COURSE OVERVIEW RE0211

Risk Based Maintenance

Course Title
Risk Based Maintenance

Course Date/Venue
November 04-08, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
RE0211

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

Course Description

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

In the last few years, world-class companies have realized the major influence of risk management on maintenance strategies. The current trend of defining maintenance management as risk management is growing dramatically within major process companies all over the world. The concept of Risk-Based Maintenance (RBM) is currently evolving as the future approach in managing maintenance. This course is mainly designed to discuss the links between maintainability, reliability, availability and risk. The course is mandatory for those responsible for developing reliability and maintenance policies and strategies.

The course will discuss the major reliability aspects of both components and complex systems. It will illustrate the main methods of reliability, availability, and risk including fault-tree, event-tree, master-logic diagram, and probability plotting. Methods for quantifying and propagating parameter uncertainties in engineering systems will be covered. Further, the course will discuss the equipment common cause failures, human reliability analysis, failure analysis, reliability centered maintenance (RCM) and probabilistic risk assessment technique (PRA). The availability concept and reliability considerations for repairable systems will also be explained.

The course will examine the role of maintenance in minimizing the risk of safety or environmental incidents, adverse publicity, and loss of profitability. It will also discuss the risk reduction tools and explain their applicability to specific situations, thereby helping delegates select the tool that best fits their own needs and circumstances. By bridging the gap between designers/maintainers and reliability engineers, the course will help delegates utilize their assets more effectively, safely, and profitably.

This will be an interactive, enjoyable and interesting learning experience. It will utilize a variety of methodologies including lectures and slide presentations. Examples and group exercises allow delegates to acquire a more detailed and practical understanding. Examples of actual obstacles encountered during reliability and risk management will be highlighted. The participation of delegates will be encouraged throughout. Delegates will also have opportunity to discuss issues relevant to their workplace if they so wish.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply the latest techniques of risk and reliability management (RRM) and implement the Risk-Based Maintenance (RBM) strategies, tactics and policies
- Identify the equipment failure patterns and how the maintenance affect on reliability
- Differentiate reliability, probability and statistics, list the elements of component reliability and discuss the system reliability analysis as well as reliability and availability of repairable items
- Carryout reliability modeling, reliability data analysis and risk analysis and describe the life cycle aspects of risks in process plants
- Apply the proper techniques in process plant shutdowns and interpret the qualitative risk and the escalation of events including risk reduction and reliability, risk based maintenance as well as reliability optimization and continuous reliability improvement
- Plan and collect data and information for RBI assessments
- Develop a risk reduction model and manage risks faced during a high cost, high downtime maintenance activity, namely plant shutdown
- Identify the link between maintenance on one hand and safety, profitability and asset life on the other

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 is intended for those involved in the development of a reliability and failure management system (maintenance policies, tactics & strategies) such as maintenance managers and engineers. Further, the course is beneficial for engineers involved in extensions, upgrades, procurement of new equipment; OEM design engineers and field support supervisors, inspectors, operations supervisors and maintenance planners.

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 Fee

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.

Accommodation

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

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.

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. Andrew Ladwig is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Ammonia Storage & Loading** Systems, **Ammonia Plant** Operation, Troubleshooting & Optimization, **Ammonia Recovery**, **Ammonia Plant Safety**, Hazard of **Ammonia Handling**, Storage & Shipping, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Wax Sweating & Blending**, **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry Process** Engineering, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, Safe **Refinery Operations**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, Gas Liquor Separation, **Industrial Liquid Mixing**, **Wax Bleachers**, **Extractors**, **Fractionation**, Operation & Control of **Distillation**, Process of **Crude ATM & Vacuum Distillation** Unit, **Water Purification**, **Water Transport** & Distribution, **Steam & Electricity**, **Flame Arrestors**, **Coal Processing**, **Environmental Emission Control**, R&D of **Wax Blending**, **Wax** Molding/Slabbing, **Industrial Drying**, Principles, Selection & Design, Certified **Process Plant** Operations, Control & Troubleshooting, **Operator** Responsibilities, **Storage Tanks Operations** & Measurements, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, Efficiency & Optimization, Continuous Improvement & Benchmarking, **Process Troubleshooting** Techniques, Oil & Gas Operation/Introduction to **Surface Facilities**, **Pressure Vessel** Operation, **Process Equipment** Performance & Troubleshooting, **Plant Startup & Shutdown**, **Startup & Shutdown** the Plant While Handling Abnormal Conditions, **Flare & Relief** System, **Process Gas Plant** Start-up, Commissioning & Problem Solving, **Process Liquid** and **Process Handling & Measuring** Equipment. Further, he is also well-versed in **Compressors & Turbines** Operation, Maintenance & Troubleshooting, **Heat Exchanger** Overhaul & Testing Techniques, Balancing of **Rotating Machinery** (**BRM**), **Pipe Stress** Analysis, **Valves & Actuators** Technology, Inspect & Maintain **Safeguarding Vent & Relief System**, Certified Inspectors for **Vehicle & Equipment**, Optimizing **Equipment Maintenance** & Replacement Decisions, Certified Maintenance Planner (**CMP**), Certified Planning and Scheduling Professional (**AACE-PSP**), **Tank Design**, Construction, Inspection & Maintenance, **Material Cataloguing**, Specifications, Handling & Storage, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control**, **Column**, **Pump & Exchangers**, Troubleshooting & Design, **Rotating Equipment** Operation & Troubleshooting, **Control & ESD** System, **Detailed Engineering Drawings**, Codes & Standards, **Budget** Preparation, Allocation & Cost Control, Root Cause Analysis (**RCA**), **Production Optimization**, Permit to Work (**PTW**), Project Engineering, **Data** Analysis, **Process Hazard** Analysis (**PHA**), **HAZOP** Study, Sampling & Analysis, **Training** Analysis, **Job Analysis** Techniques, Storage & Handling of **Toxic Chemicals & Hazardous Materials**, **Hazardous Material** Classification & Storage/Disposal, **Dangerous Goods**, Environmental Management System (**EMS**), Supply Chain, Purchasing, Procurement, **Logistics** Management & **Transport** & **Warehousing** & **Inventory**, **Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), Personal Protective Equipment (**PPE**), Fire & Gas, First Aid and Occupational Health & Safety.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses and conferences internationally.

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: ***Monday, 04th of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Reliability & Risk*** *Why Study Reliability? • Failure Models • Failure Mechanisms • Performance Measures • What is Reliability? • What is Availability? • What is Risk?*
0930 – 0945	*Break*
0945 – 1100	***Equipment Failure Patterns*** *Distinguishing Between Repairable and Non-Repairable Equipment • Types of Equipment Failure • Review Why Equipment Fails • Areas of The Bath-Tub Curve • Actual Equipment Failure Patterns • Actins to Minimize Failure Effect • Discussions • How Does Most of Your Equipment Fail?*
1100 – 1200	***Maintenance Affect on Reliability*** *Today's Maintenance Issues • Different Types of Maintenance • How Maintenance Influences Equipment Performance • Introduction to Condition Based Maintenance • Factors Contributing to Excessive Maintenance • Discussions*
1200 – 1215	*Break*
1215 – 1420	***Reliability, Probability & Statistics*** *Elements of Probability • Probability Distributions • Basic Characteristics of Random Variables • Estimation and Hypothesis Testing • Frequency Tables and Histograms • Goodness-of-Fit Test • Regression Analysis*
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 One*

Day 2: ***Tuesday, 05th of November 2024***

0730 – 0930	***Elements of Component Reliability*** *Concept of Reliability • Common Distributions in Component Reliability • Component Reliability Model • Classical Parametric Estimation • Classical Nonparametric Distribution Estimation • Bayesian Estimation Procedures • Methods of Generic Failure Rate Determination*
0930 – 0945	*Break*
0945 – 1115	***System Reliability Analysis*** *Reliability Block Diagram Method • Fault Tree and Success Tree Methods • Event Tree Method • Master Logic Diagram • Failure Mode and Effect Analysis*
1115 – 1215	***Reliability & Availability of Repairable Items*** *Repairable System Reliability • Availability of Repairable Systems • Use of Markovian Methods for Determining System Availability • Use of System Analysis Techniques in the Availability Calculations of Complex Systems*
1215 – 1230	*Break*

1230 – 1420	***Reliability Modeling*** *Stress-Strength Analysis • Software Reliability Analysis • Human Reliability • Measures of Importance • Reliability-Centered Maintenance • Reliability Growth*
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: Wednesday, 06th of November 2024

0730 – 0900	***Reliability Data Analysis*** *Accelerated Life Testing • Analysis of Dependent Failures • Uncertainty Analysis • Use of Expert Opinion for Estimating Reliability Parameters • Probabilistic Failure Analysis*
0900 – 0915	*Break*
0915 – 1100	***Risk Analysis*** *Risk Perception and Acceptability • Determination of Risk Values • Formalization of Risk Assessment • Steps in Conducting a Probabilistic Risk Assessment • Example of Risk Analysis • Precursor Analysis*
1100 – 1215	***Life Cycle Aspects of Risk in Process Plants*** *Design Quality • Risk During Construction • The Pre-Commissioning and Commissioning Phases • Planning of Maintenance Work • The Operational Phase • Modifications to Plant and Change Control • Maintenance Costs • End of Life Activities*
1215 – 1230	*Break*
1230 – 1420	***Risk Related to Process Plant Shutdowns*** *Factors Affecting Operating Run Lengths • Risks Related to Planned Shutdowns • Planning • Safety and Environmental Hazards • Work Scope and Associated Risks • Quality • Organization • Execution • Specialized Equipment Overhauls Cost Control • Communication • Contractors • Shutdown Reports • Post-Shutdown Review*
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: Thursday, 07th of November 2024

0730 – 0900	***Qualitative Risk*** *Framing Effects • The Influence of Choice • Control of Situation • Delayed Effects on Health • Voluntary Risks • Risks Posed by Natural Phenomena • Subjectivity • Morality • Dreaded Consequences*
0900 – 0915	*Break*
0915 – 1100	***The Escalation of Events*** *Learning from Disasters • Hindsight is 20-20 Vision • Foresight-Can We Improve it? • Event Escalation Model • Damage Limitation Model • Failure of Barriers • Event Escalation Relationship • Evaluating Test Frequencies • Incipiency Period*

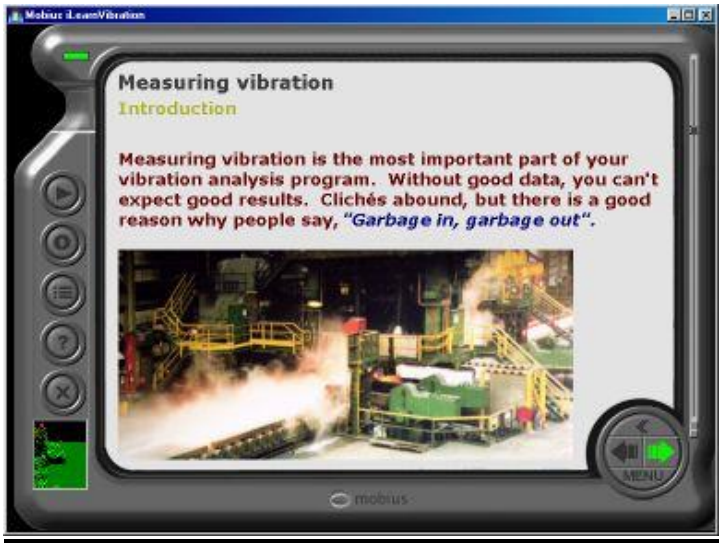
1100 – 1215	***Risk Reduction & Reliability*** *Frequency or Severity? • Reliability Block Diagrams and Mathematical Modeling • Hazard and Operability Studies • Fault Tree Analysis (FTA) • Root Cause Analysis • Total Productive Maintenance • Reliability-Centered Maintenance • Compliance and Risk • Reducing Perceived Risks*
1215 – 1230	*Break*
1230 – 1420	***Risk Based Maintenance (RBM)*** *Purpose and Scope • Most Critical Step • RBM Approaches • Integration of Practices • Mechanical Integrity Focus • RBM Planning Process • Flexibility in Application • Definitions and Acronyms • Basic Concept of RBI (Risk-Based Inspection)*
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: ***Friday, 08th of November 2024***

0730 – 0930	***Planning the RBI Assessment*** *Goals • Strategies • Selection of Assessment Method*
0930 – 0945	*Break*
0945 – 1100	***Data & Information Collection for RBI Assessment*** *Materials • Equipment Records • Quality & Validation*
1100 – 1215	***Reliability Optimization*** *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*
1215 – 1230	*Break*
1230 – 1345	***Continuous Reliability Improvement*** *Optimized Lubrication for Pumps and Electric Motors • Economics of Dry Sump Oil Mist Lubrication • Lubrication Considerations for Pump and Electric Motors • Major Machinery Lubrication Management*
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 Simulator

Course Coordinator

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