Materials Testing

Catalogue Number	3029-0000
Category	Industrial Maintenance
Duration	15 Hours

Activity 1: Getting Started

Everyday Use of Materials

What is Materials Science?

Material Properties

Materials Testing

Mechanical Testing

Testing Terminology

Types of Mechanical Tests

Test Machines

Test Specimens

Computers in Materials Testing

Measuring Strain

Activity 2: Tensile Testing I

Force/Extension Graphs

Tensile Testing

Material Properties

The Tensile Test

Measuring Specimens

Task: Performing a Tensile Test

Task: Determining Proportional Limit

Task: Determining Young's Modulus

Task: Measuring Specimen Elongation

Activity 3: Tensile Testing II

- Stress/Strain Diagrams
- Additional Mechanical Properties
- Task: Performing a Tensile Test on a Steel Specimen
- Task: Analyzing Tensile Test Data

Activity 4: Tensile Testing III

- Axial Loading
- Load-training Alignment
- Mechanical Properties Terminology
- Task: Determining Yield Strength
- Task: Determining the Yield Strength of Steel
- Task: Performing a Tensile Test of Copper
- Task: Analyzing Tensile Test Data
- Task: Comparing Material Properties

Activity 5: Creep Testing

- What is Creep?
- Creep Properties
- Extrapolation
- Creep Testing
- Task: Performing a Creep Test on a V-base Alloy
- Task: Analyzing Creep Test Data
- Task: Determining Creep Rupture Strength
- Task: Determining Creep Strength

Activity 6: Compression Strength

- What is Compressive Loading?
- Compression Testing
- Benefits of Compression Testing
- Task: Performing a Compression Test on Solder
- Task: Analyzing Compression Test Data

Activity 7: Hardness Testing

- What is Hardness
- Hardness Testing Equipment
- Task: Performing a Brinell Hardness Test
- Task: Calculating Brinell Hardness
- Task: Performing a Rockwell Hardness Test

Activity 8: Bending Test

- What is Bending Loading?
- Resistance to Bending
- Bending Testing
- Properties Determined by the Bending Test
- Elasticity and Plasticity
- Task: Performing a Bending Test
- Task: Analyzing Bending Test Data
- Task: Experimenting with a Bending Test

Activity 9: Shear Testing

- What is Shear?
- Shear Test Procedures?
- Mechanical Properties Determined by Shear Testing
- Task: Performing a Shear Test
- Task: Analyzing Shear Test Data

Activity 10: Fatigue Testing

- Cyclic Loading and Fatigue Failure
- Cyclic Loading
- Fatigue Testing
- Fatigue Test Specimens
- Task: Performing a Low-cycle Fatigue Test
- Task: Analyzing Fatigue Test Data

Activity 11: Fatigue Crack Growth Testing I

- Importance of FCG Behavior
- New Terms and Definitions
- Fatigue Crack Growth Tests
- FCG Test Results
- FCG Test Specimens
- Measuring Fatigue Crack Length
- Task: Performing an FCG Test
- Task: Analyzing Fatigue Test Data

Activity 12: Fatigue Crack Growth Testing II

- FCG Terminology New Terms and Definitions
- Waveform Calculations
- FCG Threshold Testing
- Task: Performing an FCG Test
- Task: Analyzing Fatigue Test Data

Activity 13: Failure Analysis

- Failure Analysis
- Types of Failure
- Investigating Failure Analysis
- Examining Failed Parts
- Microphotography
- Task: Identifying the Cause of Failure

Activity 14: Specialized Testing

- Material Service Conditions
- Parameters That Affect Materials Properties
- High Temperature Testing
- Measuring Specimen Temperature
- Controlled Humidity Testing
- Testing Special Materials
- High Strain Rate Testing
- Task: Attaching Thermocouples to a Specimen
- Task: Performing a Temperature Uniformity Test
- Task: Analyzing the Temperature Uniformity Results

Activity 15: Selecting Materials

- Material Selection in Product Design
- Material Requirements and Selection Criteria
- Terminology
- Task Description
- Task: Selecting the Material for Bolt