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Industrial Member Report Summary – Key Findings for Industry

Characterisation of Dissimilar Metal Interfaces and Evaluation of Resistance to Subsea Hydrogen Cracking

TWI Core Research Programme

Author: Michael Dodge

Industrial need

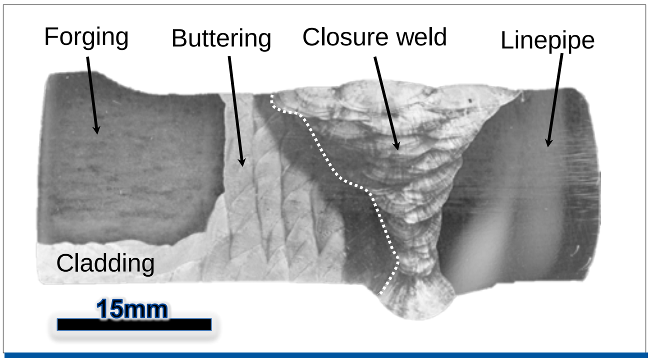
Following a number of in-service failures, there is significant interest in understanding the microstructures and environmental conditions that contribute to hydrogen cracking of subsea dissimilar metal welds. Through a programme of environmental performance tests under cathodic protection, the environmental performance of F22 and 8630M-Alloy 625 interfaces has been evaluated.

High resolution electron microscopy (SEM and TEM) was used to determine the microstructures responsible for the observed environmental performance.

Key Findings

Following a programme of characterisation and environmental testing the key findings were as follows:

- The resistance to hydrogen cracking of dissimilar metals welds may be optimised by balancing competition between HAZ tempering and new phase formation.
- Optimal PWHT times were found to be below those which led to the precipitation of carbides within a narrow band adjacent to the fusion line.
- Cracks found in a retrieved dissimilar joint indicate subsurface initiation, secondary crack coalescence and progressive propagation.



An etched cross-section showing a typical, commercially produced 8630M-Alloy 625 dissimilar joint

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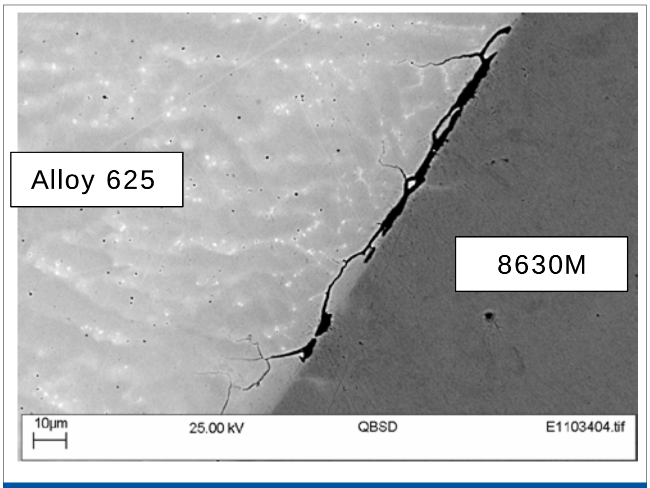

Scanning electron microscope image of cracking in a retrieved 8630M-Alloy 625 subsea joint.