



In Association with
AVT Academy



Course Name: Metallurgical Failure Analysis

Code:

DATE:

Course Objective:

By the end of this course delegates will learn about:

- To familiarize participants with the main tools and equipment used for metallurgical failure analysis.
- To introduce participants to different types of failures.
- To explain to participants the relationship(s) between design aspects, loading and/or manufacturing techniques and the different types of failures.
- To train participants to carry out a systematic failure analysis of filed parts.
- To describe and enhance necessary skills needed for successful failure analysis.
- To help the participants prevent future failures by proper inspection and or operation practice
- To train participants how to prepare a failure analysis report

Program Methodology:

Training will be delivered mainly through lectures with emphasis on practical examples and case studies practical sessions would be provided when and wherever possible.

Who Should attend?

Design engineers, Inspection engineers and technicians, process engineers, welding engineers, welding inspectors and other welding personnel, maintenance engineers and technicians, manufacturing engineers, product development engineers and managers, mechanical engineers with or without experience in metallurgy / failure analysis. Others who may benefit from this training course are commercial liability insurance underwriters and claims adjusters and trial lawyers specializing in product liability cases.

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Course Outline:

General procedures for failure analysis.

- Collection of data and samples
- Preliminary examinations
- Mechanical testing
- Macroscopic and microscopic examination
- Preparation and examination of metallographic sections
- Fractography

Types of failure and stress

- Fracture
- Wear
- Fatigue
- High temperature failures
- Types of stress
 - Tensile
 - Compression
 - Torsion
 - Shear
 - Residual stresses

• Ductile and Brittle Fracture

- Definitions and Comparisons
- Plastic deformation
- Dimple rupture
- Tearing and Shearing
- Ductile-Brittle transition
- Intergranular fracture
- Cleavage
- Thermally-induced and environmentally assisted cracking

• Fatigue failures

- Factors affecting fatigue life
- Stages of fatigue fracture

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- Fatigue Cracking
- Effect of loading variables
- High temperature fatigue
- Fatigue characterization

Wear failures

- Abrasive wear
- Adhesive wear
- Friction
- Lubricated and non-lubricated failures
- Wear examination
- Microstructure and hardness
- Wear rates

• Corrosion failures

- Electro-chemical reactions
- Types of corrosion
- Velocity affected corrosion
- Corrective and preventive measures
- Material selection
- Corrosive environments
- Stress corrosion cracking
- Analysis of corrosion failures

• Elevated temperature failures

- Creep
- Stress rupture
- Thermal fatigue
- Effect of environment
- Testing techniques and evaluation

Examples and case studies of failures encountered in engineering parts and materials

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Failures of Cast part

- Failures in welded parts
- Failures of tools and dies
- Failures of gears and gear-tooth
- Failures of shafts and bearings
- Failures of boilers and heat exchangers
- Failures of pressure vessels

Discussion of failure examples encountered by the participants

Course Duration: (5) Day

Venue:

Time: Numbers of hours: Hours

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