COURSE OVERVIEW RE0981
Advanced Maintenance & Reliability Strategies in Process Industry

Course Title
Advanced Maintenance & Reliability Strategies in Process Industry

Course Date/Venue
June 15-19, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
RE0981

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 our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Advanced Maintenance and Reliability Strategies in Process Industry. It covers the maintenance strategy covering its evolution, business impact of maintenance and reliability, role of maintenance in asset lifecycle management and key drivers of maintenance strategy in process industries; the asset management principles (ISO 55000), maintenance types and classifications, reliability engineering fundamentals, key maintenance and reliability KPIs and; the organizational roles and responsibilities.

Further, the course will also discuss the preventive maintenance (PM) optimization, predictive maintenance (PDM) technologies, root cause failure analysis (RCFA) and failure modes and effects analysis (FMEA); the spare parts and inventory strategy, planning and scheduling best practices, reliability-centered maintenance (RCM) principles and RCM implementation process; the risk-based maintenance (RBM), equipment criticality ranking, maintenance task analysis (MTA), defect elimination techniques; and the computerized maintenance management systems (CMMS) and condition-based monitoring (CBM) framework.

During this interactive course, participants will learn the data analytics for maintenance, digital reliability tools and reliability auditing and benchmarking; the performance optimization through digital twins, maintenance and reliability strategy deployment, change management in maintenance culture and training and competency management.

Course Objectives

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

- Apply and gain an advanced knowledge on maintenance and reliability strategies in process industry
- Discuss maintenance strategy covering its evolution, business impact of maintenance and reliability, role of maintenance in asset lifecycle management and key drivers of maintenance strategy in process industries
- Identify asset management principles (ISO 55000), maintenance types and classifications, reliability engineering fundamentals, key maintenance and reliability KPIs and organizational roles and responsibilities
- Explain preventive maintenance (PM) optimization, predictive maintenance (PdM) technologies, root cause failure analysis (RCFA) and failure modes and effects analysis (FMEA)
- Determine spare parts and inventory strategy, planning and scheduling best practices, reliability-centered maintenance (RCM) principles and RCM implementation process
- Discuss risk-based maintenance (RBM), equipment criticality ranking, maintenance task analysis (MTA), defect elimination techniques as well as the computerized maintenance management systems (CMMS) and condition-based monitoring (CBM) framework
- Recognize data analytics for maintenance, digital reliability tools and reliability auditing and benchmarking
- Carryout performance optimization through digital twins, maintenance and reliability strategy deployment, change management in maintenance culture and training and competency management

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 conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of advanced maintenance and reliability strategies in process industry for maintenance managers and engineers, reliability engineers, plant managers and operations supervisors, asset integrity and asset management professionals, condition monitoring specialists, maintenance planners and schedulers, process engineers and other technical staff.

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

Haward's Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

- 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.

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 Maintenance 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**, **Ammonia Storage & Loading** Systems, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, **Industrial Liquid Mixing**, **Extractors**, **Fractionation**, **Water Purification**, **Water Transport** & Distribution, **Environmental Emission Control**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, **Plant Startup & Shutdown**, **Process Troubleshooting** Techniques and Oil & Gas Operation/Surface Facilities. Further, he is also well-versed in **Rotating Machinery** (**BRM**), **Rotating Equipment** Operation & Troubleshooting, Root Cause Analysis (**RCA**), **Process Plant** Shutdown, Turnaround & Troubleshooting, Planning & Scheduling **Shutdowns & Turnarounds**, Optimizing **Equipment Maintenance** & Replacement Decisions, **Maintenance Planning & Scheduling**, **Material Cataloguing**, Maintenance, Reliability & Asset Management Best Practices, **Storage Tanks Operations** & Measurements, **Tank** Inspection & Maintenance, **Pressure Vessel** Operation, **Flare & Relief** System, **Flaring System** Operation, **PSV** Inspection & Maintenance, **Centrifugal & Reciprocating Compressor**, **Screw Compressor** Troubleshooting, **Heat Exchanger** Overhaul & Testing, **Pipe Stress** Analysis, **Control Valves & Actuators**, **Vent & Relief System**, **Centrifugal & Reciprocating Pump** Installation & Repair, **Heat Exchanger** Troubleshooting & Maintenance, **Steam Trapping & Control**, **Control & ESD** System and Detailed Engineering Drawings, Codes & Standards.

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.

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.

Accommodation

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

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

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

Day 1: ***Sunday, 15th of June 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Maintenance Strategy Overview*** *Evolution: Reactive → Preventive → Predictive → Proactive • Business Impact of Maintenance and Reliability • Role of Maintenance in Asset Lifecycle Management • Key Drivers of Maintenance Strategy in Process Industries*
0930 – 0945	*Break*
0945 – 1030	***Asset Management Principles (ISO 55000)*** *Life Cycle Approach to Asset Care • Aligning Asset Management with Organizational Goals • Risk-Based Asset Prioritization • Policy, Objectives and Performance Monitoring*
1030 – 1130	***Maintenance Types & Classifications*** *Corrective versus Preventive versus Predictive versus Proactive • Run-to-Failure versus Condition-Based Maintenance • Shutdown/Turnaround Maintenance • Planning and Scheduling Interfaces*
1130 – 1215	***Reliability Engineering Fundamentals*** *Reliability, Availability, Maintainability (RAM) • Failure Rate and Bathtub Curve • Mean Time Between Failures (MTBF) • Failure Modes, Effects and Criticality Analysis (FMECA)*
1215 – 1230	*Break*

1230 – 1330	***Key Maintenance & Reliability KPIs*** *MTBF, MTTR, Availability, OEE • Maintenance Cost per Unit Throughput • Emergency versus Planned Maintenance Ratio • Wrench Time and Schedule Compliance*
1330 – 1420	***Organizational Roles & Responsibilities*** *Maintenance Planner versus Scheduler • Reliability Engineer versus Maintenance Engineer • Operations versus Maintenance Coordination • Contractor versus in-House Maintenance*
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: Monday, 16th of June 2025

0730 – 0830	***Preventive Maintenance (PM) Optimization*** *PM Development Methodologies • Risk-Based PM Frequencies • PM Effectiveness Review and Deferral Analysis • Calendar versus Usage-Based PM*
0830 – 0930	***Predictive Maintenance (PdM) Technologies*** *Vibration Monitoring Fundamentals • Thermography and Infrared Scanning • Ultrasonic Leak Detection and Acoustic Monitoring • Lubrication Analysis and Oil Condition Monitoring*
0930 – 0945	*Break*
0945 – 1100	***Root Cause Failure Analysis (RCFA)*** *5 Whys Technique • Fishbone (Ishikawa) Diagram • Fault Tree Analysis • Chronic versus Sporadic Failure Identification*
1100 – 1215	***Failure Modes & Effects Analysis (FMEA)*** *FMEA Methodology and Scoring System • Identifying Failure Modes and Detection Methods • Criticality Ranking and Action Prioritization • FMEA Integration with CMMS*
1215 – 1230	*Break*
1230 – 1330	***Spare Parts & Inventory Strategy*** *Critical Spare Identification • ABC and XYZ Inventory Classification • Lead Time Analysis and Reorder Point • Inventory Cost versus Equipment Availability Trade-Offs*
1330 – 1420	***Planning & Scheduling Best Practices*** *Work Order Lifecycle • Planning Backlog and Job Scoping • Weekly Scheduling and Daily Execution • KPI Tracking for Planner Effectiveness*
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: Tuesday, 17th of June 2025

0730 – 0830	***Reliability-Centered Maintenance (RCM) Principles*** *History and Goals of RCM • Failure Consequence Categories • RCM Logic Tree Process • Key Steps to Implement RCM*
0830 – 0930	***RCM Implementation Process*** *System Boundary Definition • Functional Failure Analysis • Task Selection and Justification • Updating Maintenance Plans Post-RCM*

0930 – 0945	*Break*
0945 – 1100	***Risk-Based Maintenance (RBM)*** *Risk Matrix Development • Likelihood and Consequence Scoring • Prioritization of Maintenance Based on Risk • Integrating RBM with Turnaround Planning*
1100 – 1215	***Equipment Criticality Ranking*** *Criticality Assessment Criteria • Risk Priority Number (RPN) Calculation • Dynamic Criticality versus Static Criticality • Use in Work Prioritization and Resource Allocation*
1215 – 1230	*Break*
1230 – 1330	***Maintenance Task Analysis (MTA)*** *Determining Job Steps and Durations • Tools and Materials Identification • Safety and Environmental Controls • Feedback Loop to Improve Estimates*
1330 – 1420	***Defect Elimination Techniques*** *Operator-Driven Reliability (ODR) • Condition Monitoring Feedback Loops • Design for Reliability (DfR) Concepts • Early Equipment Management (EEM)*
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*

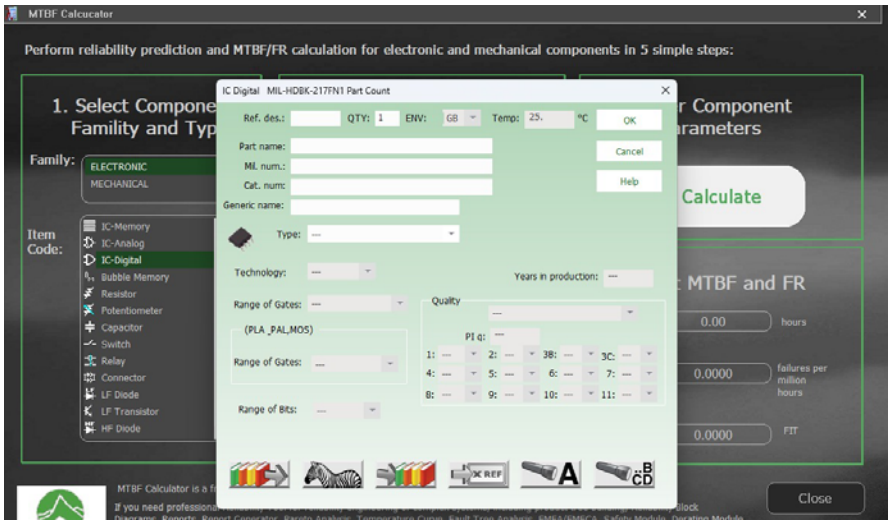
Day 4: ***Wednesday, 18th of June 2025***

0730 – 0830	***Computerized Maintenance Management Systems (CMMS)*** *CMMS Functionality Overview • Work Order Generation and History Tracking • Maintenance KPIs Dashboard • Integration with ERP and Procurement*
0830 – 0930	***Condition-Based Monitoring (CBM) Framework*** *Condition Indicators and Thresholds • Setting Alarms and Event-Based Maintenance • Wireless and IIoT Sensor Integration • Alert Logic and Notification Escalation*
0930 – 0945	*Break*
0945 – 1100	***Data Analytics for Maintenance*** *Descriptive, Diagnostic and Predictive Analytics • Failure Trend Analysis • Use of Data Historians and Dashboards • Building Data Reliability Culture*
1100 – 1215	***Digital Reliability Tools*** *Reliability Block Diagrams (RBD) • Weibull Analysis and Statistical Modeling • Monte Carlo Simulations for Downtime Impact • Integration of Mobile Apps and Cloud Tools*
1215 – 1230	*Break*
1230 – 1330	***Reliability Auditing & Benchmarking*** *Reliability Maturity Assessment Models • Reliability Audit Process and Checklist • Benchmarking with Industry Best Practices • Continuous Improvement Tracking*
1330 – 1420	***Performance Optimization through Digital Twins*** *Digital Twin Applications in Maintenance • Simulation of Failure Scenarios • Real-Time Virtual Monitoring • Feedback Integration for Continuous Learning*
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*

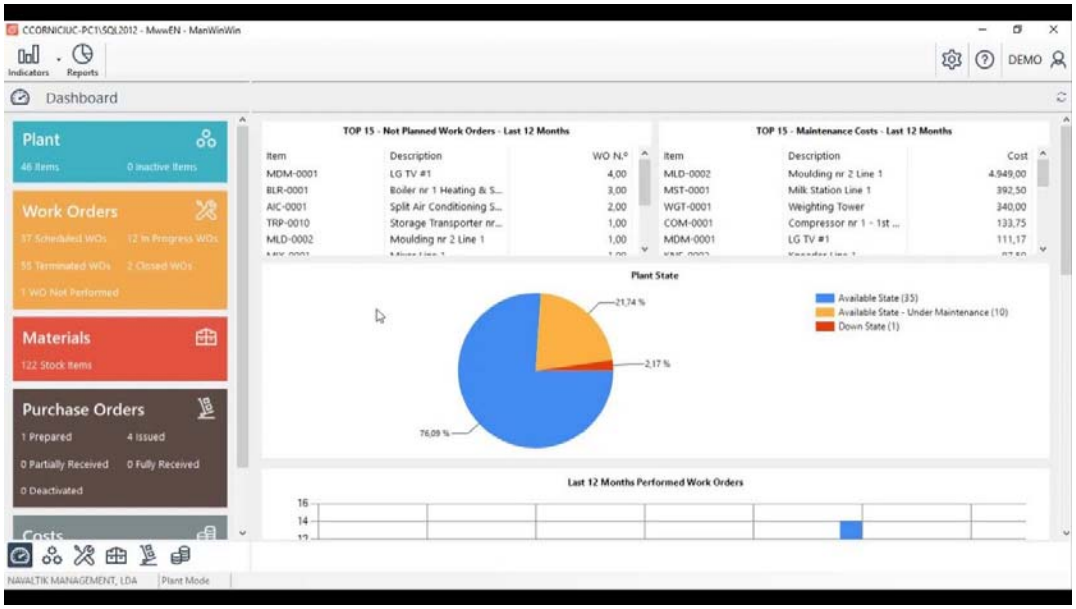
Day 5:	Thursday, 19th of June 2025
0730 – 0830	***Maintenance & Reliability Strategy Deployment*** *Developing Long-Term Maintenance Strategy • Linking Strategy to Business Goals • Prioritizing Improvement Initiatives • Strategy Review and Refresh Cycles*
0830 – 0930	***Change Management in Maintenance Culture*** *Culture versus Systems in Maintenance Transformation • Operator Care and Total Productive Maintenance (TPM) • Engaging Frontline Personnel • Sustaining Behavioral Change*
0930 – 0945	*Break*
0945 – 1100	***Training & Competency Management*** *Skills Matrix Development • Technical versus Behavioral Competency • Training Needs Identification • Certification and Career Pathways*
1100 – 1215	***Performance Dashboards & Reviews*** *Real-Time KPI Dashboards • RCA Tracking and Reporting • Failure Cost and Downtime Visualization • Review Meeting Structure and Frequency*
1215 – 1230	*Break*
1230 – 1345	***Case Studies & Industry Benchmarks*** *RCM Implementation Success in Refineries • Turnaround Risk-Based Optimization Example • Condition Monitoring Cost Reduction Case • MTBF/Availability Improvement in Petrochemical Plants*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t 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 "MTBF Calculator" and "ManWinWin Express CMMS Software".



MTBF Calculator



ManWinWin Express CMMS Software

Course Coordinator

Reem Dergham, Tel: +974 4423 1327, Email: reem@haward.org