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Industrial Member Report Summary – Key Findings for Industry

Establishing the Unloading Compliance Method for Generating R-Curves using SENT Specimens

TWI Core Research Programme

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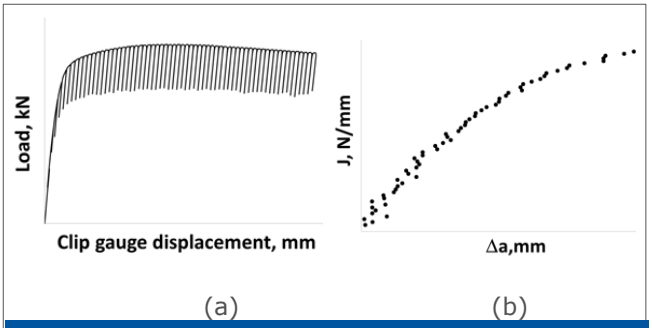
Industrial need

The single edge notched tension (SENT) fracture toughness specimen is rapidly gaining acceptance and being more widely used as a substitute for the deeply-notched single edge notched bend (SENB) specimen, since generally SENT tests result in higher fracture toughness being measured. The SENT fracture toughness test is in the process of being standardised by BSI in BS 8571. Methods such as using unloading compliance to generate resistance curves (R curves) with a single specimen must be validated in order for them to be used in the test standard.

Formulae to determine the unloading compliance of SENT specimens from published literature were implemented into TWI's testing procedures, and the results validated against equivalent R-curves generated using established multiple-specimen techniques.

Key Findings

- The unloading compliance method can be used with SENT specimens to plot R curves.
- The quality of the unloading compliance R-curve is sensitive to the specimen design and configuration.
- It is necessary to use side-grooves when using unloading compliance with SENT specimens; the best quality R-curves were from side-grooved specimens with a notch depth to specimen width ratio of 0.5.
- A standard method for performing SENT tests should be established so that the optimum test parameters are used consistently.



The unloading compliance method, uses the slope from partial unloadings during the test (a), to estimate crack extension, Δa, to plot R-curves (b).

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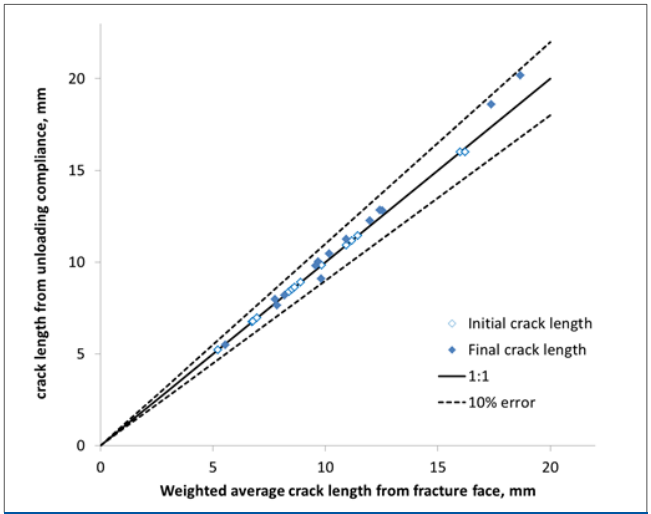

Validation of crack lengths estimated from unloading compliance against measurements from fracture faces