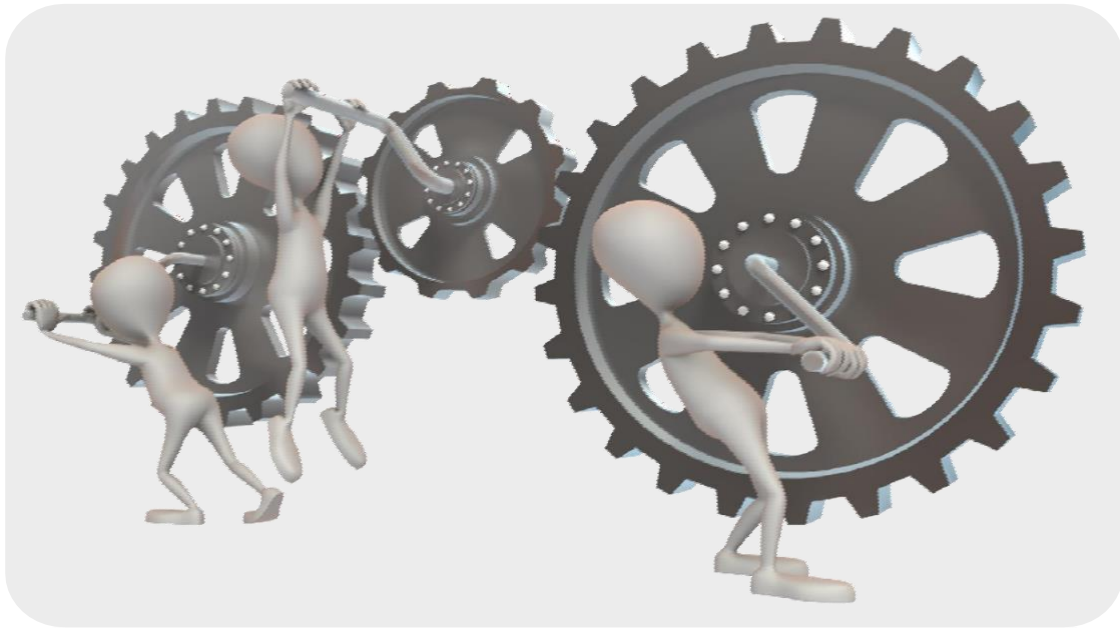




ME105

Maintainability, Maintenance and Reliability for Engineers

Course Introduction:

This course covers the basic concepts of Reliability, Availability and Maintainability (RAM) and procedures to apply them in the process industries. A number of case studies are followed to aid understanding of how to use RAM, to analyze the unavailability issues in processes. The course is aimed at managers and process engineers who need to understand the importance of RAM, both in production management and in process design.

Maintenance strategy has a critical influence on plant availability in the process industries. Too frequent preventive maintenance will cause the operation to lose profit through reduced product throughput. Not enough preventive maintenance will cause the process to suffer unscheduled break-downs, needing corrective maintenance. Further maintenance policy is also influenced by the external environment, for example, the penalty of lost production, spare parts inventory etc. The course introduces systematic ways to determine preventive maintenance policy.

In process design, traditionally maintenance is not studied until the process configuration has been fixed. However, this often misses the opportunities to reduce product life cycle cost. It is not only important to understand the behavior of individual items of equipment but also different system configurations. The course will also introduce techniques that allow RAM to be fully integrated into conceptual design in order to optimize flow sheet design and minimize production life cycle cost. A tool failure, Mode Effects and Criticality Analysis is also introduced to aid conduct RAM assessment.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- Understand how it is connected between life cycle cost and reliability-wise
- Recognize the relationship between reliability, availability and maintenance
- Explain how to plan your preventive maintenance
- Describe how to find the optimal design by incorporating RAM into process design
- Identify your item/system failure modes

Who Should Attend?

The course is intended for people with a chemical or mechanical engineering background working in the process industries, or in engineering and consultancy companies servicing those industries.

Process design engineers, reliability engineers and project engineers/managers should attend this course.

Course Outline:

Day 1:

- RAM & Business, RAM Study General Process
- Reliability Basics
 - Definitions and Basic Concepts
- Reliability Prediction
 - Reliability Models in Practice
 - Reliability Growth
 - Design Reliability

Day 2:

- Maintainability and Maintenance
 - Maintainability Definition
 - Maintenance Measurement
 - Maintenance Policy
- Availability Basics, Application in Practice
- The Relationship between Reliability, Availability and Maintenance - Quantitative Relationships

Day 3:

- Preventive Maintenance (PM) Optimization, Optimize PM for a Single Item
- System Reliability Block Diagram (RBD)
 - Relationship between Flow Sheet and RBD
 - How to Develop a RBD from Fault Tree Analysis
- System Reliability/Availability Evaluation

- Serial/Parallel Systems
- K-Out-of-N Systems
- Complex Systems

Day 4:

- System Preventive Maintenance Optimization
 - PM Frequency Optimization for a System
- Redundancy System Reliability/Availability
 - Active Parallel Redundancy Systems
 - Standby Redundant Systems
- Intermediate (Buffer) Storage
 - Use of Intermediate Storage for Reliability

Day 5:

- Incorporating RAM into Conceptual Design Optimization, Incorporate Reliability, Availability and Maintenance Optimization into Conceptual Design
- Using FMECA/FTA to Identify your Equipment Failure Modes
 - FMECA (Failure Mode Effective and Criticality Analysis)
 - (FTA) Fault Tree Analysis in Practice Fuels
 - Feedstock Quality
 - Industry Structure
- Concluding Remarks

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 course locations. This rate includes participant's manual, Hand-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