



ME019: Excellence in Maintenance & Reliability Management: *Rotating Equipment Reliability Optimization & Continuous Improvement*

Training Description:

Every year, industry in the United States alone is spending around one trillion dollars on plant and equipment maintenance. According to maintenance specialists, at least one third of this amount is wasted, and that's just the tip of the iceberg. Bad maintenance management is responsible for equipment failures, disrupted production schedules, delays in deliveries, and poor product quality. Why is industry wasting one out of every three dollars spent on maintenance? The answer is simple: Poor management and poor systems.

The problem of reliability allocation and optimization of Rotating Equipment has been widely investigated by world-class process companies during the last decade. Instead of concentrating exclusively on redundancy allocation as per the old fashion maintenance, the minimum required reliability for each component of the equipment are now estimated in order to achieve the equipment reliability goal with minimum cost.

Thereafter, the engineer can decide whether this minimum required component reliability will be achieved via fault avoidance or redundancy. This new philosophy allocates reliability to a component according to the cost of increasing its reliability.

Continuous improvement of plant reliability by optimizing predictive maintenance for rotating equipment is one of the most important challenges plants face today. To know how to effectively prevent equipment failures, conduct a successful root cause failure analysis and improve condition monitoring for pumps, turbines and compressors are continuing challenges for engineers. Proper analysis and solving of chronic problems at the source saves time and money.

This intensive training course is designed to assist maintenance management personnel responsible for delivering maximum reliability and availability of equipment at the lowest possible cost. The course will present techniques designed to improve the effectiveness of maintenance management activities, to ensure that physical assets perform their required functions, operate reliably, and support corporate goals.

The course will explain the effective method of component condition monitoring for use as both a predictive maintenance and root cause analysis tool. It also details the major failure causes, the world-class proven root cause analysis procedure with exercises and case histories, installation, pre-commissioning planning, functional testing and commissioning, preventive maintenance strategies and more.

The course sessions will focus on the modern methods and techniques on the most critical aspects of maintenance management such as Organizing maintenance resource, Selecting the right maintenance work, analyzing failures, Setting and conducting a maintenance plan, planning spare parts, Estimating and controlling maintenance costs, Computerizing maintenance planning and measurement operations. The participants will also be introduced to Reliability tools and the effect human reliability has on plant availability.

To maximize the benefits of the course, participants should be prepared to actively participate in the Course and bring examples of standard work plans, a list of plant performance metrics, the work priority system in-place, and any other maintenance or reliability material they would like to review and discuss.

Training Objectives:

This hands-on, highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

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

- ✓ Achieve excellence in maintenance and reliability management including rotating equipment reliability optimization and continuous improvement
- ✓ Recognize the aspects of maintenance excellence and identify the different equipment failure patterns and the reasons why equipment fails
- ✓ Perform machinery failures prevention and maintenance management
- ✓ Apply the concept of optimizing reliability particularly condition monitoring and predictive maintenance
- ✓ Employ the methods of preventive maintenance and condition monitoring as well as effective predictive maintenance including root cause analysis techniques
- ✓ Implement the procedure of work selection, work planning and scheduling and specify the different proven turnaround practices in accordance with success factors and management practices
- ✓ Apply the various stewardship and performance metrics including performance work management, KPIs, maintenance effectiveness metrics and work force utilization metrics
- ✓ Perform site reliability assessment in order to identify targets for improvement and prepare site reliability optimization plan
- ✓ Discuss rotating reliability assurance and carryout machinery installation as per the guidelines
- ✓ Identify pipe stress and soft foot effects on component failures including the effects of misalignment on reliability, quality assurance and continuous improvement
- ✓ Apply the concept of Computerized Maintenance Management Systems (CMMS) with focus on SAP system and identify the CMMS components, benefits, implementation plan and more

Training Designed for:

This course is intended for all Maintenance & Reliability Management Personnel such as Managers, Engineers, Supervisors, Section Heads, Planners and Foremen.

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request.”

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ Introduction
- ❖ Maintenance Excellence

- Framework for Maintenance Excellence, Overall Philosophy, Maintenance Principles, Work Environment, Equipment, Information Systems, Elements for Effective Maintenance, Establishing the Environment for Improvement, Types of Maintenance, Maintenance Strategy Development, Productive Maintenance, Discussion
- ❖ **Equipment Failure Patterns**
 - Types of Equipment Failures, Why Equipment Fails, Failure Analysis & Root Cause, Discussion
- ❖ **How to Prevent Machinery Failures**
 - Introduction, Component Function Awareness — 'What should it Do?,' Component Condition Monitoring — 'What is it Doing?,' Preventive (PM) and Predictive Maintenance (PDM), Troubleshooting, Reliability, Everyone's Responsibility
- ❖ **Maintenance Management**
 - Managing Maintenance, Basic Principles, Maintenance Business Model, Business Elements, Maintenance Organization, Discussion, Business Plan, R&M Policy, Maintenance Plans, Discussions, Objectives, Equipment Plans Development, Plan Options, Approaches, Discussion

DAY TWO:

- ❖ **Optimizing CCM and PDM (Component Condition Monitoring and Predictive Maintenance)**
 - The Major Machinery Components, Component Condition Monitoring, Predictive Maintenance (PDM) Techniques
- ❖ **Preventive Maintenance & Condition Monitoring**
 - Types of Condition Based Monitoring, Vibration Monitoring, Pump Monitoring Frequency, Infrared Thermography, Physical Effects Monitoring, Lube Oil Analysis, Discussion
- ❖ **Effective Predictive Maintenance (Including Root Cause Analysis Techniques)**
 - Introduction, Troubleshooting Procedure Overview, Initial Fact Finding, Thorough Knowledge of Equipment, Component and System Functions, Defining Abnormal Conditions, Listing All Possible Causes, Eliminating Causes Not Related to the Problem, State Root Causes of the Problem, Develop an Action Plan to Eliminate Root Cause
- ❖ **Root Cause Analysis Techniques (Improving Component Function Knowledge Base)**
 - Introduction, Component Function, Component Failure Causes, Component Condition Monitoring, Examples of Knowledge Base Enhancement

DAY THREE:

- ❖ **Work Selection Mission**
 - Work Screening Procedure, Work Request Requirements, Prioritization Systems, Cost Benefit Analysis, Discussion
- ❖ **Work Planning and Scheduling**
 - Planning Objectives, Planning Effectiveness, Planning Metrics, Planners and Staffing, Routine Maintenance Planning, Work Plan, Planning Tools, Scheduling & Considerations, Types of Schedules, Work Execution Packages, Maintenance Backlog, Discussion
- ❖ **Proven Turnaround Practices**
 - Success Factors, T/A Concern Areas, Management Practices, Milestone Plan, Work Scope, Projects, Material Procurement, Process Operations, Pre-T/A Reviews, Discussions
- ❖ **Stewardship and Performance Metrics & KPIs**

- Performance Indicator Characteristics, Business Results Indicators, Process Unit Run-Length Goals, Work Management KPIs, Maintenance Effectiveness Metrics, Equipment Specific Indicators, Work Force Utilization Metrics, Discussion

DAY FOUR:

❖ Site Reliability Assessment

- Site Reliability Audit Form, Reduction of Data, Identifying Targets for Improvement, Forms and Worksheets

❖ Preparing a Site Reliability Optimization Plan

- Introduction, Identifying Opportunities for Optimization, Determine the Root Cause of Each Identified Opportunity, Establish Steps to Prevent Re-occurrence of Problems, Setting Up an Effective Multi Disciplined Site Reliability Initiative, Obtain and Maintain Management Support, How to Maintain Continuous Improvement of the Established Program

❖ Rotating Equipment Reliability Assurance

- Introduction, The Pre-FEED Phase, The Specification and ITB Phase, Pre-Bid Activity and Degree of Audits, Bid Evaluations, Pre-Award Meeting, The Coordination Meeting, Design and Manufacturing Audits, Document Review, Testing Phase

❖ Machinery Installation Guidelines

- Introduction, Site Procedures, Foundations, Piping, Shaft Alignment, Couplings, Cleaning of Equipment and Associated Pipe, Final Inspection and Start-Up Checks, First Start, Run-In and Initial Operation

❖ Practical Sessions

- This hands-on, highly-interactive training includes simulator, real-life case studies and exercises

DAY FIVE:

❖ Pipe Stress and Soft Foot Effects on Component Failure

- Introduction, How Pipe Stress and Soft Foot Can Cause Component Failure, The Root Causes of Excessive Pipe Stress and Soft Foot, Condition Monitoring Indications of Excessive Pipe Stress and Soft Foot, Confirming Excessive Pipe Stress and/or Foundation Forces (Soft Foot), Correcting Excessive Pipe Stress and Foundation Forces on Equipment, Implementation of the Action Plan

❖ The Effects of Misalignment on Reliability

- Introduction, Why Misalignment Reduces Rotating Equipment Reliability, How Misalignment Effects Can Be Detected, Alignment Methods and Guidelines

❖ Quality Assurance & Continuous Improvement

- Objectives and Implementation, Data to be Screened, Bad Actors and RCFA, Quality Audits, Discussion

❖ Computerized Maintenance Management Systems (CMMS)

- Components, Benefits, Implementation Plan and Issues, SAP Maintenance, Discussion: What System Installed? Are all the Features Used? How long did it take to Implement? Do you have a SAP System? Do you Know How to Use it? What are the difficulties you Face with SAP?

❖ Course Conclusion

❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615