

THE USE OF THE SENT GEOMETRY FOR THE DETERMINATION OF TOLERABLE DEFECT SIZES IN PIPE-LINE GIRTH WELDS

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ABSTRACT

Certain installation techniques for sub-sea pipe lines impart relatively high plastic strains (circa 2%) into the girth welds. The integrity of these welds is critical both for safe installation and successful operation. Defect acceptability criteria are drawn up based on both fracture mechanics and plastic collapse criteria by means of Engineering Critical Assessment usually based on BS7910.

Whilst differing geometries of fracture toughness samples (and structures) give broadly similar toughness values under brittle conditions, in the ductile regime, differing levels of crack tip constraint will lead to quite different toughness values being exhibited by different geometries. The conventional 3-pt bend and CT geometries tend to give conservative lower bound toughness values which whilst making for safe design can in some situations be excessively conservative. Recently the use of the Single Edge Notch Tension (SENT) sample with relatively low constraint has been adopted for the assessment of pipe line girth welds during installation as this is considered to produce toughness results more representative of reality.

This presentation briefly reviews the rationale for the use of the SENT geometry, discusses some of the practicalities of testing these samples with electromechanical frames which have the required load holding capability and excellent daylight and looks at possible further developments in the use of the sample for the validation of ECAs in situations of reversed plastic straining.