling of machining/cutting/ finishing processes

Developing the cutting process model using the Particle Finite Element Method (PFEM) which shows promising results in the modelling of materials subjected to large deformation of the workpieces.

3 Machining of Additive Manufactured steels

Providing new insights into the cutting tool wear mechanisms behind surface integrity generation and identifying critical parameters on its generation.

4 Additive Manufacturing of novel maraging steel

Addressing the application of a new quality of steel that does not exist in the current market (Lean Maraging Steel).

Expected results

- Develop an in-house software module for the simulation of milling/turning and finishing processes based on PFEM method.
- Evaluate steel grades for surface integrity and optimization of AMed and machined parts.
- Develop an in-house software module for the simulation of the electrical discharge machining (EDM) process.
- Determine the influence of steel AM technology, machining strategies, machining process parameters and cutting tools materials.
- Identify and describe the most significant AMed and machined component characteristics to establish surface integrity and functionality relationship.

Project phases

1. **Additive manufacturing** of conventional and novel steels
2. **Machining strategies** for Additive Manufactured steels
3. **Machining processes** and component behavior modelling
4. **Surface integrity** characterization
5. **Validation** of the proposed solutions