



ME185

MACHINERY FAILURE

Analysis, Prevention & Troubleshooting

Course Introduction:

This course presents a systematic approach to fault diagnosis and failure prevention in a broad range of machinery used in the process, manufacturing, power generation, and mining industries. The key routes to preventive maintenance are demonstrated through both overview and the study of examples in metallurgical failure analysis, vibration analysis, and a sequential approach to machinery troubleshooting and problem solving.

Equipment failure events will be reviewed and participants are encouraged to bring relevant assembly drawings to the course or such components as failed bearings, gears, mechanical seals, and similar machine elements for failure analysis discussion.

Course Objectives:

Upon completion of this course, participants will gain an understanding of structured, results-oriented, root cause failure analysis methods for all types of machine components and entire machinery systems. Participants will also learn how parts fail, why they fail in a given mode, and how to prevent failures. Participants will gain a thorough understanding of making the best possible use of available failure statistics and how these can be used in a conscientiously applied comprehensive program of specifying, purchasing, installing, commissioning, and operating machinery

Who Should Attend?

Maintenance and machinery engineers, supervisors, and technicians involved in machinery operation and troubleshooting. Also, personnel from all process industries (refining, petrochemical, chemical, mining, pharmaceutical, fertilizer, food processing, and utilities).

Course Outline:

- Session 1: Failure Analysis and Troubleshooting
 - Causes of Machinery Failure
 - Contributing Factors Often Overlooked
- Session 2: Metallurgical Failure Analysis Methodology
 - Failure Analysis of Bolted Joints
 - Shaft Failures and Their Origins
 - Ductile vs. Brittle Failures and Stress Raisers
 - Redesign Opportunities

- Session 3: Machinery Component Analysis and Reliability Improvement
 - Wear Failures
 - Couplings, Bearings and Gear Failure Analysis
- Session 4: Machinery Component Analysis and Reliability Improvement (Continued)
 - Mechanical Seals and O-Ring Failures – Selection Strategies
- Session 1: Machinery Component Analysis and Reliability Improvement (Continued)
 - Machinery Lubrication Management (Economics & Optimization)
- Session 2: Vendor Selection and Reliability Review Methods
 - Why Reliability Reviews are Justified
 - Centrifugal Pump Selection Examples
- Session 3: Vendor Selection and Reliability Review Methods (Continued)
 - Compressor Reliability Review Examples
- Session 4: Machinery Troubleshooting
 - The Matrix Approach to Machinery Troubleshooting (for pumps, compressors, fans, turbines, and others)
 - Examples from Litigation Cases
- Session 1: Vibration Analysis - A Management Overview
 - Specific Machinery Problems
 - Monitoring and Analysis Methods
 - Future Outlook
- Session 2: Structured Problem Solving Sequence
 - Situation Analysis
 - Cause Analysis
 - Action Generation
 - Decision Making
- Session 3: Structured Problem Solving Sequence (Continued)
 - Root Cause Failure Analysis (RCFA) Principles I
- Session 4: Structured Problem Solving Sequence (Continued)
- Root Cause Failure Analysis (RCFA) Principles II

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session