COURSE OVERVIEW RE0212
Excellence in Maintenance and Reliability Management

Course Title
Excellence in Maintenance and Reliability Management

Course Reference
RE0212

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	January 28-February 01, 2024	TBA Meeting Room, The H Hotel, Sheikh Zayed Road, Dubai, UAE
2	February 04-08, 2024	TBA Meeting Room, Radisson Blu Hotel Istanbul, Sisli, Istanbul, Turkey
3	March 03-07, 2024	TBA Meeting Room, Pullman Doha Westbay, Doha, Qatar

Course Description

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

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 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 delegate will also be introduced to Reliability tools and the effect human reliability has on plant availability.

To maximize the benefits of the course, delegates 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.

The course includes a comprehensive e-book entitled *"Machinery's Handbook Pocket Companion",* published by Industrial Press, which will be given to the participants to help them appreciate the principles presented in the course.

Course Objectives

Upon the successful completion of this course, each participant 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

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course covers systematic techniques and methodologies in the maintenance and reliability management towards reliability optimization and continuous improvement of rotating equipment for all maintenance & reliability management personnel such as managers, engineers, supervisors, section heads, planners and foremen.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Mohamed Refaat, MSc, BSc, is a **Senior Maintenance & Reliability Engineer** with almost **30 years** of extensive experience in **Rotating Equipment** and **Machinery** including **Pumps**, **Compressors**, **Turbines**, **Motors**, **Turbo-expanders**, **Gears**, etc. His wide experience also covers **Modern Maintenance & Reliability** Management, **Maintenance Errors**, **Maintenance Audit & Site Inspection**, **Maintenance Management** Best Practices, **Rotating Equipment** Reliability Optimization, Practical **Machinery Vibration**, **Vibration** Techniques, Effective **Reliability Maintenance**, Excellence in **Maintenance & Reliability** Management, **Preventive & Predictive Maintenance**, Machinery Failure Analysis (**RCFA**), **Reliability** Optimization & Continuous Improvement, **Maintenance** Planning, Scheduling & Work Control, **Maintenance Management** Strategy, **Mechanical & Rotating Equipment** Troubleshooting, Preventive Maintenance, Predictive Maintenance, Reliability Centered Maintenance (**RCM**), Condition Based Monitoring (**CBM**), **Centrifugal Compressor & Steam Turbine**, **Centrifugal Pump**, **Pump** Technology, **Gas Turbine** Technology, **Heat Exchanger**, **Turbines & Motors**, **Variable Speed Drives**, **Seals**, **Control Valves**, Advanced **Valve** Technology, **Dry Seal**, **Fired Heaters**, **Air Coolers**, **Crude Desalter**, **Process Vessels & Valves**, **Industrial Equipment & Rotating Machinery**, **Mechanical** Engineering, **Mechanical Equipment & Turbomachinery**, **Piping**, **Pipelines**, **Valves**, **Lubrication Technology**, **Vibration Analysis**, **Power System Hydraulics**, **Security Detection** Systems & Operation, **Process Plant** Equipment, Troubleshooting **Process Operations**, **FMEA** and Troubleshooting of machinery and rotating equipment including turbines, bearings, compressors, pumps etc. He is currently the **Mechanical Maintenance Section Head** of the **Arab Petroleum Pipelines Company** where he is in charge of planning, scheduling & managing the execution of preventive & corrective mechanical maintenance activities for all equipment. He is responsible for executing the scheduled inspections & major overhauls for gas turbines, valves & pumps, carrying out off-line vibration monitoring plans, troubleshooting, fault diagnosing & investigating failures of machinery.

During his career life, Mr. Mohamed was able to modify the gas turbines self cleansing system to improve its maintainability and extend the air filters' lifetime. He was responsible for defining & updating the equipment codes and parameters for replacing the old **CMMS** with **MAXIMO**. He also worked as the Operations Supervisor wherein he was closely involved with the operation of the crude oil internal **pipeline** system between the tankers and tank farm, operation & control of the booster pumps for pumping crude oil for main pipelines and the development & implementation of the plans & procedures for draining the main terminal internal lines for maintenance purposes. He also held the position of Measurement Engineer where he was responsible for the crude oil custody transfer, performing loss control analysis and operating the crude oil automatic sampler & related equipment. Prior to that, he was the Design Engineer responsible for the design phase of the Truck Mixer Manufacturing Project of the Mechanical Design Department.

Mr. Refaat has **Master** and **Bachelor** degrees in **Mechanical Engineering** and a General Certificate of Education (**GCE**) from the **University of London**, **UK**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and a member of the Engineering Syndicate of Egypt. He has further delivered numerous training, courses, workshops, seminars and conferences worldwide.

Course Fee

Dubai	**US$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Doha	**US$ 6,000** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

In addition to the Course Manual, participants will receive an e-book *"Machinery's Handbook Pocket Companion"*, published by Industrial Press.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***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*
0930 – 0945	*Break*
0945 – 1100	***Equipment Failure Patterns*** *Types of Equipment Failures ● Why Equipment Fails ● Failure Analysis & Root Cause ● Discussions*
1100 – 1230	***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*
1230 – 1245	*Break*
1245 – 1420	***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*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Optimizing CCM and PDM (Component Condition Monitoring and Predictive Maintenance)*** *The Major Machinery Components • Component Condition Monitoring • Predictive Maintenance (PDM) Techniques*
0930 – 0945	*Break*
0945 – 1100	***Preventive Maintenance & Condition Monitoring*** *Types of Condition Based Monitoring • Vibration Monitoring • Pump Monitoring Frequency • Infrared Thermography • Physical Effects Monitoring • Lube Oil Analysis • Discussion*
1100 – 1230	***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*
1230 – 1245	*Break*
1245 – 1420	***Root Cause Analysis Techniques (Improving Component Function Knowledge Base)*** *Introduction • Component Function • Component Failure Causes • Component Condition Monitoring • Examples of Knowledge Base Enhancement*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Work Selection*** *Mission • Work Screening Procedure • Work Request Requirements • Prioritization Systems • Cost Benefit Analysis • Discussion*
0930 – 0945	*Break*
0945 – 1100	***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*
1100 – 1230	***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*
1230 – 1245	*Break*

1245 – 1420	***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
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Site Reliability Assessment*** *Site Reliability Audit Form ● Reduction of Data ● Identifying Targets for Improvement ● Forms and Worksheets*
0930 – 0945	*Break*
0945 – 1100	***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*
1100 – 1230	***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*
1230 – 1245	*Break*
1245 – 1420	***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*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***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*
0930 – 0945	*Break*
0945 – 1100	***The Effects of Misalignment on Reliability*** *Introduction ● Why Misalignment Reduces Rotating Equipment Reliability ● How Misalignment Effects Can Be Detected ● Alignment Methods and Guidelines*

1100 – 1230	***Quality Assurance & Continuous Improvement*** *Objectives and Implementation ● Data to be Screened ● Bad Actors and RCFA ● Quality Audits ● Discussion*
1230 – 1245	*Break*
1245 – 1345	***Computerized Maintenance Management Systems (CMMS)*** *Components ● Benefits ● Implementation Plan and Issues ● SAP Maintenanace ●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?*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

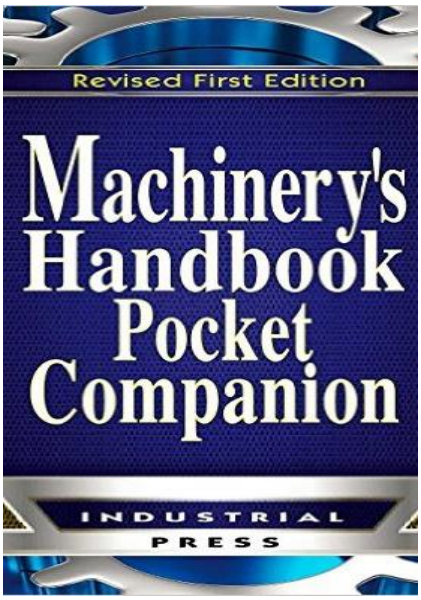
Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the state-of-the-art simulator "iLearnVibration".

iLearnVibration

Book(s)

As part of the course kit, the following e-book will be given to all participants:



Title : Machinery's Handbook Pocket Companion
ISBN : 9780831130954
Author : Christopher McCauley
Publisher: Industrial Press

Course Coordinator

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