

Industrial Member Report Summary – Key Findings for Industry

Development of Assessment Procedures for Non-Sharp Defects in Steel

TWI Core Research Programme

Authors: P Bastid, S Blackwell, Y-J Janin, R Sanderson, G Wu and I Hadley

Industrial need

Current Engineering Critical Assessment (ECA) methods treat most flaws as crack-like, ie infinitely sharp at the crack tip. This may be too conservative when the actual flaw is non-sharp. This may lead to inefficient over-design, and unnecessary shutdown, repair, refurbishment or replacement. An assessment technique taking account of non-sharp defects can therefore reduce fabrication and operating costs, and improve safety.

Key Findings

A programme of mechanical testing and numerical modelling was carried out with the following outcomes:

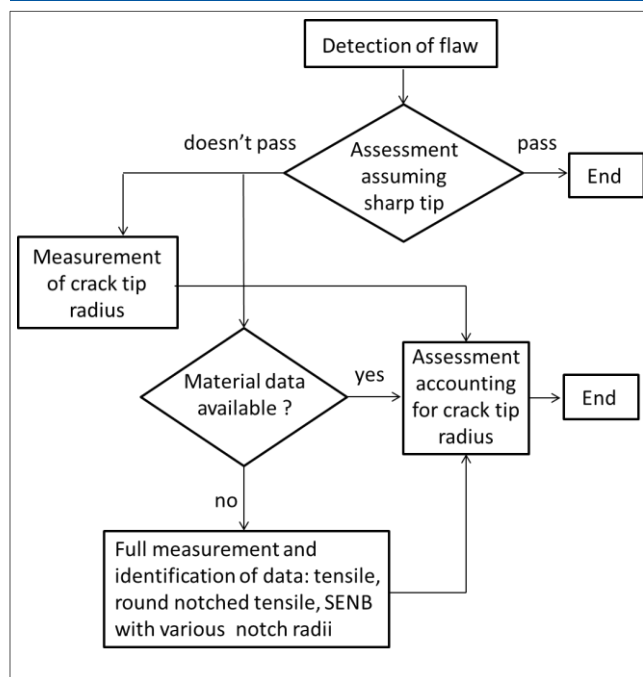
- Apparent fracture toughness increases approximately linearly as the notch tip radius increases.
- Notch radius affects the brittle-ductile transition temperature. The greater the notch radius, the lower the brittle-ductile transition temperature.
- FEA showed that the predicted load–crack mouth opening displacement (CMOD) curve was in general slightly under estimated in the case of the parent metal, and over-estimated in the case of the weld metal.
- The threshold stress for propagation of micro cracks to cleavage fracture was identified for parent and weld metal.
- Bordet’s advanced local approach model is suitable for the prediction of the fracture probability of specimens with various initial crack notch radii, accounting for both the initiation of micro-cracks and their propagation to cleavage fracture.

How to benefit from this work:

- As an Industrial Member of TWI, you have free access to the [full report](#)
- If you are not an Industrial Member of TWI, find out how your company could benefit from Membership www.twi-global.com/membership
- Read more [here](#) on ECA services at TWI.
- Contact isabel.hadley@twi.co.uk to learn more



Fracture path of specimens containing different notch radii



Proposed methodology for the assessment of non-sharp defects