Contribution ID: **19** Type: **Oral Presentation**

A new lab scale multidegradation test rig to study the effect of fatigue bending on the tribocorrosion performance of austenitic stainless steel

Wednesday 22 October 2025 16:20 (20 minutes)

Tribocorrosion often occurs in conjunction with fatigue in engineering applications, leading to a material multidegradation phenomenon. This interaction has been extensively investigated, particularly within the oil and gas industry, where different grades of stainless steels have been tested under diverse tribocorrosion-fatigue conditions. The underlying mechanisms governing the interaction between fatigue loading and tribocorrosion are influenced by multiple factors, including the alloying composition of the material. However, the predominant factor appears to be the specific nature of the applied fatigue loading. More recently, this degradation process has gained increasing relevance in emerging offshore applications, such as Offshore Renewable Energy (ORE) systems, which are subjected to similar environmental and mechanical stressors.
In this study, we present findings from the "MORE" project, funded by the EU through the Clean Energy Transition Partnership (CETP). This project aims at standardizing small- and large-scale multi-degradation testing systems for the ORE industry. The project's objective is to establish an accelerated pathway for the validation of materials used in the offshore renewable energy sector. For this purpose, a small-scale multi-degradation test rig (SSMD) was designed, prototyped, and built to study different metallic materials and coatings (used in ORE systems) in a tribocorrosive set-up under four-point bending fatigue loading. Austenitic Stainless Steel (316L) was chosen for the initial trials focusing on the effect of static and cyclic bending on the tribocorrosion behavior.

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Session Classification: Erosion-corrosion and fatigue corrosion

Track Classification: Energy conversion: tribology of lubricated systems in presence of water and currents