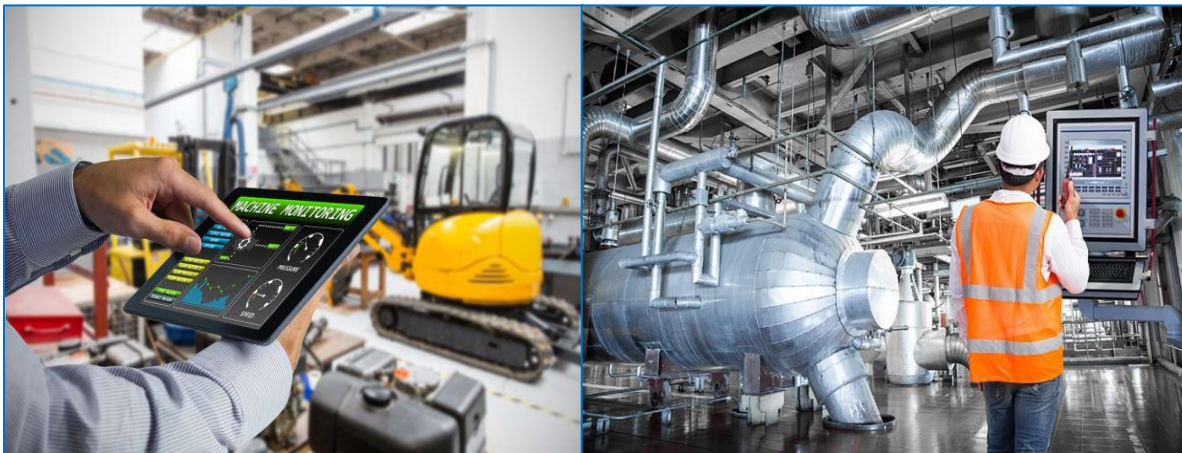




ME172: Precision, Preventive & Predictive Maintenance

Training Description:

Precision maintenance was created to ensure plant and equipment was maintained to the finest specification so that variations which caused defects and failures were eliminated as the maintenance work was done. Precision maintenance rebuilds machines and equipment to the highest standards so that fewer problems occur during operation. Precision maintenance is a matter of systematically ensuring the important things for equipment and machinery health are done right and done accurately first time.

Preventive and Predictive maintenance techniques provide data that define required servicing and inspection periods so that maintenance departments can determine in advance when equipment must be shut down for overhaul. Statistics are proving that these programs, when properly implemented, can minimize equipment and system breakdowns, resulting in a major reduction in total maintenance and operating costs.

This dynamic course covers all facets of Precision, Preventive and Predictive Maintenance. It is designed to benefit every level of maintenance personnel, providing the most up-to-date facts and techniques on the maintenance technology that is revolutionizing the way our industry operates. It examines the importance of PPM in a "World Class Maintenance" environment.

The course is designed to provide an insight into Condition Based Monitoring (CBM). It will cover the various methods of maintenance and it will give the participant an introduction to the techniques utilized in Condition Based Monitoring such as Noise & Vibration Measurement, Infrared Thermography, Oil Debris Analysis, Laser Alignment and Balancing.

Participants will understand the place of condition monitoring in the maintenance process and will appreciate the implications for maintenance cost saving and improved machine reliability. They will be able to assess plant for the most appropriate monitoring parameter, will learn of the various specialist instruments and methods, be able to plan a monitoring programme and set up measurement rounds.

The course will introduce participants to the dynamic behaviour of machines and discuss appropriate fault detection and diagnostic criteria and schemes for various applications. It will address the more popular techniques which employ dynamic data analysis, including vibration and acoustic emission signals for the recognition of early life failures in machines. Emphasis will be placed on the practical application of tools to identify a wide range of mechanical, electrical and lubrication flaws in machinery and an objective approach to the optimum choice of analysis procedure.

Training Objectives:

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

- ✓ Apply systematic techniques on precision, preventive and predictive maintenance
- ✓ Recognize the world-class aspects of maintenance today through maintenance and reliability, maintenance cost, maintenance profitability, maintenance development and maintenance policies
- ✓ Identify the equipment failure process covering the machinery failure, P-F curve concept, equipment failure patterns and failure characteristics
- ✓ Define equipment criticality assessment and its process
- ✓ Carryout machinery troubleshooting systematic approach and corrective maintenance
- ✓ Discuss the economics of preventive maintenance including tradeoff between repairs and PM,

three preventive maintenance scenarios, payback, return on investment (ROI) and cost/benefit ratio (CBR)

- ✓ Classify the maintenance policies and maintenance development overtime of predictive maintenance (PDM)
- ✓ Apply major parameters used for detection of machine and vibration monitoring
- ✓ Employ ultrasonic monitoring, infrared thermography monitoring and lubricant quality and wear particle analysis
- ✓ Illustrate electrical signal analysis (ESA), PPM programme and reliability centered maintenance
- ✓ Apply root cause failure analysis (RCFA) as well as recognize maintenance and reliability terms

Training Designed for:

This course is intended for maintenance managers, plant engineers, maintenance engineers, maintenance superintendents and first-line supervisors, instrumentation engineers, CBM engineers, preventive maintenance specialists and other technical staff.

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
- ❖ Understanding Maintenance
 - Understanding Maintenance, Understanding Reliability, Maintenance & Reliability – Strategic Importance, Maintenance & Reliability – Objectives, Understanding Maintenance Cost, Maintenance Cost Facts & Figures, Maintenance & Profitability, Maintenance Development Overtime, Maintenance Policies
- ❖ Equipment Failure Process
 - Failure Process – Introduction, what is Machinery Failure? The P-F Curve Concept, How Failures Appear? Equipment Failure Patterns, The Failure Characteristics
- ❖ Equipment Criticality Assessment (ECA)
 - What is Equipment Criticality Assessment? Why do you need ECA? ECA Process
- ❖ Machinery Troubleshooting “A Systematic Approach”
 - What is Troubleshooting? The “So What?” of Troubleshooting, Machinery Troubleshooting “Seven Step Troubleshooting Philosophy” (Symptom Recognition, Symptom Elaboration, Listing of Probable Faulty Functions, Localizing the Faulty Function, Localizing the Fault to a Component, Failure Analysis, Retest Requirements), Machinery Troubleshooting (Matrix Approach)

DAY TWO:

❖ Corrective Maintenance

- Preventive Maintenance (PM) (What is Preventive Maintenance? Cleaning, Lubrication, Relubrication Volume), Lubrication – Grease, Methods of Supplying Lubricant, Precision Lubrication, Forced Lubrication, Turbine Lubricating Oil System Function, Lubrication Storage & Handling – Best Practice, Summary of Lubrication Best Practices, Potential Outdoor Lubricant Storage Problems
- Overview of Oil Analysis, Comparative Viscosity, Adjusting & Tightening, Testing & Calibration, Scheduled Replacement, Inspection, Rebuild

❖ Economics of Preventive Maintenance

- Tradeoff Between Repairs and PM, Three Preventive Maintenance Scenarios (No Preventive Maintenance, Current PM Levels, Industry Benchmark PM) Payback, Return on Investment (ROI), Cost/Benefit Ratio (CBR)

DAY THREE:

❖ Predictive Maintenance (PDM)

- Classification of Maintenance Policies, Maintenance Development Overtime, Major Parameters used for Detection of Machine, Vibration Monitoring (What is Machine Vibration?, Why Monitor Machine Vibration?, How is Vibration Measured?, How is Vibration Described?, Vibration Detection Vs. Analysis, Which Machines Need Monitoring?, International Standards on Vibration, Vibration Monitoring & Analysis, Faults Detected by Vibration Analysis

❖ Ultrasonic Monitoring

- Ultrasonic Monitoring – Measuring, Ultrasonic Detection (Leak Detection, Steam Traps, Valve Leak Detection, Bearing Lubrication, Bearing Faults, Gear Faults), Ultrasonic (Pump Cavitation, Electrical Inspection), Ultrasonic Monitoring – Setting a Baseline, Advantages & Cost

❖ Infrared Thermography Monitoring

- What is Thermography? Uses, Benefits, See the Heat, See the Problem, Predictive Maintenance (PdM) Techniques

DAY FOUR:

❖ Lubricant Quality & Wear Particle Analysis

- Oil Sampling & Testing (Lube Oil Selection, History, Oil Analysis, Oil Quality Analysis), Rolling Element Bearing & Improved Lubrication, Wear Particle Analysis (Particle Types & Sources, Alarm Limits for Various Machines (Source: National Tribology Services)
- Origin of Particles • Non-Vibration Based Condition Monitoring and Fault Diagnostic Methods

❖ Electrical Signal Analysis (ESA)

- Rotor Bar Damage • Bearing Problems

❖ PPM Programme Putting it All Together

- Setting Up a PPM Program (Sequence of Major Steps)

❖ Practical Sessions

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

DAY FIVE:

- ❖ **Reliability Centered Maintenance**
 - Introduction, Benefits, Development, Process
- ❖ **Root Cause Failure Analysis (RCFA)**
 - The Three Levels of Root Cause – Physical, Human & Latent Causes, General Principles of RCA, Steps for Root Cause Failure Analysis – Reporting an Incident or Problem, Scoping, Appoint the RCA Team, Defining the Problem, Collection of Data, Data Analysis, Total Productive Maintenance, Program Development Master Plan, A Chart for Autonomous Maintenance, Training Skill Development Matrix, Big Losses, Overall Equipment Effectiveness (OEE), Total Effective Equipment Performance, Direct Benefits of TPM, Indirect Benefits of TPM, Difficulties Faced in TPM Implementation, The Cost of Implementing TP, Conclusion
- ❖ **Maintenance & Reliability Terms**
 - Downtime, Reliability, Availability, Mean Time Between Failure (MTBF), Mean Time to Repair (MTTR), Maintainability
- ❖ 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:

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