ICTD
المركز العالمي للتدريب والتطوير
International Centre For Training & Development

ME164
Optimizing Equipment Maintenance & Replacement Decisions

Course Introduction:

Is your equipment (fixed or mobile) failing before planned replacement?

Are you unable to execute maintenance tasks because spare parts are not available?

Have you made significant investment in CBM methods and tools but struggle to realize the benefit?

Do you have lots of data from oil analyses but still struggling to accurately predict your equipment breakdowns?

Do you know how to determine optimum asset life?

Are you struggling to justify the economics of asset replacement?

Are you having difficulties in deciding whether to rebuild or replace your equipment to minimize the life cycle costs?

Do you need to optimize your emergency spare requirements?

If you answer YES to any of the above questions, this course is for you

Course Objectives:

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

- Focus on the techniques of optimization - the single most important thrust of this learning program. Whether the decision is about work-crew sizes, or the replacement of component-parts or entire equipment units, the concept of making the very best, most optimal, decision will be the principal concern of the training program
- Equip the participating maintenance managers, planners and schedulers and engineers with the know-how to select the most appropriate analytical tools for their maintenance decision-making
- Reflect the growing focus of industrial safety and the profusion of safety-related litigation - think of transportation accidents, chemical spills, and mining disasters - the program will show how safety objectives relate to the optimization models, and will underline the advantages of having a well-documented and rigorously-executed program of maintenance and replacement
- Introduce the critical decision-making topics that can make a significant difference to the in-service time of equipment, to the costs related to doing maintenance too often or too seldom, and the optimization of asset utilization
- Cover the classic need-to-know material in the area and to acquaint the participants with leading-edge and on-the-horizon approaches that they will encounter in the near future

Who Should Attend?

This course is intended for engineers, professionals of plant operations, facility professionals, maintenance or reliability professionals who are responsible for maintaining and managing the physical equipment assets of a plant/facility. The ideal candidate for this course is an engineer, professional of plant operations, facility professional, maintenance or reliability professional who is responsible for maintaining and managing the physical equipment assets of a plant/facility. He or she represents large facilities and plants from industries such as oil and gas, petrochemical and fertilizer, pulp and paper, cement and ceramics, power generation and utilities, primary metals, and heavy manufacturing and facilities.

Course Outline:

Day 1:

Physical Asset Management & Reliability Concepts

From Maintenance Management to Physical Asset Management

- Challenges of physical asset management
- The maintenance excellence pyramid
- Reliability through the operator: Total Productive Maintenance
- Reliability by design: Reliability Centered Maintenance
- Optimizing Maintenance & Replacement Decisions

Reliability Improvement through Preventive Maintenance

- Analysis of Component Failure Data
- Probability Density Function
- Reliability Function
- Hazard Function
- Weibull Density
- Infant Mortality
- Bath-Tub Curve

Exercise in Analyzing Component Failure Data Using the Weibull Distribution

- Estimating the Weibull Parameters
- Using Median Rank Tables
- The role of the Real-code software Package

Day 2:

Dealing with Censored Data, the 3-Parameter Weibull, and the Kolomorgov-Smirnov Test

- Upper-End Censoring, Multiply Censored Group Data
- Estimating the Location Parameter in the Weibull Distribution
- Checking the Goodness-of-Fit of the Distribution

Reliability Improvement through Preventive Maintenance (continued)

- Component Replacement Procedures including Glasser's Graph
- Block Replacement Policies
- Age-Based Replacement Policy
- Setting Policies based on Safety Constraints, Cost-Minimization and Availability-Maximization
- Repairable systems

Case Studies in Component Preventive Replacement

- Including boiler plant, bearings, pumps, sugar feeds, compressor valves, and centrifuges

Day 3:

Spare parts provisioning

- Fast moving spares
- Emergency (insurance) spares

Case studies in spares provisioning

- Including line replaceable units (LRUs), cylinder heads, repairable conveyor electric motors and utility transformers

Group and individual exercises

Reliability Improvement through Inspection

Inspection Frequency and Depth for equipment in continuous operation

- Inspection Intervals to Maximize Profit
- Maximizing Equipment Availability
- Inspection Intervals for Equipment Used in Emergency Situations (e.g. protective devices)
- Case studies including oil and gas field equipment such as pressure safely valves (for protective devices)

Day 4:

Health-Monitoring Procedures

- Proportional Hazards Modelling
- Spectroscopic Oil Analysis Programs

- Optimization of Condition-Based Maintenance Procedures
- Role of software for CBM optimization
- Case studies including food procession industry (vibration monitoring), pulp and paper and shipping equipment such as compressors (vibration monitoring) and diesel engines (oil analysis), turbines in an electrical generating station (pressure measurements)
- Demonstration of software for optimizing condition-based maintenance decisions

Reliability Improvement through Asset Replacement

Aspects of Discounted Cash Flow Used in Capital Equipment Replacement Analysis

- Estimating the Interest Rate Appropriate for discounting
- Present-Value Calculations
- The effects of Inflation in the Analysis
- Calculating the Equivalent Annual Cost (EAC)

Economic Life of Capital Equipment

- The "Classic" Economic Life Model
- Before-and-After Tax Calculations
- The Repair-vs-Replace Decision
- Life-Cycle Costing
- Technological Improvement

Day 5:

Case Studies in Capital Equipment Replacement

- Including seamers in the food processing industry and combustion engines in the oil and gas sector

Group and individual exercises

Clinic: Hands-On Use of PC Software for Capital Equipment Replacement Analysis

- Participants will solve pre-set problems

Effective Use of Maintenance Resource

Organizational Structure, Crew Sizes, Workshop Resource Requirements

- Balancing Maintenance Costs against Plant Reliability
- Establishing the optimal number of machines to have in a workshop
- Resource Requirements Using Queuing Theory and Simulation
- Utilization of Outside Resources
- Lease vs. Buy Decision

Case studies including balancing maintenance cost and reliability in an electrical generating station, establishing optimal mix of machines to have in a steel mill maintenance workshop, establishing shift patterns and maintenance crew sizes in a petrochemical plant

Maintenance Management Information Systems

- Methodology for Auditing a CMMS

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 Questionaires
- 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