CrackFit Crack/Defect Assessment Procedure & Software *for Industry*

CRACKFIT deals with the assessment of cracks/defects in both high and low temperature power and process plants. The software was initially developed by ETD as a prototype and has been jointly developed into a **commercial version** by **ETD** and **Laborelec** - R&D and services arm of the Belgian utility Electrabel. The software contains a range of component geometries (**17 geometries**) commonly seen in high temperature plant. Crack initiation and growth in all defect geometries have been tested by one group of experts and verified by another.

Features

- A complete coverage of Crack/Defect Assessment Procedure developed specifically for industry use.
- A verified procedure and software with a very useful and detailed database for the assessment of cracks in their power, petrochemical, refining or other high temperature plant.
- Ability to expand the range of component/ defect geometries (current geometry's per table below).

Component	Geometry	Analysis								
		SIF	Ref. Stress	C*	Failure/ Rupture stress check	Creep /Fatigue Incubation	CCG	FCG	CFCG	Sensitivity & Probabilistic Analysis
1. Straight Pipe	1. Axial Semi-elliptical internal defect	√	√	√	√	√	√	√	√	√
	2. Axial semi-elliptical external defect	√	√	√	√	√	√	√	√	√
	3. Circumferential semi-elliptical internal defect	√	√	√	√	√	√	√	√	√
	4. Circumferential semi-elliptical external defect	√	√	√	√	√	√	√	√	√
	5. Complete circumferential internal defect	√	√	√	√	√	√	√	√	√
	6. Complete circumferential external defect	√	√	√	√	√	√	√	√	√
	7. Circumferential elliptical embedded defect	√	√	√	√	√	√	√	√	√
2. T-Joint	1. Semi-elliptical external defect at saddle	√	√	√	√	√	√	√	√	√
	2. Semi-elliptical internal defect at crown	√	√	√	√	√	√	√	√	√
	3. Semi-elliptical external defect at weld toes	√	√	√	√	√	√	√	√	√
3. Nozzle	1. Circumferential part through wall axisymmetrical internal defect	√	√	√	√	√	√	√	√	√
	2. Radial part through wall internal defect	√	√	√	√	√	√	√	√	√
4. Elbow	1. Extrados - Circumferential semi-elliptical external defect	√	√	√	√	√	√	√	√	√
5. Test Specimen	1. CT (with & without) side groove	√	√	√	√	√	√	√	√	√
	2. SENT (with & without side groove)	√	√	√	√	√	√	√	√	√

Benefits

The software is accompanied with a manual that covers the Procedure in detail. Both for the experienced and the young engineer this manual can be a very useful tool for cross reference, for calculation and analysis and it also makes an excellent learning tool. CRACKFIT is designed to be a ***dynamic and flexible tool.*** The software has been cleverly designed to allow the expansion of its contents in terms of adding new geometries that a new owner may like to add for his specific plant. Allows your organisation to train your staff in defect assessment - from defining a specific geometry problem to building and validating the solution.

Assessment Modules

Incorporated in the software are *Materials*, *Cyclic loading* and *Leak-Before-Break (LBB)* modules as discussed below:

The *Material* module allows the user to select different materials commonly used in high temperature plant, such as: martensitic steel ASME P91 including the weld metal and HAZ properties; traditional low alloy steels such as 2.25Cr1Mo (P22) steel, rotor steels such as P11 and 1CrMoV, and the austenitic steels such as 304 and 316. The material properties included are tensile strength, stress rupture, rupture ductility, fatigue and creep crack growth data from established sources like British Standard BSi PD5500, HIDA and ECCC datasheets.

The *Cyclic Loading* module provides algorithm for the user to apply up to four scenarios of cyclic loading of different maximum and minimum load, temperature and dwell time values for the case of creep-fatigue interaction. The cyclic loading can be performed until the component fails or until the maximum time specified is reached.

The *Sensitivity and Probabilistic analysis;* In reality, input data required for the defect assessment can be varied and may be obtained from well scattered data tending to produce large deviation of the input values, hence reducing the confidence in the quality of the results. CRACKFIT accommodates the two types of analyses by allowing the user to simply choose the confidence level for different type of input data. The outcome of the evaluation (such as 'time to failure', 'cycles to failure', 'number of cycles required for a certain crack growth' etc.) is represented in CRACKFIT in a simple tornado or bar diagram for the sensitivity analysis case, and the 'probability of failure versus time' curve can be derived from the probabilistic analysis using the Monte-Carlo Simulation.

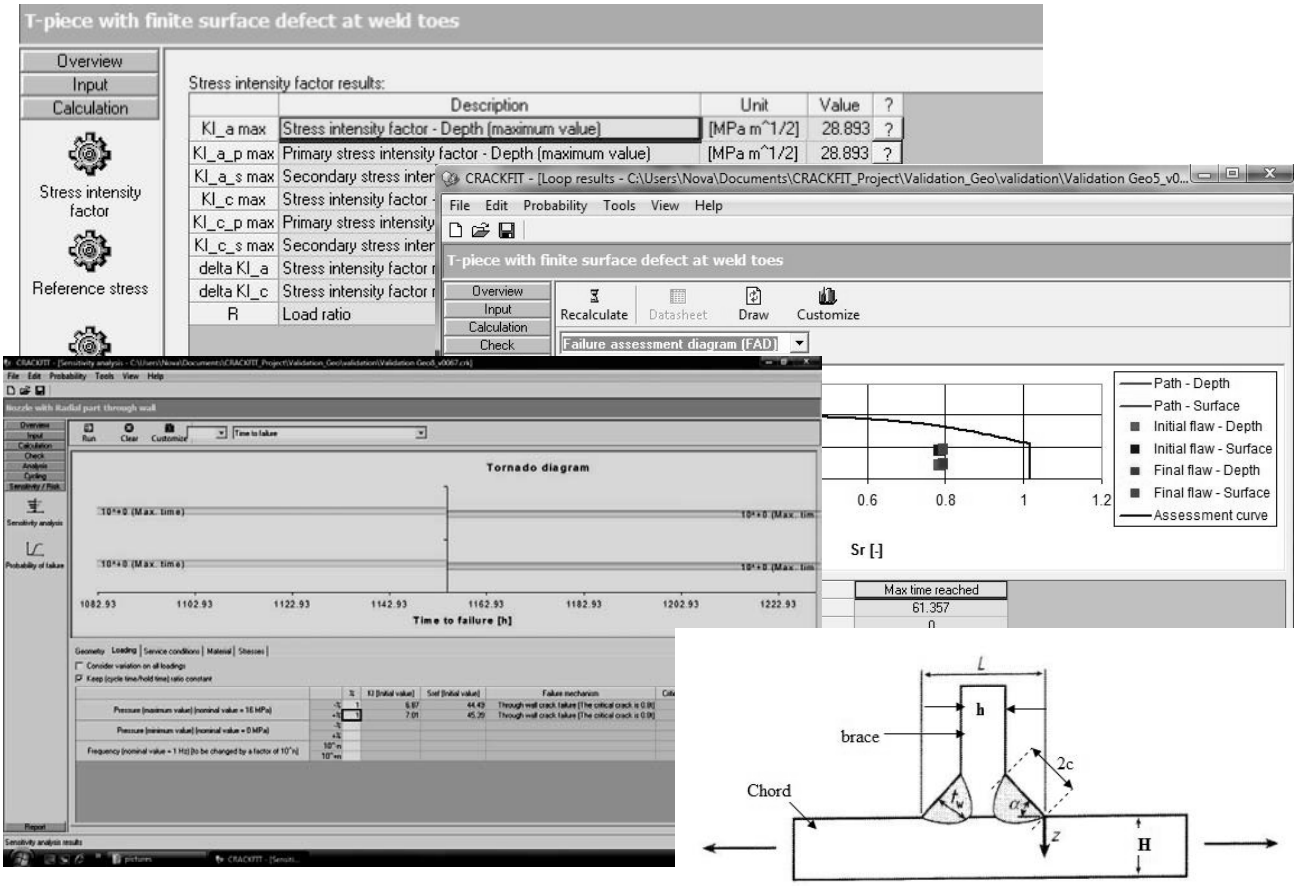
The Procedure and Software Details

The Software package:

Deals with the **life assessment of various components** which contain defects like lack of fusion/penetration in welds (defect at weld toes), internal and external surface emerging or embedded defects in straight pipes, defects at stress concentrations such as sharp corners (T-piece, nozzle) and standard laboratory specimens.

Is user friendly for industry engineers who would like to carry out defect assessment **without having to go through different established codes or country/in-house defect assessment practices**.

The procedures such British Standards 7910, the French code RCC-MR (A16), and the European procedure 'HIDA' are available as options in the software. The software allows for the failure analysis (fast fracture, plastic collapse and ligament rupture) and evaluation of damage mechanisms such as creep, fatigue, and creep-fatigue interaction.



Further information

European Technology Development, Fountain House, Cleeve Road,
Leatherhead, Surrey, KT22 7LX, UK

Tel: + 44 1372 363 111 or, Tel: + 44 1372 363 112 Fax: + 44 1372 363 222

enquiries@etd-consulting.com www.etd-consulting.com