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# LOADING AND ENVIRONMENT EFFECTS ON STRUCTURAL INTEGRITY

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**Are the mechanical field parameters sufficient to predict uniquely the failure due to the ductile or cleavage mechanisms?70**
Andrzej Neimitz, Jaroslaw Galkiewicz ..... 70

**A new design concept for prevention of hydrogen-induced mechanical degradation: viewpoints of metastability and high entropy71**
Motomichi Koyama, Takeshi Eguchi, Kenshiro Ichii, Cemal Cem Tasan, Kaneaki Tsuzaki ..... 71

**Experimental simulation of fatigue crack growth by consecutive notches72**
Svyatoslav Eleonskiy, Yury Matvienko, Vladimir Pisarev ..... 72

**Defect structure of deformed heterogeneous materials: acoustic emission and X-ray microtomography73**
Ekaterina Damaskinskaya, Ivan Panteleev, Dina Gafurova, Dmitry Frolov ..... 73

**Investigation of pulsating water jet peening on the surface integrity of welded austenitic stainless steel joints74**
Madhulika Srivastava, Sergej Hloch, Rupam Tripathi, Dražan Kozak, Somnath Chattopadhyaya, Amit Rai Dixit, Josef Foldyna ..... 74

**Environmental effects in biaxially orientated Polymethyl Methacrylate75**
Sze Ki Ng, Muhammad A. Kamaludin, John P. Dear, Bamber R. Blackman ..... 75

**Optimization of the fracture mechanical properties of additively manufactured EN AW-707576**
J.-P. Brüggemann, L. Risse, G. Kullmer, H. A. Richard ..... 76

**Fracture mechanical investigations on selective laser melted Ti-6Al-4V77**
J.-P. Brüggemann, L. Risse, G. Kullmer, B. Schramm, H. A. Richard ..... 77

**Influence of fracture mechanically graded materials on the crack propagation behaviour in three-dimensional structures78**
Katharina Dibblee, Hans Albert Richard, Gunter Kullmer ..... 78

**Crack growth simulation with Adapcrack3D in 3D structures under the influence of temperature79**
T. D. Joy, J. -P. Brüggemann, G. Kullmer ..... 79

**Working life estimate of the tubular T-joint by application of the LEFM concept80**
Jelena M. Djoković, Ružica R. Nikolić, Branislav Hadzima, Dušan Arsić, Libor Trško ..... 80

**Cruciform welded joints: hot-dip galvanization effect on the fatigue life and local energetic analysis81**
L. M. Viespoli, F. Mutignani, H. Remes, F. Berto ..... 81

**Experimental-numerical analysis of appearance and growth of a crack in hard-faced layers of the hot-work high-strength tool steels82**
Dušan Arsić, Vukić Lazić, Aleksandar Sedmak, Zijah Burzić, Bojan Medjo, Ružica Nikolić ..... 82

**Experimental investigation of mixed mode fracture of tropical wood material83**
Odounga Bernard, Moutou Pitti Rostand, Toussaint Evelyne, Grediac Michel ..... 83

**Effects of eco-friendly corrosion inhibitors on the behavior of API X65 pipe steel under dynamic loading84**
Hadj Meliani Mohammed ..... 84

**The effectiveness of the green inhibitors against corrosion in hydrochloric acid on mechanical properties of API 5l x52 pipe steel85**
Hadj Meliani Mohammed, Guy Pluvinage ..... 85

**Failure analysis of gas sweetening tower absorber packing86**
M. Newishy, S. A. Khodir, H. Abdel-Aleem ..... 86

**Flaw interaction under bending, residual stress and thermal shock loading87**
H. E. Coules ..... 87

**Structural analysis and composite material testing for space antenna reflector88**
Egor Moskvichev ..... 88

**The combined effect of pressure and autofrettage on the 3-D stress intensity factor of an internally cracked spherical pressure vessel89**
Mordechai Perl, Matan Steiner ..... 89

**Effects of increased span on fracture toughness using non-standard PCVN specimens and implications for the reference temperature, $T_{090}$**
Vitor Scarabeli Barbosa, Claudio Ruggieri ..... 90

**Experimental tests on new titanium alloy interbody cervical cages91**
Guido La Rosa, Carmelo Clienti, Rosalia Mineo ..... 91

**Cracking in paintings due to relative humidity cycles92**
Joseph D. Wood, Cécilia Gauvin, Christina R.T. Young, Ambrose C. Taylor, Daniel S. Balint, Maria N. Charalambides ..... 92

ECF22 - Loading and Environmental Effects on Structural Integrity

# Working life estimate of the tubular T-joint by application of the LEFM concept

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**Abstract**

The crack growth in tubular joints usually occurs along the weld's toe. That is the point where the chord and brace intersect. The semi-elliptical crack appears in this area from the initial flaw that was created during the welding. Sensitivity to fatigue depends on combination of cyclic loading, initial defects, environmental influences and the hot spot stresses, which are result of the walls' bending during the loading of a structure. The principles of the linear elastic fracture mechanics (LEFM) are applied here to crack growth in the tubular T-joint, subjected to axial load, in-plane and anti-plane bending. Influences of the level and type of loading, as well as of the joint's geometrical characteristics, on the fatigue crack propagation and consequently on the working life of the welded joint, are considered. Based on the conducted analysis, which implies a set of assumptions, one can draw sufficiently relevant conclusion on the remaining working life of the tubular T-joint. The assumptions included: the crack shape is semi-elliptical, there is only one crack propagating through the tube wall, the cyclic plastic zone at the crack tip is small with respect to other geometrical variables and the crack grows only if the difference between the stress intensity factor values at maximal and minimal loads is greater than the stress intensity factor necessary for the fatigue crack growth initiation. Results are presented in the form of diagrams from which can be seen that for the same load level the longer working life is achieved for the axial load of the joint than for the in-plane bending, while the values for the anti-plane bending lie between these two limiting results.

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*Keywords:*tubular T- joint; fatigue crack; Paris law; LEFM

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