


CoBRAIN PARTNERS



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



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#CoBRAIN



INTEGRATED
COMPUTATIONAL-EXPERIMENTAL
MATERIAL ENGINEERING
OF THERMAL SPRAY COATINGS

PROJECT DETAILS

Start date: 1 January 2023

Duration: 4 YEARS

EU contribution: € 5.15M

www.cobrain-project.eu

Industrial Challenges addressed by CoBRAIN

Protective coatings against wear and corrosion play a critical role in strategic industrial fields. However, existing technologies have considerable drawbacks in terms of sustainability.

APPLICATION & REQUIREMENTS	COMPONENT
Automotive & Transport Rods for piston & shock absorbers - Toughness, corrosion, resistance, low friction Reworking of lifting rods - Toughness, corrosion resistance, low friction	
Oil & Gas Metal sealed ball valves, medium-large sized wear & corrosion resistance, even at high P & T (e.g. 15 MPa, 650°C)	
Steel Industry Rollers for temper mill High hardness, wear resistance, large components	
Chemical Industry Pump sleeves with high corrosion resistance & high wear resistance	
Textile Industry Thread guides with high wear resistance & very smooth surfaces	

2 Years Achievements

- Creation of an overarching ontology helps data interoperability.
- Integration of physical models with experiments is particularly important when dealing with coating technologies generating strongly out-of-equilibrium conditions (need validation of predictions for complex phenomena).
- Multiple physical modelling methods needed to cover a range of aspects from phase evolution to microstructure generation, mechanical and functional properties, etc.
- Clear definition of output data is important to provide input to Machine Learning (ML).
- Some physical models can be more difficult than others to be integrated with ML because of slower computation times and resulting difficulties in generating very extensive datasets.

Next Steps

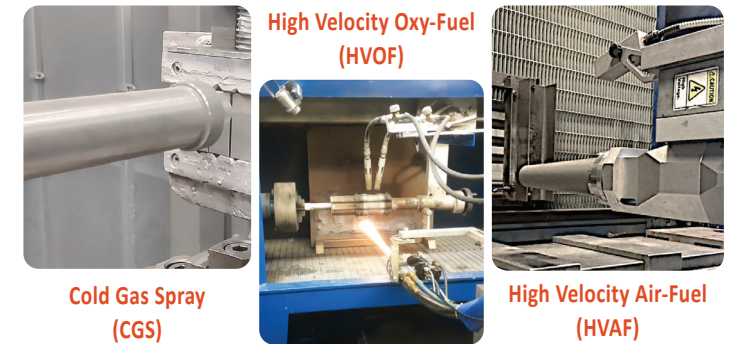
- Optimization of ML model with targeted experimental validation activities.
- Integration of ML with Life Cycle Performance Assessment (LCPA) to create a Sustainable Decision Support System (SDSS).
- Validation by trialling on industrial case studies.

The CoBRAIN Approach


Manufacturing of HEA Powders & Coatings

Experimental Validation

Coatings Production Workflows Established



Manufacturing of Coatings & Testing

Physical Modelling / ML / Experiments Integration

Sustainable Decision Support System SDSS