

COURSE OVERVIEW RE0981 Advanced Maintenance & Reliability Strategies in Process Industry

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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

<u>Course Duration/Credits</u> 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.



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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.



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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: -

• **BAC**

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.

• ACCREDITED

<u>The International Accreditors for Continuing Education and Training</u> (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, Stateof-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, 15 th of June 2025				
0730 - 0800	Registration & Coffee				
0800 - 0815	Welcome & Introduction				
0815 - 0830	PRE-TEST				
0830 - 0930	<i>Maintenance Strategy Overview</i> 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 & ClassificationsCorrective versus Preventive versus Predictive versus Proactive • Run-to-Failure versus Condition-Based Maintenance • Shutdown/TurnaroundMaintenance • 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				



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1230 - 1330	<i>Key Maintenance & Reliability KPIs</i> 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
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Day 2:	Monday, 16 th of June 2025
0730 - 0830	Preventive Maintenance (PM) OptimizationPM Development Methodologies• Risk-Based PM FrequenciesEffectiveness 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 17^{th} of June 2025

Day 3:	Tuesday, 17 th of June 2025
	Reliability-Centered Maintenance (RCM) Principles
0730 - 0830	History and Goals of RCM • Failure Consequence Categories • RCM Logic
	Tree Process • Key Steps to Implement RCM
	RCM Implementation Process
0830 - 0930	System Boundary Definition • Functional Failure Analysis • Task Selection
	and Justification • Updating Maintenance Plans Post-RCM



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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	<i>Equipment Criticality Ranking</i> <i>Criticality Assessment Criteria</i> • <i>Risk Priority Number (RPN) Calculation</i> • <i>Dynamic Criticality versus Static Criticality</i> • Use in Work Prioritization and <i>Resource Allocation</i>
1215 – 1230	Break
1230 - 1330	<i>Maintenance Task Analysis (MTA)</i> 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, 18 th of June 2025
	Computerized Maintenance Management Systems (CMMS)
0730 – 0830	CMMS Functionality Overview • Work Order Generation and History
0750 - 0850	Tracking • Maintenance KPIs Dashboard • Integration with ERP and
	Procurement
	Condition-Based Monitoring (CBM) Framework
0830 - 0930	Condition Indicators and Thresholds • Setting Alarms and Event-Based
0000 - 0000	Maintenance • Wireless and IIoT Sensor Integration • Alert Logic and
	Notification Escalation
0930 - 0945	Break
	Data Analytics for Maintenance
0945 – 1100	Descriptive, Diagnostic and Predictive Analytics • Failure Trend Analysis •
	Use of Data Historians and Dashboards • Building Data Reliability Culture
	Digital Reliability Tools
1100 – 1215	Reliability Block Diagrams (RBD) • Weibull Analysis and Statistical Modeling
1100 - 1215	Monte Carlo Simulations for Downtime Impact • Integration of Mobile Apps
	and Cloud Tools
1215 – 1230	Break
	Reliability Auditing & Benchmarking
1230 - 1330	Reliability Maturity Assessment Models • Reliability Audit Process and
1200 - 1000	Checklist • Benchmarking with Industry Best Practices • Continuous
	Improvement Tracking
	Performance Optimization through Digital Twins
1330 – 1420	Digital Twin Applications in Maintenance • Simulation of Failure Scenarios •
	Real-Time Virtual Monitoring • Feedback Integration for Continuous Learning
	Recap
1420 - 1430	Using this Course Overview, the Instructor(s) will Brief Participants about the
1120 1100	Topics that were Discussed Today and Advise Them of the Topics to be
	Discussed Tomorrow
1430	Lunch & End of Day Four



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Day 5:	Thursday, 19 th of June 2025
	Maintenance & Reliability Strategy Deployment
0730 – 0830	Developing Long-Term Maintenance Strategy • Linking Strategy to Business
0750 - 0850	Goals • Prioritizing Improvement Initiatives • Strategy Review and Refresh
	Cycles
	Change Management in Maintenance Culture
0830 - 0930	Culture versus Systems in Maintenance Transformation • Operator Care and
0050 - 0550	Total Productive Maintenance (TPM) • Engaging Frontline Personnel •
	Sustaining Behavioral Change
0930 - 0945	Break
	Training & Competency Management
0945 - 1100	Skills Matrix Development • Technical versus Behavioral Competency •
	Training Needs Identification • Certification and Career Pathways
	Performance Dashboards & Reviews
1100 – 1215	Real-Time KPI Dashboards • RCA Tracking and Reporting • Failure Cost and
	Downtime Visualization • Review Meeting Structure and Frequency
1215 – 1230	Break
	Case Studies & Industry Benchmarks
1230 - 1345	RCM Implementation Success in Refineries • Turnaround Risk-Based
1250 - 1545	Optimization Example • Condition Monitoring Cost Reduction Case •
	MTBF/Availability Improvement in Petrochemical Plants
	Course Conclusion
1345 - 1400	Using this Course Overview, the Instructor(s) will Brief Participants about a
	Topics that were Covered During the Course
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course



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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".

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Course Coordinator

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