



‘Mechanical Testing Techniques Training Course’ Wednesday, 28th September 2022

Key learning objectives:

- Understand the meaning of terms such as strength, ductility, hardness and toughness
- Appreciate why compromise between high values of strength and toughness is necessary
- Understand the metal structure differences that give rise to continuous and discontinuous yielding
- Be familiar with parameters such as Young’s modulus (E), yield strength, proof stress, UTS, ductility measures, engineering stress-strain, true stress-true strain and work hardening index ‘n’
- Distinguish between ductile, brittle and intergranular failures

Who should attend:

This course suits managers and technicians responsible for the QA testing of metals & metal products. It is also relevant to designers, specifiers, sales and purchasing personnel

The course aims to give a grounding in the range of mechanical properties measured for metals together with descriptions of the test methods used.

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Section 1: Introduction

Section 2: Tensile Tests

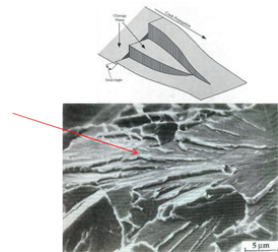
- Tensile tests: parameters, sample preparation and types
- Gripping methods: screw, wedge, hydraulic and pneumatic
- Contact and non-contact extensometry
- Continuous and discontinuous yielding; influence of metal structure
- Further test parameters: engineering and true stress-strain, work hardening index



Universal testing system

Section 3: Ductile, brittle and intergranular failure

- Deformation of ductile metals
- Brittle (or cleavage) fracture
- Ductile-brittle transition
- Crack propagation and crack arresting mechanisms
- Intergranular fracture



Brittle Fracture and 'River Patterns'

Section 4: Hardness Tests

- Hardness principles: Brinell, Vickers, Rockwell; indenters and test conditions
- Relationship between hardness and grain size: Hall-Petch equation
- Micro-hardness tests: Vickers and Knoop
- Nano-indentation
- Hardness conversion



Vickers hardness testing machine

Section 5: Pendulum impact tests

- Toughness: a definition
- Charpy and Izod test procedures
- Sample types: full and sub-sized samples
- Test results: ductile-brittle transition temperature
- Role of microstructure
- Charpy vs Izod



Pendulum impact testing machines

Section 6: Fatigue and creep testing

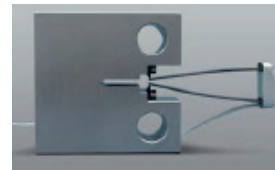
- Fatigue in metals
- Fatigue testing: axial loading and rotating bend test machines
- Fatigue testing: stress-life (S-N), strain-life (ϵ -N) and fatigue crack growth rate ($da / dN - \Delta K$) approaches
- Stages of creep
- Creep mechanisms: dislocation climb, Nabarro-Herring and Coble creep
- Creep and stress rupture testing



Typical fatigue and creep testing systems

Section 7: Fracture mechanics

- Linear-elastic fracture theories
- Fracture toughness tests: methods and sample types
- Factors affecting toughness
- Realm of application for different fracture mechanics theories; LEFM, EPFM etc.



Measurement of 'Crack tip opening displacement' (CTOD)

Course fee:

£ 250 + VAT per delegate

Course venue:

Jurys Inn
Watling Street
Hinckley
LE10 3JA
