Professional Engineering Services

Maintenance Engineering
A Modern Approach

Course Duration 5 Days

Designed For Maintenance & planning managers, supervisors, mechanical, electrical, planning & integrity engineers,

Course Objectives This is a skill building course designed to teach participants how to make maintenance decisions and optimize maintenance plans using RCM and how to assess plant availability and optimize plant capacity utilizing the latest techniques in maintenance management.

Course outcome

- The course shall present a cradle-to-grave strategy to preserve equipment function, avoid the consequences of failures, and ensure the productive capacity of equipment. Moving well beyond traditional approaches, this strategy incorporates quality and safety, human error, and software maintenance considerations along with costing, reliability, and maintainability. The course shall assist attendees to optimize maintenance activities, extend equipment life, and minimize failures.

Course Contents

Part I: Maintenance Management Introduction

- Introduction on maintenance planning.
- Maintenance Facts and figures.
- Maintenance engineering objectives.
- Maintenance terms and definitions.

Part II: Maintenance Management & Control

- Introduction
- Maintenance Department Functions
- Types of Maintenance Management
- Benefits & Drawbacks of Centralized Maintenance management
- Maintenance Management Principles
- How to Evaluate Your Maintenance Efforts?
- Elements of Effective Maintenance Management

Maintenance Policy

- Material Control
- Work order System
- Equipment Records.
- PM&CM
- Job Planning & Scheduling
- Backlog control & priority system
- Performance measurements
- How to control a maintenance project (Methods of applying PERT & CPM)
- Maintenance management principles

Part III: Maintenance Strategy

Preventive Maintenance

- Introduction.
- PM schedule.
- Preventive Maintenance Elements & Objectives
- Steps for Establishing a P.M Program
- How to decide the need for PM
- PM steps and measures.
- Preventive Maintenance Advantages & Disadvantages

Corrective Maintenance

- Introduction.
- Corrective Maintenance types & steps
- Corrective Maintenance Downtown Components
- How to reduce CM Time
- CM measures.

Part IV: Reliability Centered Maintenance "RCM"

- Introduction
- RCM Objectives & Goals
- RCM Principles
- RCM Process & Components
- Maintenance Types
  - Reactive Maintenance
  - Preventive Maintenance
  - Reactive Maintenance
  - Proactive Maintenance
- Reliability Engineering
- Failed- Item analysis
- Root Cause Failure Analysis (RCFA)
- RCFA Objectives
- Specs for New/Rebuilt Item/Equipment
- Age-Exploration - AE

- Technical Content.
- Performance Interval
- Task Grouping
- Rebuilding Certification/Verification
- Recurrence Control
- Repetitive Failures
- Precision rebuild and installation
- Rotor Imbalance Effect
- Misalignment Effect
- Predictive Testing and Inspection Technologies (PTI)
  - Six PTI Technologies/Approaches
  - Vibration monitoring and analysis
  - Electrical condition monitoring
  - Thermograph
  - Lubricant and wear particle analysis
  - Oil Analysis
  - AVD Applications
  - Nondestructive Testing (NDT)
  - Ultrasonic Testing (Imaging)
  - Dye Penetrate Inspections
  - Hydrostatic Testing
  - Radiography
  - Magnetic particle testing
  - Eddy current testing
  - NDT Limitations & Location guidelines
- RCM Effectiveness Measurement Indicators
- RCM Advantages & Reasons for Failure.

Part V: Inventory Control:

- Introduction
- Historical Information
- Inventory Purposes
- Inventory Control ABC Classification
- Steps for Grouping annual Usage
- Items Cost & Annual Consumption
- Control Policies

Part VI: Maintenance Economics, Human Errors, Safety

Maintenance Economics

- Economic Order Quantity Model
- Types of costs
- Holding Cost Elements
- Production Order Quantity Model
- Quantity Discount Model
- SAFETY STOCK
- Increasing / Decreasing Maintenance Inventory-associated Factors
- Estimating Spare Part Quantity Model

Human Errors in Maintenance

- Introduction
- Error In System Life Cycle
- Top Human Failure Problems
- Reasons for Maintenance Error
- Guidelines to Reduce Human Error
- Fault Tree Analysis Method Example

Quality & Safety in maintenance

- Need For Quality Maintenance
- Maintenance Work Quality
- Post-Maintenance Testing Objectives & Key Elements
- Common PMT Activities & Key Elements
- Reasons of Safety
- How to Improve Safety in Maintenance?
- Maintenance Personnel Safety

Part VII: Maintenance costing

- Introduction.
- Types & Reasons of Maintenance Cost
- Factors Influencing Maintenance Cost
- Maintenance Budget
- Maintenance Budget Types
- Budget Preparation Approaches & Steps
- Maintenance Labor Cost Estimation
- Maintenance Material Cost Estimation Models
- Cost Data Collection
- Equipment Ownership Maintenance Cost.

Part VIII: Reliability & MAINTAINABILITY

Reliability

- Introduction
- Root Cause Of Equipment Reliability problems
- Causes Of Failure During The Burn-in Period
- Reliability Measures, Networks & Analysis Methods.
- Failure Modes and Effect Analysis

MAINTAINABILITY

- Introduction
- Maintainability Terms And Definitions
- Objective of Maintainability
- Lifecycle Four phases
- Maintainability Design Characteristics
- Modularization
- Standardization

- Maintainability Measures
- Common Errors Related to Maintainability Design

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