



INSTITUTE OF MAINTENANCE MANAGEMENT EDUCATION



Virtual Training Programme

Effective Preventive, Predictive and Proactive Maintenance

Introduction

Effective preventive maintenance is necessary to preserve the inherent reliability of equipment and detect failures in sufficiently advance time to plan, schedule and conduct necessary corrective actions. If preventive maintenance activities do not achieve these objectives in a cost effective manner then we have to examine their validity. We need to be sure that preventive maintenance schedules are having a positive impact on plant reliability and we aren't simply following such activities because they are part of the maintenance programme for many years. It is not uncommon to find that many Fixed Time Maintenance (FTM) tasks, such as scheduled overhauls and replacements are being done on periodic basis because that is what the plant has always done, and nobody has challenged the validity of these tasks. These tasks are often driven by the availability of time and maintenance people instead of the true validity of the tasks.

The purpose of carrying out preventive maintenance is to detect and check potential failures at an early stage. This usually takes the form of preventive inspections, such as look, listen & feel. Further, preventive maintenance is also aimed to preserve the inherent reliability of plant equipment. When commissioned, all plant and equipment have a level of inherent reliability that is mainly determined by the design, manufacture and installation factors. If equipment is correctly operated and maintained, equipment should achieve that level of inherent reliability. Such a result is achieved through scheduled replacement or restoration of worn parts or through tasks such as cleaning, lubrication, inspection and making various adjustments.

Predictive Maintenance allows the user to evaluate the condition of equipment and avoid failures. It is based on monitoring condition of plant equipment and machinery by using various techniques in order to forestall a significant change which is indicative of a developing fault. Predictive maintenance represents a diagnostic approach to plant maintenance to help taking timely action on the basis of realistic needs of maintenance. This practice is based on the objective checking of machine condition on a periodical basis and intended to provide quantitative measurement of wear and defects. Further, it's

aimed to predict equipment problems and failures in advance to avoid the need of breakdown maintenance to a greater extent.

In distinct contrast to preventive maintenance, predictive maintenance makes use of a number of modern condition monitoring instruments to measure a whole range of parameters that prove detrimental to the health, condition and performance of plant equipment and machinery. It's a new generation technique brought out to meet the challenges of reducing downtime to a greater extent. Proper integration of predictive maintenance with preventive maintenance systems and practices ensures far more effective control on downtime of plant equipment and machinery.

Proactive maintenance, on the other hand, involves a maintenance strategy that corrects the source of the underlying equipment conditions. Proactive maintenance focuses on determining potential root causes of machine failures, and dealing with those issues before problems occur. Proactive maintenance looks at why machine breaks down. The goal of proactive maintenance is to reduce unplanned downtime, equipment failure, and risks associated with operating faulty equipment. The purpose of proactive maintenance is to see machine failures as something that can be anticipated and eliminated before they develop. The main goal of proactive maintenance is to increase asset reliability and reduce the risk of downtime. Creating a proactive maintenance program helps organizations find hidden inefficiencies and reduce maintenance and operational costs.

Methodology

The methodology for conducting the Virtual Training Programme is briefly described as below:

- Focused Presentation
- Interactive Discussions
- Case Studies
- Question - Answer Sessions
- Practical Exercises

Programme Coverage

- Insights into Planned Maintenance Concepts & Practices
- Essential Elements of Preventive Maintenance & Lubrication Activities
- Organizing Effective Preventive Maintenance Programme
- Initiatives for Improved Planned Maintenance System
- Concepts, Considerations and Economics of Predictive Maintenance
- Predictive Maintenance Tools & Techniques
- Proactive Maintenance and Root Cause Elimination
- Practical Exercise

Focal Points of the Training Programme

- **Planned Maintenance Concepts & Practices:** Develop deeper insights into planned maintenance concepts & practices paving way for better conservation of assets, increased life expectancy of machines, reduced downtime, fewer major repairs, improved reliability and higher profitability.
- **Effective Preventive Maintenance & Lubrication Programme:** Learn to augment preventive maintenance programme to get most out of the plant equipment & machinery and avoid unnecessary downtime. Also, assimilate key requirements of systematic and effective lubrication programme.
- **Initiatives for Improved Planned Maintenance System:** Get introduced to various initiatives to help strengthen planned maintenance system at your work place.
- **Predictive Maintenance Concepts, Economics and Tools & Techniques:** Understand fundamental concepts of predictive maintenance and economics vis-à-vis preventive maintenance. Build a clear understanding about various predictive maintenance tools & techniques to meet the challenge of reducing downtime to a greater extent.
- **Proactive Maintenance:** Gain the importance of proactive maintenance strategy aimed to find underlying equipment conditions and hidden inefficiencies. Get exposure to determine potential root causes of machine failures and dealing with those issues before problems occur.
- **Practical Exercise:** Gain some invaluable experience by working on practical exercise based on planned maintenance system & practices in industry.

Benefits of Attending the Training Programme

Benefits of attending the training program will include the ability to:

- Gain deeper insights and understanding of planned maintenance concepts & practices to make way for progressive improvements.
- Minimize equipment downtime in addition to reducing workload of the maintenance workforce.
- Reduce costs by moving to a more professional approach to maintenance management through economical operations.
- Remove production interruptions to a lower level by way of improved planned maintenance practices.
- Understand the proactive maintenance strategy to eliminate the need of fixing equipment again and again.

- Get to know about root cause issues of various machines and how to deal with them effectively.
- Gain invaluable experience of dealing with systemic maintenance problems by way of practical group discussion.

Participation

- Maintenance Engineers & Managers
- Plant Engineers
- Team Leaders
- Technical Executives from operation, reliability, asset management, etc.
- Engineering Supervisors, etc.

Course Contents

MODULE I: Insights into Planned Maintenance Concepts - I

- Basic Maintenance Concepts
- Machine Reliability and Availability
- ROI and Maintenance
- Forms of Maintenance
- Evolution of Maintenance Techniques
- Why Planned Maintenance is Necessary!

MODULE II: Insights into Planned Maintenance Concepts - II

- Reactive vs. Planned Maintenance
- Direct, Indirect & Total Maintenance Cost
- Maintenance Cost Objectives
- Components of Downtime
- Loss of Profit due to Downtime
- Maintenance Mantras
- Making Economic Decisions

MODULE III: Essential Elements of Lubrication & Preventive Maintenance Programme

- Purpose of Lubrication
- General Lubrication Problems
- Systematic Lubrication Programme
- Steps to Planned Lubrication System
- Effective Preventive Maintenance

MODULE IV: Organizing Effective Preventive Maintenance System

- Elements of Planned Maintenance System
- Ideas for Effective Maintenance Programme
- Systematic Approach in Designing a Planned Preventive Maintenance System
- Machine Criticality and Selective Policy
- Codification of Equipment
- Planned Maintenance Forms, Records & Reports

MODULE V: Concepts, Considerations and Economics of Predictive Maintenance

- Prediction through Condition Monitoring
- Over and Under Maintenance & Examples
- Preventive Maintenance vis-à-vis Predictive Maintenance
- Quantitative Measurement of Equipment Condition
- Economical Benefits of Predictive Maintenance
- Condition-based Maintenance v/s Fixed Time Maintenance & Case Studies

MODULE VI: Predictive Maintenance Tools & Techniques

- NDT Techniques
 - Ultrasonic Examination
 - Radiography
 - Thermography
 - Eddy Current Method
 - Magnetic Particle Inspection
 - Dye Penetrant Test
 - Visual Inspection Techniques
 - Other Techniques
- Debris Analysis
- Performance Trend monitoring
- Vibration Monitoring and Analysis

MODULE VII: Proactive Maintenance

- Meaning of 'Being Proactive'
- Maintenance Underperformance
- Fixing Forever vs. Forever Fixing
- Elements of Proactive Maintenance
- Potential Failures and P- F Interval
- Root Cause Elimination
- Example on Proactive Maintenance

MODULE VIII: Practical Exercise, Appraisal and Conclusion

- Practical Exercise on Strengthening Planned Maintenance System & Practices
- Presentation of the Ideas by the Participants and Interaction with the Faculty
- Closing Remarks by the Faculty
- Feedback from the Participants
- Appraisal and Conclusion

IMME and Maintenance Reliability Training Programmes

Institute of Maintenance Management Education (www.immeinstitute.org) commenced operations in late 70s as a leading training and consultancy organization to facilitate paving way for excellence in maintenance function in industry. Since then IMME has conducted a large number of top quality maintenance reliability training programmes on different themes and topics. Tens of thousands of candidates from various reputed companies in the corporate sector have participated in different training programmes & courses conducted by IMME in a period of over 30 years.

Maintenance reliability of plant equipment is a key activity in any manufacturing organization. In order to attain top performance in maintaining its assets, a company needs a comprehensive approach that depends on the integration of people, plant and processes. The maintenance reliability organization needs to be efficient, well organized, cost-effective and innovative to realize higher plant availability and smooth operations. Through maintenance reliability training, coaching and mentoring, Institute of Maintenance Management Education (IMME) provides value to the clients by focusing on creation of organic teams who understand asset performance management at strategic reliability level to help improve business profitability.

IMME helps companies reach their maintenance reliability goals by way of building capacity and competency – knowledge, skill, motivation, initiative, team work, etc. of maintenance managers, plant engineers, maintenance supervisors, technicians, etc. through training on various themes related to maintenance reliability function. Identifying and embracing the best practices in maintenance reliability management enables an organization to avoid failures, breakdown maintenance work and other barriers to success while maintaining safe, reliable operations and minimizing cost

EXCELLENCE IN TRAINING FOR OVER 30 YEARS

Some of our Clients

Tens of thousand of maintenance engineers, managers, plant executives and other engineering personnel from various reputed companies in the corporate sector have participated in different in-house / virtual training programmes, distance courses, outbound programmes, workshops, seminars, etc. conducted by IMME in a period of over 30 years.

Some of the companies who have participated in various short-term training programmes conducted by IMME in the past are shown below:

ABB Limited
 Adinath Textiles Limited
 Ador Welding Ltd.
 Alfa Laval (India) Ltd.
 Amaraja Batteries Ltd.
 Ambuja Cements Ltd.
 Amrit Banaspati Co. Ltd.
 Anshupati Textiles
 (A Divn. of Vardhman Polytext
 Ltd.)
 Antifriction Bearings
 Corporation Ltd., The
 Ashok Leyland Ltd.
 Asian Cables & Industries Ltd.
 Asian Paints (India) Ltd.
 Atul Limited
 Bajaj Auto Ltd.
 Balkrishna Industries Limited
 (Unit : Balkrishna Paper Mills)
 Balmer Lawrie & Co. Ltd.
 Bata India Limited
 Bellary Steels & Alloys Ltd.
 Bharat Aluminium Co. Ltd.
 Bharat Dynamics Ltd.
 Bharat Electronics Ltd.
 Bharat Heavy Electricals Ltd.
 Bharat Petroleum Corporation
 Ltd.
 Bharat Refractories Ltd.
 Bhuruka Gases Limited
 Birla Cement Works
 Blue Star Limited
 Bombay Dyeing & Mfg. Co.
 Ltd., The
 Borosil Glass Works Ltd.
 Brakes India Limited
 Bridge and Roof Co. (India) Ltd.
 Britannia Industries Ltd.
 Cable Corporation of India Ltd.
 Carborundum Universal Ltd.
 Castrol India Limited
 Ceat Limited
 Central Electronics Limited
 Cetex Petrochemicals Limited
 Chennai Petroleum Corpn. Ltd.
 Chittaranjan Locomotive Works
 Cipla Limited
 Coal India Limited
 Colgate-Palmolive (India) Ltd.
 Continental Device India Ltd.
 Coromandel Fertilizers Ltd.
 Cosmo Ferrites Limited
 Cosmo Films Limited
 Crompton Greaves Limited
 Cutfast Abrasive Tools Ltd.
 DCM Textiles
 Dabur India Limited
 Deepak Fertilisers and
 Petrochemicals
 Corporation Ltd.
 Deepak Nitrite Limited
 Denso India Ltd.
 Dhampur Sugar Mills Ltd., The
 Dharamsi Morarji Chemical Co.
 Ltd., The
 E.I.D. Parry (India) Ltd.
 Eicher Tractors
 Emco Transformers Ltd.
 Enercon (India) Limited
 Esab India Limited
 Escorts Limited
 Ester Industries Limited
 Eveready Industries India Ltd.
 Fertilizers and Chemicals
 Travancore Ltd., The
 Finolex Industries Ltd.

Gharda Chemicals Ltd.
 Godrej & Boyce Mfg. Co. Ltd.
 Goodyear India Limited
 Graphite India Limited
 Grasim Industries Limited
 Greaves Cotton Limited
 Gujarat Mineral Development
 Corporation Ltd.
 Gujarat State Fertilizers Co.
 Ltd.
 Hawkins Cookers Limited
 Heavy Vehicles Factory
 Hindalco Industries Ltd.
 (Renusagar Power)
 Hindustan Aeronautics Limited
 Hindustan Everest Tools
 Limited
 Hindustan Fertilizer Corporation
 Limited
 Hindustan Unilever Limited
 Hindustan Newsprint Limited
 Hindustan Organic Chemicals
 Ltd.
 Hindustan Petroleum
 Corporation Ltd.
 Hindustan Wires Limited
 ITC Limited
 ITI Limited
 India Glycols Ltd.
 India Pistons Limited
 Indian Farmers Fertilizer
 Co-operative Ltd.
 Indian Oil Corporation Ltd.
 Indian Ordnance Factories
 Integral Coach Factory
 Jawaharlal Nehru Port Trust
 Kalyani Steels Ltd.
 Karnataka Antibiotics &
 Pharmaceuticals Ltd.
 Kirloskar Brothers Limited
 Kirloskar Copeland Limited
 Kirloskar Electric Company Ltd.
 Kirloskar Oil Engines Ltd.
 Kirloskar Pneumatic Co. Ltd.
 Lakshmi Electrical Control
 Systems Ltd.
 Larsen & Toubro Limited
 Lubrizol India Pvt. Ltd.
 Lupin Limited
 MRF Limited
 Maharashtra Seamless Limited
 Mahindra & Mahindra Ltd.
 Malayala Manorama Co. Ltd.
 Malwa Cotton Mills Ltd.
 Manali Petrochemical Ltd.
 Mark Auto Industries Ltd.
 Mineral Exploration Corporation
 Ltd.
 Mother Dairy
 Mysore Paper Mills Ltd., The
 NTPC Limited
 Nagarjuna Fertilizers and
 Chemicals Ltd.
 National Aluminium Company
 Ltd.
 National Engineering Industries
 Ltd.
 National Fertilizers Limited
 National Steel Industries Ltd.
 Neyveli Lignite Corporation Ltd.
 Nuclear Fuel Complex
 Nuclear Power Corporation of
 India Ltd.
 Orient Cement
 Orient Paper Mills

Oriental Carbon & Chemicals
 Ltd.
 Panchmahal Steel Limited
 Panyam Cements & Mineral
 Industries Ltd.
 Pasupati Acrylon Ltd.
 Philips India Ltd.
 Poona Shims Pvt. Ltd.
 Prakash Industries Ltd.
 Pyrites, Phosphates &
 Chemicals Ltd.
 Radico Khaitan Ltd.
 (Unit: Rampur Distillery)
 Rajasthan State Co-operative
 Spg. & Gng. Mills Federation
 Ltd.
 Ramkumar Mills Ltd.
 Ranbaxy Laboratories Ltd.
 Rane Brake Linings Ltd.
 Rashtriya Chemicals &
 Fertilizers Ltd.
 Raymond Limited
 Reckitt Benckiser (India) Ltd.
 Reliance Industries Ltd.
 SRF Limited
 Samcor Glass Limited
 Samtel Color Limited
 Saraswati Sugar Mills, The
 Shiram Pistons and Rings Ltd.
 Siemens Ltd.
 Simbhaoli Sugar Mills Ltd., The
 Sona Steering Systems Ltd.
 Steel Authority of India Ltd.
 Stumpp, Shuele & Somappa
 Springs Pvt. Ltd.
 Sudarshan Chemical Industries
 Ltd.
 Sunflag Iron & Steel Co. Ltd.
 TVS Motor Company Ltd.
 Tamilnadu Petroproducts Ltd.
 Tata Chemicals Limited
 Tata Power Company Ltd.
 Tata Motors Ltd.
 Tata Steel Ltd.
 Technova Imaging Systems (P)
 Ltd.
 Thermax Limited
 Titan Industries Limited
 Traco Cable Company Limited
 Tractors and Farm Equipment
 Ltd.
 Travancore Titanium Products
 Limited
 U.P. Twiga Fibreglass Ltd.
 USV Limited
 United Phosphorous Ltd.
 Usha Martin Ltd.
 V.I.P. Industries Ltd.
 Vadilal Industries Ltd.
 Videocon Appliances Ltd.
 Vikram Cement
 (A Unit of Grasim Industries
 Ltd.)
 Vindhya Telelinks Ltd.
 Voltas Limited
 Walchandnagar Industries
 Limited
 Wipro Limited
 Wires and Fabriks (S.A.) Ltd.
 Wockhardt Limited
 Xpro India
 (A Divn. of Birla Cimmo Ltd.)
 Zenith Chemicals
 (A Divn. of Zenith Ltd.)