

COURSE OVERVIEW ME0080-4D
Hydraulic System Operation, Maintenance & Troubleshooting

Course Title

Hydraulic System Operation, Maintenance & Troubleshooting

Course Date/Venue

Session 1: August 12-15, 2024/Boardroom,
Warwick Hotel Doha, Doha,
Qatar

Session 2: November 11-14, 2024/
Boardroom 1, Elite Byblos Hotel
Al Barsha, Sheikh Zayed Road,
Dubai, UAE



Course Reference

ME0080-4D

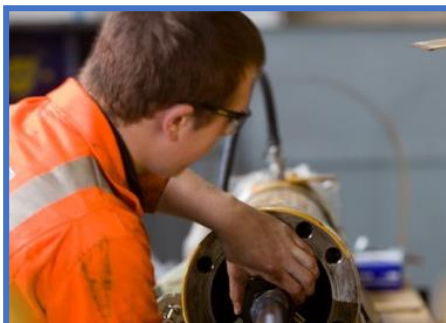
Course Duration/Credits

Four days/2.4 CEUs/24 PDHs

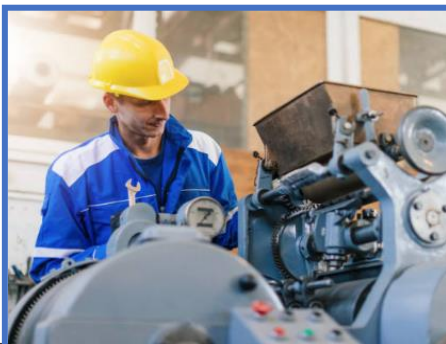
Course Description



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



Whatever your hydraulic applications, you can increase your knowledge of the fundamentals, improve your maintenance programs and become an excellent troubleshooter of problems in this area by attending this information packed course. Cutaways of all major components are brought to the sessions to visually demonstrate the components' construction and operation. Developing an understanding of "How" it works leads to an understanding of how and why it fails. Multimedia views of the equipment are given to give you as realistic a view of hydraulic systems as possible.



The Hydraulics course is a comprehensive, highly practical and interactive five-day course. You will have an opportunity to discuss Hydraulic Systems construction, design-applications, operations, maintenance and management issues and be provided with the most up-to-date information and Best Practice in dealing with the subject. Towards the end of the course, you will have developed the

skills and ability to recognise and solve hydraulic problems in a structured and confident manner.

Course Objectives

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

- Operate, maintain and troubleshoot hydraulic panel units in a professional manner
- Work with hydraulic components and identify how hydraulic components function in a hydraulic circuit
- Discuss pressure and flow and define the limits of pressure measurement
- Determine hydraulic fluids, hydraulic pipe and hoses, hydraulic cylinders, hydraulic accessories, hydraulic pumps and hydraulic motors
- Read hydraulic schematics and work safely with hydraulic components and systems
- Troubleshoot hydraulics problems and apply a simple preventative maintenance program to lengthen hydraulic components life
- Make simple repairs to hydraulic systems and identify hydraulic systems components
- Develop an understanding of the essential hydraulic terms and their key applications and recognise the impact hydraulic fluids have on components
- Discuss the correct operation, control sequences and procedures for the safe operation of various simple hydraulic system
- Identify the control valves, direction control valves, pressure control valves and flow control valves
- Recognize electro-hydraulic systems and hydrostatic transmission
- Initiate an effective inspection and maintenance program and minimise forced outages
- Prevent serious damage to hydraulic equipment and outline the latest technologies available for electro-hydraulic systems
- Employ proper application of hydraulic circuits and troubleshooting of hydraulic systems

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 covers systematic techniques in the operation, maintenance and troubleshooting of hydraulic system for operation, maintenance, inspection & repair managers, supervisors & engineers, plant engineers, plant operations and

maintenance personnel, mechanical engineers, design engineers, consulting engineers and other technical staff.

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

Doha	US\$ 5,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	US\$ 4,500 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.

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 **2.4 CEUs** (Continuing Education Units) or **24 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. Karl Thanasis, PEng, MSc, MBA, BSc, is a **Senior Mechanical & Energy Expert** with over **45 years** of practical experience within the **Energy Sectors**. His wide expertise includes **Energy Management International Standards, Energy Audit, Energy Efficiency, Industrial Energy Efficiency, Energy Efficiency & Management, Nuclear Power Plant, Renewable Energy, Solar Energy, Thermal Energy, Engineering Drawings, Codes & Standards, P&ID**

Reading, Interpretation & Developing, Drawing Interpretation, Oil & Gas Field Commissioning, Start-Up & Troubleshooting, Oil Field Operations & Water Treatment, Process Plant Performance & Efficiency, Water Testing, Wastewater Treatment Technology, Industrial Water Treatment in Refineries & Petrochemical Plants, Piping System, Water Movement, Water Filtering, Mud Pumping, Sludge Treatment and Drying, Aerobic Process of Water Treatment that includes **Aeration, Sedimentation and Chlorination Tanks**. His strong background also includes **Pump Operation & Maintenance, Pumps, Turbo-Generator, Turbine Shaft Alignment, Mud Pumping, Sludge Pumps, Filters, Metering Pumps, Steam Turbines, Power Generator Plants, Gas Turbines, Turbine Shaft Alignment, Root Cause Failure Analysis (RCFA), Boilers, Process Fired Heaters, Heater Fabrication, Thermal & Fired Heater Design, Heat Exchangers, Heat Transfer, Coolers, Boiler & Steam System Management, Chiller & Chiller Plant Design & Installation, Pressure Vessel, Safety Relief Valve Sizing & Selection, Valve Disassembling & Repair, Pressure Relief Devices (PSV), Hydraulic & Pneumatic Maintenance, Advanced Valve Technology, Design and Sizing of all Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps, Filters, Metering Pumps, Aerators and Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager, Plant Manager, Area Manager - Equipment Construction, Construction Superintendent, Project Engineer and Design Engineer**. His duties covered **Plant Preliminary Design, Plant Operation, Write-up of Capital Proposal, Investment Approval, Bid Evaluation, Technical Contract Write-up, Construction and Sub-contractor Follow up, Lab Analysis, Sludge Drying and Management of Sludge Odor and Removal**. He has worked in various companies worldwide in the **USA, Germany, England and Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA and Greece** and has **Master and Bachelor** degrees in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU in USA** respectively as well as an **MBA** from the **University of Phoenix in USA**. Further, he is a **Certified Instructor/Trainer**.



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	Introduction to Hydraulics Origin of Hydraulics & Classification • Force • Work • Power • Energy • Mass • Weight • Torque • Density • Specific Gravity • Specific Weight
0930 – 0945	Break
0945 – 1100	Pressure & Flow Definition & Units of Pressure Measurement • Pascal's Law & Applications • Pressure-Force Relationship • Fluid flow/ Discharge • Steady & Unsteady Flows • Bernoulli's Principle • Laminar & Turbulent Flows • Pressure- Flow Relationship
1100 – 1215	Hydraulic Fluids Cavitation • Aeration • Locations of Filters & Strainers • Filter Terminology • Measurement of Contamination Levels
1215 – 1230	Break
1230 – 1330	Hydraulic Pipes & Hoses Major Components of Hydraulic Lines • Hydraulic Hoses • Metal Tubes & Pipes • Designing Hydraulic Lines • Hose Routing & Installations
1330 – 1420	Hydraulic Cylinders Classification (Single & Double Acting) • Construction of Cylinders • Cylinder Mounting • Seals • Cylinder Design Checklist • Common Cylinder problems
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2

0730 – 0930	Hydraulic Accessories Reservoirs (Pressure & Non Pressure Types) • Accumulators • Heat Exchangers • Hydraulic Actuators
0930 – 0945	Break
0945 – 1100	Hydraulic Pumps Principle of Pump Operation • Classification (Positive & Non-Positive Displacement) • Gear Pump • Vane Pump (Variable Volume & Pressure Compensated Variable Volume Pumps) • Piston Pump (Axial/Inline, Bent Axis, Radial, Variable Volume, Pressure Compensated & Over Center Axial Pumps) • Gerotor Pump • Rating of Pumps • Pressure, Flow & Efficiencies of Pumps
1100 – 1215	Hydraulic Motors Principle of Motor Operation • Classification (Rotating & Piston Type) • Gear Motors • Vane Motors • Piston Motors • Difference Between Hydraulic Motors & Hydraulic Pumps • Specification of Hydraulic Motors • Efficiency of Hydraulic Motors • Motor Slippage



1215 – 1230	Break
1230 – 1420	Control Valves Purpose • Classification (Direction, Pressure & Flow control valves) • Valve Symbols
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0930	Direction Control Valves Poppet Valve • Check Valve • Spool Valve (Rotary & Sliding Valves) • Direct & Indirect Operated Valves • Valve Actuation Methods (Manual, Electrical, Pilot, Pneumatic, Electro-Hydraulic & Electro- Pneumatic) • 2,3 & 4 Way Direction Control Valves • Positive & Negative Overlapping • Center Conditions (Open Center, Closed Center, Tandem Center & Float Center Valves)
0930 – 0945	Break
0945 – 1100	Pressure Control Valves Relief Valves (Pressure Regulating & Emergency Relief) • Meaning of Surge Pressure • Sequence Valves • Counterbalance Valves • Pressure Reducing Valves • Unloading Valves
1100 – 1215	Flow Control Valves Classification (Non-Pressure Compensated & Pressure Compensated) • Location of Flow Control Valve (Meter-in, Meter-out & Bleed-off Circuits)
1215 – 1230	Break
1230 – 1315	Electro-Hydraulic Systems Proportional Solenoid • Proportional Valves (Direction Control, Flow Control & Pressure Control Valves) • Servo Valves (Direction & Pressure Servo Valves, Single Stage & Multi Stage Servo Valves) • Use of Transducers in Hydraulic Systems
1315 - 1420	Hydrostatic Transmission Overview of Hydrostatic Transmission • Configurations of Hydrostatic Transmission • Control of Hydrostatic Transmission • Applications of Hydrostatic Transmission
1420 – 1430	Recap
1430	Lunch & End of Day Three

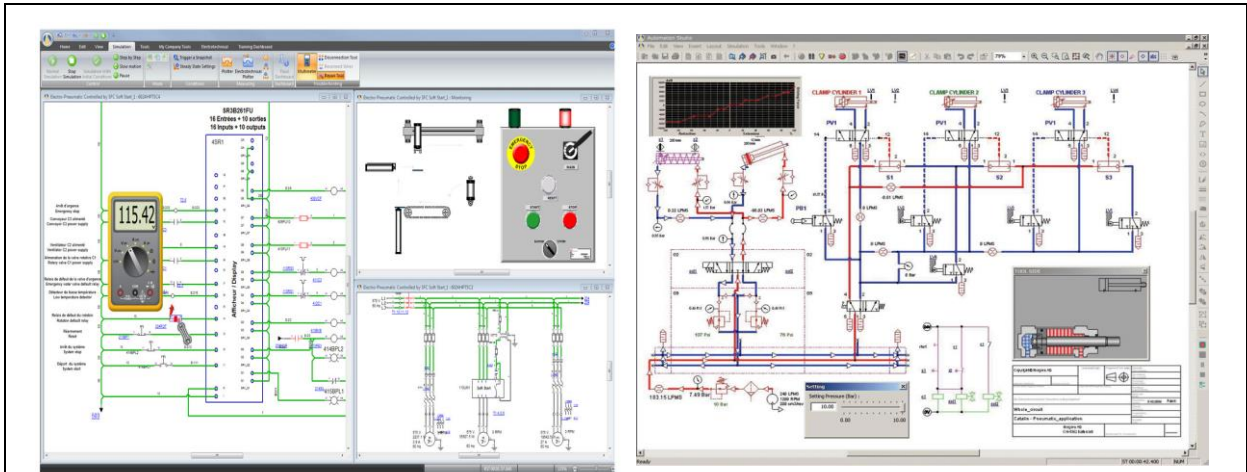
Day 4

0730 – 0930	Application of Hydraulic Circuits Symbols of Hydraulic Components • Need for Check Valve in Hydraulic Circuits • Regenerative Circuit
0930 – 0945	Break
0945 – 1100	Application of Hydraulic Circuits (cont'd) Flow Equalizer • Counterbalance Circuit • Pre Fill & Compression Relief Circuit
1100 – 1215	Application of Hydraulic Circuits (cont'd) Decompression Circuit • Circuits of Open Center, Closed Center, Tandem Center & Indirect Control • Hydraulic Circuits of Various Machines
1215 – 1230	Break
1230 – 1345	Troubleshooting Hydraulic Systems Flow Chart Analysis of Hydraulic Circuits • Maintenance
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates

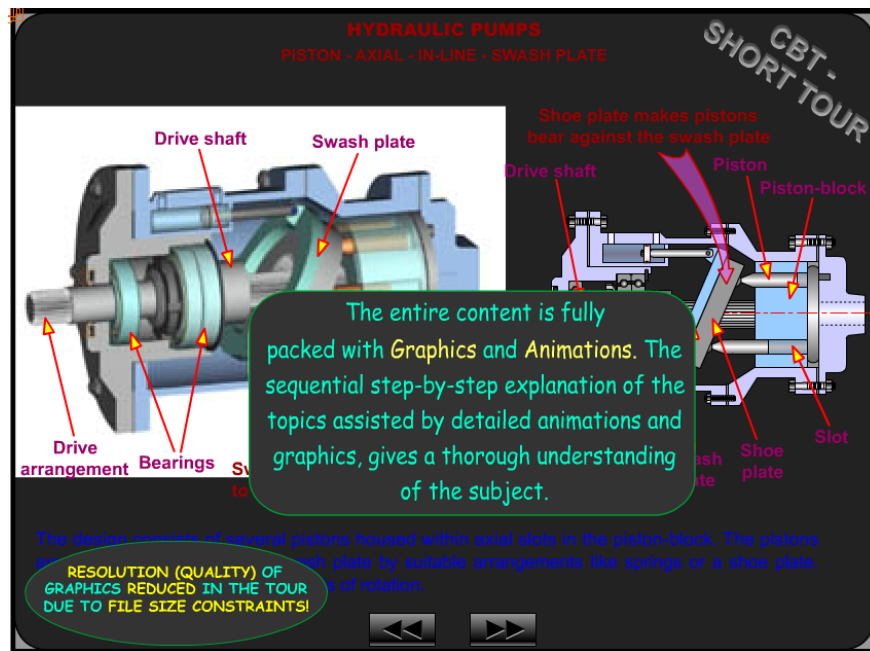


Simulator (Hands-on Practical Sessions)

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 “Automation Studio (Hydraulic & Pneumatic Software)” and “Industrial Hydraulic Software”.



“Automation Studio (Hydraulic & Pneumatic Software)”



Industrial Hydraulics Software

Course Coordinator

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