

“Machinery Failure Analysis” Training programs
Mechanical Engineering
 (English Material)

Course Length: 20 Hours @ 5 days

Part 1

- Definition and Concept of Reliability
- Task Definition of Equipment Maintenance
- Reliability Theory Applied To The Analysis Of Equipment Life Data:
 - Practical examples

Part 2

- Predicting failure frequency
- Fundamentals of Cost Analysis:
 - Introduction
 - Recovering the of an asset over its life
 - Discounting methods
- Life Cycle Costing [LCC]:
 - The LCC process
 - The six steps of LCC
 - How costs are determined

Part 3

- Replacement decisions
 - Equipment reliability assessment
 - Failure mode and effect analysis [FMEA]
 - Availability analysis example
- Decision analysis using LCC:
 - Benefit-cost analysis process
 - Sparing decisions

Part 4

- **Failure Analysis and Troubleshooting as a Tool for Machinery**
 - Causes of machinery failure
 - Contributing factors often overlooked
- Structured problem solving sequence:
 - Situation analysis
 - Cause analysis
 - Action generation
 - Decision making

- Planning for change
 - Root cause failure analysis [RCFA]
- Metallurgical failure analysis methodology
 - Failure analysis of bolted joints
 - Shaft failures and their origins
 - Ductile and brittle failures of shafts
 - Redesign opportunities
 - Wear failures
- Machinery component analysis and reliability improvement :
 - Rolling element bearing failures Distress in journal and tilt pad bearings

Part 5

- **Machinery Component Failures**
 - Gear failure analysis
 - Coupling selection and failure prevention
 - Mechanical seal distress
 - O-ring failures and their causes
 - Lubrication considerations
 - Lubrication for pumps, motors and gas turbines
 - Major machinery lubrication management
 - Machinery troubleshooting:
 - Generalized machinery troubleshooting
 - The matrix approach to machinery troubleshooting: pumps, centrifugal Compressors, blowers and drivers
 - Vibration Analysis
 - Specific Machinery problems
 - Monitoring and Analysis Methods
 - Future outlook (Management overview)