Techniques of Failure Analysis

Energy Milestones Corporation

Advancing Professionals to the next level

Energy Milestones is proud to be accredited, partner and associated with the following association bodies:

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Techniques of Failure Analysis

Overview

This advanced course offers a practical refresher on rotating and reciprocating machinery, focusing on common operational issues and diagnostic challenges. It builds a strong foundation for engineers and technologists transitioning into machinery diagnostics and reliability roles. Through real industrial case studies, participants will learn how to detect, locate, and analyze mechanical faults using proven methodologies.

Course Objectives

By the end of the course, participants will be able to:

- **Apply a structured approach to mechanical failure investigation.**
- **Plan and conduct effective testing, measurements, and analysis to identify root causes.**
- **Develop and evaluate corrective and preventive solutions based on failure insights.**
- **Distinguish between strong and weak technical explanations using evidence and analysis.**
- **Use qualitative and quantitative tools to assess and explain failures effectively.**

Course Content

1. Machine Failure

- Why machines fail
- Types and causes of failure
- Plant-level impact and cascading failures
- Failure modes
- Chronic vs. sporadic failures

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Course Content

2. Machinery Troubleshooting

- **Diagnostic approaches for:**
  - Pumps
  - Compressors
  - Turbines
  - Bearings
  - Couplings
  - Lubrication systems

3. Alignment and Balance

- Importance and benefits of correct alignment
- Types and consequences of misalignment
- Unbalanced types and causes
- Key balancing considerations

4. Failure Analysis Tools

- Failure Modes and Effects Analysis (FMEA)
- FMECA and risk-based maintenance
- Technical integrity audits
- FMEA worksheets and limitations
- Hands-on case study

5. Methodologies & Strategies

- Brainstorming techniques
- Flowcharts, histograms, Pareto & fishbone diagrams
- Cause and effect analysis
- Fault tree analysis
- Actionable recommendations

6. Common Issues in Failure Analysis

- Turning problems into improvement opportunities
- Keys to improving plant profitability
- “5 Whys” and “7 Points” for effective RCA
- Staying updated with evolving practices

7. Planning & Scheduling Techniques

- Importance of maintenance planning
- Planning levels and processes
- Weekly scheduling, procedures, and checklists
- Look-ahead planning and priority setting

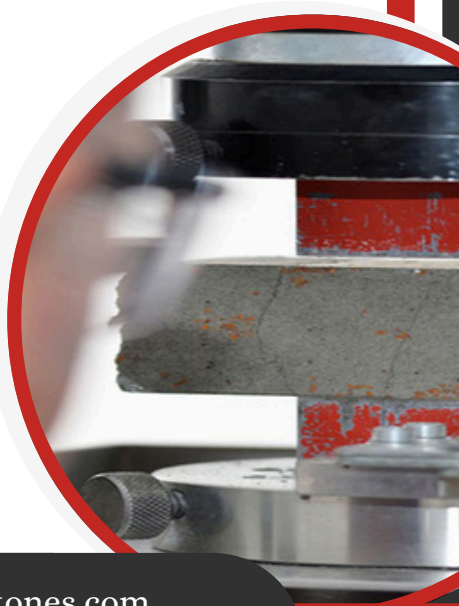
8. Maintenance Hierarchy

- Goals of maintenance
- Reactive, preventive, and predictive strategies
- TPM, RCM, and OEE explained
- Maintenance management principles

9. Maintenance Performance Evaluation

Evaluation criteria:

- Environment, operations, materials, and support
- Planning, cost control, and mobile services
- Organizational effectiveness and KPIs
- 10. Machinery Reliability
- Reliability techniques and tools
- Dependability and life-cycle thinking
- Human factors in reliability
- Maintainability and system performance



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Targeted Audience

This course is ideal for:

- Mechanical engineers
- Facility and technical managers
- Maintenance and reliability professionals
- Project and discipline leads
- Anyone tasked with resolving machinery failures or leading teams of differing technical opinions

Course Methodology

Facilitated by an experienced professional trainer, this training course will be conducted as a highly interactive workshop session. A variety of training methodologies and facilitation techniques will be employed before and during the course, as applicable. These methods are aimed at enhancing individual and group interaction while maximising learning. Some of these methods are:

- Online Pre-post Test
- Colourful Visual Aids
- Gamification
- Self-Assessment Instruments
- Simulations
- Case Studies
- Videos
- Group Exercises & Discussions
- Role plays
- Indoor & Outdoor games