

COURSE OVERVIEW ME0699
Reciprocating Pump Maintenance & Troubleshooting

Course Title

Reciprocating Pump Maintenance and Troubleshooting

Course Date/Venue

September 01-05, 2024/The Kooh Al Noor Meeting Room, The H-Hotel, Sheikh Zayed Road, Dubai, UAE

Course Reference

ME0699

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.



This course is designed to provide participants with a detailed and up-to-date overview of Reciprocating Pump Maintenance and Troubleshooting. It covers the basic principles of reciprocating pumps; the pump performance parameters and materials and construction; the proper installation techniques, alignment procedures and tools; the factors affecting pump operation; the operating limits and performance optimization; the preventive and predictive maintenance and maintenance scheduling techniques; and the visual and non-destructive testing (NDT) methods, inspection checklists and documentation.



Further, the course will also discuss the lubrication systems, seal and packing maintenance, valve maintenance and bearing maintenance; the common pump issues and their symptoms; the troubleshooting approach, vibration analysis and noise analysis; the leak detection, testing procedures for performance verification, analyzing test results and identifying issues; the proper installation and maintenance of advanced seals; the pump disassembly and reassembly; and the cylinder and piston maintenance.

During this interactive course, participants will learn the inspection and maintenance of crankshafts and connecting rods; the techniques for balancing and alignment; the installation and maintenance of advanced bearings; the root cause analysis (RCA), reliability-centered maintenance (RCM) and condition monitoring; the energy efficiency optimization and techniques for improving pump efficiency; and the performance audits and recommendations for performance improvement.

Course Objectives

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

- Apply and gain an in-depth knowledge on project controls
- Discuss the basic principles of reciprocating pumps including pump performance parameters and materials and construction
- Carryout proper installation techniques, alignment procedures and tools
- Identify the factors affecting pump operation as well as operating limits and performance optimization
- Apply preventive and predictive maintenance, maintenance scheduling techniques, visual and non-destructive testing (NDT) methods, inspection checklists and documentation
- Recognize lubrication systems and apply seal and packing maintenance, valve maintenance and bearing maintenance
- Discuss the common pump issues and their symptoms and employ systematic troubleshooting approach, vibration analysis and noise analysis
- Apply leak detection, testing procedures for performance verification, analyzing test results and identifying issues
- Implement proper installation and maintenance of advanced seals, pump disassembly and reassembly including cylinder and piston maintenance
- Apply inspection and maintenance of crankshafts and connecting rods, techniques for balancing and alignment and installation and maintenance of advanced bearings
- Carryout root cause analysis (RCA), reliability-centered maintenance (RCM) and condition monitoring
- Apply energy efficiency optimization and techniques for improving pump efficiency as well as conduct performance audits and implement recommendations for performance improvement

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 provides an overview of all significant aspects and considerations of reciprocating pump maintenance and troubleshooting for maintenance technicians, mechanical engineers, plant operators, reliability engineers, process engineers, supervisors and managers, maintenance planners and schedulers, equipment inspectors 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

Certificates are accredited by the following international accreditation organizations: -

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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.

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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. Craig Nilsen, CMRP, CRCMP, is a Senior Maintenance & Reliability Engineer with over 25 years of extensive experience within the Oil & Gas, Refinery and Petrochemical industries. His wide expertise includes Maintenance Planning & Scheduling, Maintenance Planning Process, Maintenance Shutdown & Turnaround, Maintenance Audit Best Practices, Maintenance & Reliability Management, Reliability Engineering, Maintenance & Reliability Best Practices, Reliability, Availability & Maintainability (RAM), Root Cause Analysis, Maintenance Process, Reliability-Centered Maintenance (RCM), Reliability Engineering Analysis (RE), Root Cause Analysis (RCA), Asset Integrity Management (AIM), Reactive & Proactive Maintenance, Maintenance Process, Work Task Prioritization, Condition Monitoring, Mechanical Engineering, Mechanical Manufacturing Engineering, Mechanical Engineering Design, Electro Technology, Maintenance Planning, Spare Parts Planning & Inventory Management, Computerized Maintenance Management Systems (CMMS), Process Plant Shutdown & Turnaround, Maintenance Optimization & Best Practices, Reliability Centered Maintenance Principles & Application, Efficient Shutdowns, Turnaround & Outages, Process Plant Shutdown, Turnaround & Troubleshooting, Shutdown & Turnaround Management, Optimizing Equipment Maintenance & Replacement Decisions, Maintenance Management & Cost Control, Preventive & Predictive Maintenance, Effective Reliability Maintenance & Superior Maintenance Strategies, Integrity & Asset Management, Total Plant Reliability Maintenance, Vibration Measurement, Spare Parts & Materials Management, Mechanical & Rotating Equipment Troubleshooting & Maintenance, Rotating Equipment Reliability Optimization, Laser Alignment, Thermography, Risk Assessment, Legal Liability, Construction Regulations, Machine Vibration Analysis, Bag Filters Operation & Troubleshooting, Blower & Fan, Pumps, Valves, Bearings & Lubrication, Mechanical Seals, Mechanical Equipment Maintenance, Gearboxes, Shaft Alignment, Rotating Equipment, Preventive & Predictive Maintenance, Spare Management and Network Analysis.

During his career life, Mr. Nilsen gained his practical and field experience through his various significant positions and dedication as the **Maintenance Engineer, Repair Shop Supervisor, Maintenance & Reliability Specialist, Maintenance Planner/Reliability Specialist, Senior Maintenance Planner/Condition Monitoring Specialist, Supply Chain Maintenance Planner, Technical Advisor, Senior Trainer/Lecturer and Fitter & Turner** for Algorax (Pty) Limited.

Mr. Nilsen has a **National Higher Diploma in Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer, a Certified Maintenance and Reliability Professional (CMRP)** from the Society of Maintenance & Reliability Professionals (SMRP), a **Certified Reliability Centered Management Professional (CRCMP)** from the International Organization of RCM Professionals (IORCMP) and a **Qualified Fitter & Turner**. Moreover, he is an active member of the Society of Maintenance and Reliability Professionals (SMRP) and the South African Asset Management Association (SAMA). He has further delivered numerous trainings, courses, seminars, workshops and conference internationally.

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.

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 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, 01st of September 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Basic Principles of Reciprocating Pumps Types of Reciprocating Pumps • Working Principles & Components
0930 – 0945	Break
0945 – 1100	Pump Performance Parameters Flow Rate, Pressure, & Efficiency • Performance Curves & their Interpretation
1100 – 1215	Materials & Construction Materials Used in Pump Construction • Corrosion Resistance & Material Selection
1215 – 1230	Break
1230 – 1330	Installation & Alignment Proper Installation Techniques • Alignment Procedures & Tools
1330 – 1420	Operational Parameters Factors Affecting Pump Operation • Operating Limits & Performance Optimization
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2: Monday, 02nd of September 2024

0730 – 0830	Maintenance Planning & Scheduling <i>Preventive & Predictive Maintenance • Maintenance Scheduling Techniques</i>
0830 – 0930	Inspection Techniques <i>Visual & Non-Destructive Testing (NDT) Methods • Inspection Checklists & Documentation</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Lubrication Systems <i>Types of Lubricants & their Applications • Lubrication Schedules & Best Practices</i>
1100 – 1215	Seal & Packing Maintenance <i>Types of Seals & Packing Materials • Installation & Maintenance Procedures</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Valve Maintenance <i>Types of Valves Used in Reciprocating Pumps • Inspection & Maintenance of Valves</i>
1330 – 1420	Bearing Maintenance <i>Types of Bearings & their Applications • Bearing Inspection, Lubrication, & Replacement</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Two</i>

Day 3: Tuesday, 03rd of September 2024

0730 – 0830	Troubleshooting Fundamentals <i>Common Pump Issues & their Symptoms • Systematic Troubleshooting Approach</i>
0830 – 0930	Vibration Analysis <i>Basics of Vibration Analysis • Identifying & Diagnosing Vibration Issues</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Noise Analysis <i>Common Sources of Noise in Reciprocating Pumps • Noise Reduction Techniques</i>
1100 – 1215	Leak Detection <i>Identifying & Locating Leaks • Repair Techniques & Tools</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Performance Testing <i>Testing Procedures for Performance Verification • Analyzing Test Results & Identifying Issues</i>
1330 – 1420	Case Studies & Practical Examples <i>Real-World Troubleshooting Scenarios • Group Discussion & Problem-Solving</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Three</i>

Day 4: Wednesday, 04th of September 2024

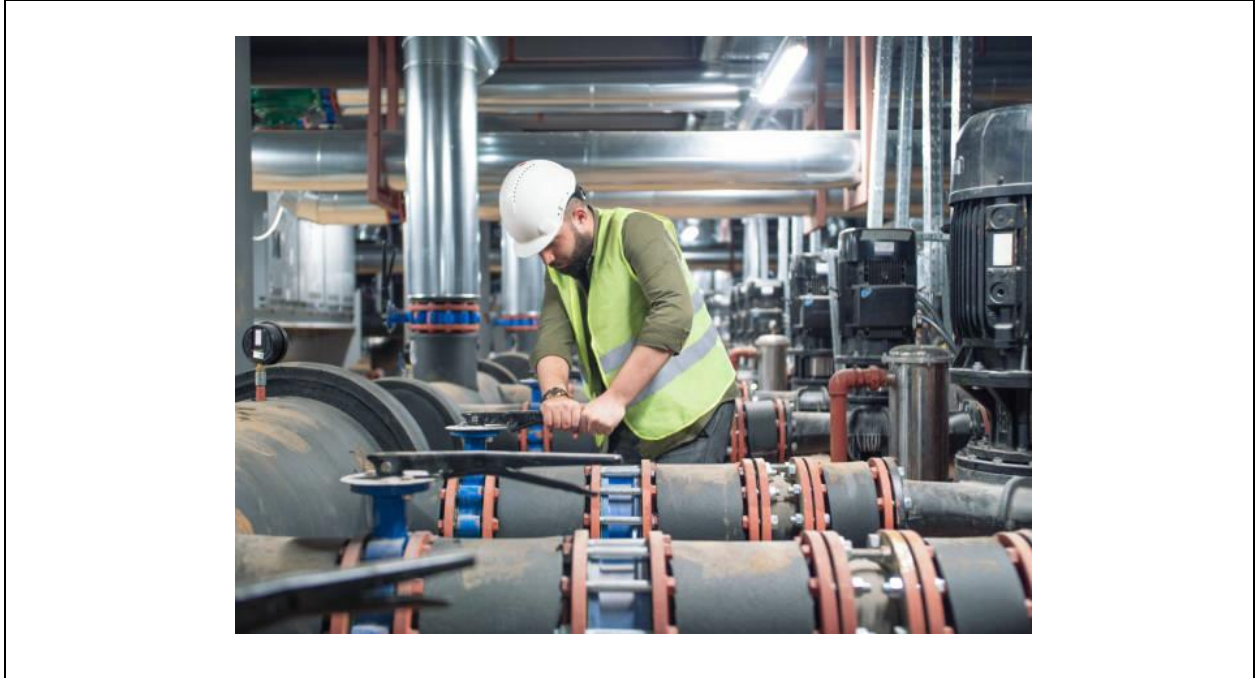
0730 – 0830	Advanced Seal Technologies Latest Advancements in Seal Technology • Installation & Maintenance of Advanced Seals
0830 – 0930	Pump Disassembly & Reassembly Step-By-Step Disassembly Procedures • Inspection & Replacement of Worn Components
0930 – 0945	Break
0945 – 1100	Cylinder & Piston Maintenance Inspection & Maintenance of Cylinders & Pistons • Techniques for Ensuring Proper Fit & Function
1100 – 1215	Crankshaft & Connecting Rod Maintenance Inspection & Maintenance of Crankshafts & Connecting Rods • Techniques for Balancing & Alignment
1215 – 1230	Break
1230 – 1330	Advanced Bearing Technologies Latest Advancements in Bearing Technology • Installation & Maintenance of Advanced Bearings
1330 – 1420	Workshop Practice Hands-On Practice of Maintenance & Repair Techniques • Guided Practice & Feedback
1420 – 1430	Recap
1430	Lunch & End of Day Four

Day 5: Thursday, 05th of September 2024

0730 – 0830	Root Cause Analysis (RCA) Fundamentals of RCA • Applying RCA to Recurring Pump Issues
0830 – 0930	Reliability-Centered Maintenance (RCM) Principles of RCM • Implementing RCM for Reciprocating Pumps
0930 – 0945	Break
0945 – 1100	Condition Monitoring Techniques for Continuous Condition Monitoring • Using Data to Predict Maintenance Needs
1100 – 1230	Energy Efficiency Optimization Identifying Energy-Saving Opportunities • Techniques for Improving Pump Efficiency
1230 – 1245	Break
1245 – 1345	Performance Audits Conducting Performance Audits • Implementing Recommendations for Performance Improvement
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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