

Quantifying Sour Service Limits of Additively Manufactured Materials



JOINT INDUSTRY PROJECT OUTLINE

PROP305545

Project 34116

Summary

Additive Manufacturing (AM) technologies are rapidly maturing and it is now possible to routinely manufacture high quality complex parts from a variety of metallic materials. However, components with the highest potential for AM to add value in the oil & gas industry are exposed to corrosive environments, particularly sour service. In these applications, materials must be accepted by the well-respected oil & gas Standards ISO 15156/NACE MR0175 and API 6ACRA; AM materials are not currently recognised by these Standards preventing AM parts from entering service.

This programme will leverage TWI's industry-leading expertise and experience in sour corrosion testing and AM to generate test data to support a ballot for acceptance of laser-powder bed fusion (L-PBF) deposited Alloy 718 material by ISO 15156/NACE MR0175 and API 6ACRA, and evaluate the influence of AM material and process variables on resistance to environmental cracking.

Alloy 718 and L-PBF have been selected for the programme as Alloy 718 is ubiquitous in high value sour service applications, and L-PBF is the most mature AM process with numerous machine vendors and part manufacturers in the market. Acceptance of L-PBF Alloy 718 by ISO 15156/NACE MR0175 and API 6ACRA would unlock a huge cost and time saving potential in the oil & gas industry, with additional environmental benefits.

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Objectives

- Generate some test data to help support a potential ballot for the acceptance of L-PBF Alloy 718 into ISO 15156/NACE MR0175 and API 6ACRA Standards.
- Evaluate the influence of AM variables on resistance to environmental cracking.

Benefits

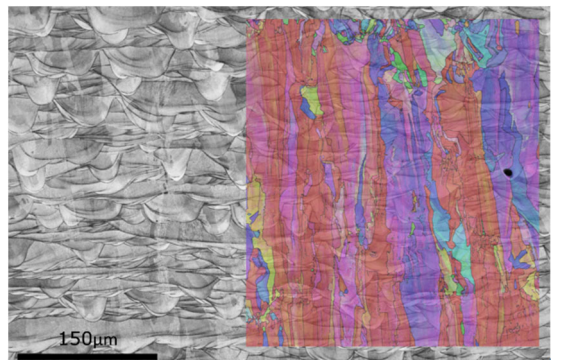
- Help to unlock the full potential of additive manufacturing in the oil & gas industry.
- Enable new and sophisticated AM manufacturing and design approaches to achieve:
 - **Cost savings:** By reducing material consumption and consolidating complex assemblies into single parts;
 - **Downtime reduction:** Reducing long lead times on urgently needed castings and forgings, from months or years to hours or days;
 - **Environmental savings:** Enabling a new generation of AM design approaches to reduce waste and achieve increased operating efficiencies and reduced energy costs.

Deliverables

- Test data necessary to support future ISO 15156/NACE MR0175 and API 6ACRA ballots
- Technical report detailing characterisation and testing results with expert interpretation from materials, corrosion and AM engineers.



Sour stress corrosion cracking in wrought 316L austenitic stainless steel



Unique microstructure of 316L stainless steel deposited by L-PBF as shown by an EBSD orientation map overlaid on a light micrograph.

Price and Duration

The ticket price for the work is £70,000 per sponsor.

Further Information

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