



CrackWISE®

Flaws (such as cracks and other forms of welding defects) can arise during the manufacture and use of metallic components. For safety-critical items, the failure of a single component due to the presence of a flaw can have severe safety, economic and environmental consequences. Some

flaws, however, may be harmless as they will not lead to failure during the lifetime of the component; repair of such flaws is economically wasteful. A fitness-for-service procedure (also called Engineering Critical Assessment or ECA) allows flaws to be evaluated and sentenced consistently and objectively using fracture mechanics principles. ECA is therefore often used to supplement the simple workmanship-based flaw acceptance criteria stated in construction codes.

British Standard BS 7910 "Guide to methods for assessing the acceptability of flaws in metallic structures" is an ECA procedure

developed and published in the UK but used worldwide. Even a straightforward analysis to the BS 7910 standard typically requires the use of multiple parametric equations, and there is often a need to carry out complex iterative calculations. Specialist software is invaluable in performing, reporting, editing and archiving such calculations and it is for these situations that the CrackWISE® software was developed.

TWI has developed structural integrity software since the early 1990s when the DOS-based program CrackWISE® was first released. Since then, the software has been redesigned and re-released on several occasions, reflecting changes in both the underlying procedure and the

software/hardware platforms available to engineers at the time.

A new version of BS 7910 was published in 2013. This represents a major revision, particularly in the clauses relating to fracture. Amongst the new content are methods for assessing the effects of strength overmatching and undermatching in welds, for assessing crack tip constraint and for incorporating the effects of residual stress. These changes have prompted the development of a new version of CrackWISE®, Version 5 (CW5), replacing earlier versions of the software.

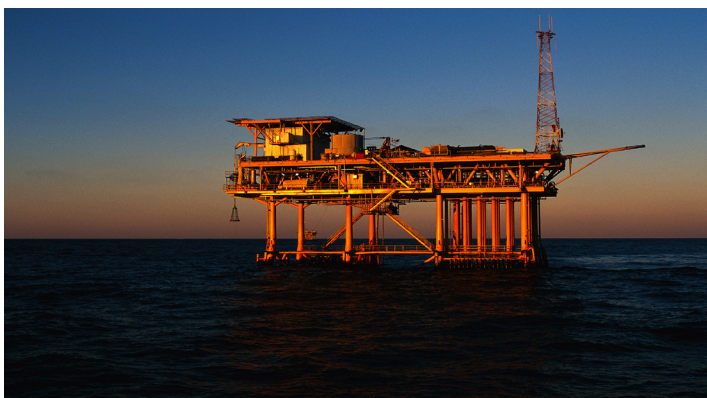
Key benefits of CrackWISE®

- Automates the widely-accepted flaw assessment procedure, BS 7910
- Fully compatible with the fracture and fatigue clauses of BS 7910: 2013. An analysis carried out using CW5 is therefore compatible with the document and traceable to the relevant clauses
- Based on over 20 years of experience in software development and ECA consultancy
- Extensively validated software, developed under the TickIT scheme
- Latest advances in fracture assessment techniques incorporated
- Current edition of BS 7910 in pdf included
- User-friendly interface, intuitive to both existing and new CrackWISE® users
- Software and technical support available

Hence, primary choice of industry experts

Key features of CrackWISE®

- Wide range of:
 - flaw geometries (through-thickness, surface, edge, embedded and corner flaws)
 - structural geometries (plates, pipes, spheres, curved shells, bars, bolts, cruciform joints)



- Fracture assessment:
 - Robust analysis of known flaws, using either single-point values of fracture toughness or tearing resistance curves
 - BS7910: 2005 and BS7910: 2013 compatible Failure Assessment Diagrams (FADs) and user-defined FADs
 - Mismatch assessment options for selected geometries
 - Annex Q toolkit automating incorporation of residual stress profiles given in Annex Q
 - Calculation of critical parameters (flaw size, applied stress, toughness etc)
 - Sensitivity calculations
 - Critical/sensitivity calculations
 - Built-in or user-defined partial safety factors
- Fatigue Crack Growth (FCG) assessment:
 - Using simplified (Paris law), bi-linear or user-defined propagation laws
 - Built-in crack growth parameters for steels in air and marine environments and for non-ferrous metals in air
- Combined fatigue/fracture assessment
- Misalignment calculator for estimating stress concentration factors in accordance with Annex D
- Material properties:
 - Advanced guidance on the yielding behaviour of the materials
 - Estimation of tensile properties from hardness data
 - Estimation of low-temperature and above-ambient tensile properties from room temperature data
 - Charpy toughness correlation tool kit
 - Maximum Likelihood toolkit
- Annex T toolkit giving guidance on Non-Destructive Testing (NDT) capability.

Industrial applications

CrackWISE® is used:

- Worldwide, throughout the oil, gas and petrochemical industries, the power sector (nuclear, fossil and renewable), the construction industry and the transport sector
- For a wide range of structures including pipelines, pressure vessels, piping, tanks, buildings, bridges, ships, road transport and aircraft
- Throughout the life cycle, including design, in-service assessment, life extension and failure investigation.

Training

- Practical application of BS 7910 procedures for the assessment of flaws in structures: this is a four day course intended for structural, civil, design, maintenance, welding and inspection engineers and those responsible for optimising asset performance or risk management, and includes use of CrackWISE® software
- CrackWISE® Training Workshop – one day training workshop intended for engineering staff involved in fitness-for-service assessment.

Free demonstration software

Free demonstration software is available for download from: www.twisoftware.com/crackwise
Contact us at: crackwise@twi.co.uk



1349.0114



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TWI Ltd, Granta Park, Great Abington, Cambridge, CB21 6AL, UK
Tel: +44(0)1223 899000, Fax: +44(0)1223 892588
E-mail: twi@twi.co.uk, Web: www.twi-global.com