COURSE OVERVIEW ME0080
Hydraulic System Operation, Maintenance & Troubleshooting

Course Title
Hydraulic System Operation, Maintenance & Troubleshooting



Course Date/Venue
Session 1: May 30-June 03, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar
Session 2: November 07-11, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
ME0080



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.

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/Outcomes & Benefits for the Participants

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.

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. Manuel Dalas MSc, BSc, is a **Senior Mechanical & Maintenance Engineer** with over **25 years** of industrial experience in **Oil**, **Gas**, **Refinery**, **Petrochemical**, **Power** and **Nuclear** industries. His wide expertise includes **Pipe Stress Analysis** using **CAESAR II**, **CAESAR II** Application, **Piping Dynamic**, **Static & Other Special Analysis** using **CAESAR II**, **Expansion Joints** Design & Analysis, **Impact Load** Analysis, **Piping** Systems, **Piping Codes** Used in **CAESAR II**, **RFP Pipe** Maintenance & Repair, **Relief Valve** Analysis, Safety **Relief Valve**, **Tanks & Tank Farms**, **Seismic Loads**, **Tank Shell**, **Tank Failure**, **Vacuum Tanks**, **Tank Design & Engineering**, **Tank Contractions**, **Material Cataloguing**, **Maintenance Planning & Scheduling**, Reliability Centered Maintenance (**RCM**), **Reliability Maintenance**, **Condition Based Maintenance & Condition Monitoring**, **Asset & Risk** Management, **Vibration Condition Monitoring & Diagnostics** of Machines, **Vibration & Predictive** Maintenance, Reliability Improvement & Vibration Analysis for Rotating Machinery, Effective Maintenance **Shutdown & Turnaround** Management, **Engineering Codes & Standards**, **Rotating Equipment** Maintenance, **Mechanical** Troubleshooting, **Static Mechanical Equipment** Maintenance, **Machinery** Failure Analysis, **Machinery Diagnostics & Root Cause Failure** Analysis, **Plant Reliability & Maintenance** Strategies, **Boiler** Operation & Water Treatment, **Pumps** Maintenance & Troubleshooting, **Fans**, **Blowers & Compressors**, **Process Control Valves**, Piping Systems & Process Equipment, **Gas Turbines & Compressors** Troubleshooting, Advanced **Valve** Technology, **Pressure Vessel** Design & Analysis, **Steam & Gas Turbine**, **High Pressure Boiler** Operation, **Centrifugal & Positive Displacement Pump** Technology Troubleshooting & Maintenance, **Rotating Machinery** Best Practices, **PD Compressor & Gas Engine** Operation & Troubleshooting, **Hydraulic Tools & Fitting**, **Mass & Material Balance**, **Water Distribution & Pump Station**, **Tank Farm & Tank Termina**l Safety & Integrity Management, **Process Piping** Design, Construction & **Mechanical Integrity**, **Stack & Noise** Monitoring, **HVAC & Refrigeration** Systems, BPV Code, Section VIII, Division 2, **Facility Planning & Energy** Management, Hoist - Remote & Basic **Rigging & Slinging**, **Mobile Equipment** Operation & Inspection, **Heat Exchanger**, **PRV & POPRV/PORV**, **Bearing & Lubrication**, **Voith Coupling** Overhaul, **Pump & Valve** Technology, **Lubrication** Inspection, **Process Plant** Optimization, Rehabilitation, Revamping & Debottlenecking, Engineering Problem Solving and **Process Plant** Performance & Efficiency. Currently, he is the **Technical Consultant** of the **Association of Local Authorities of Greater Thessaloniki** where he is in charge of the mechanical engineering services for piping, pressure vessels fabrications and ironwork.

During his career life, Mr. Dalas has gained his practical and field experience through his various significant positions and dedication as the **Technical Manager**, **Project Engineer**, **Safety Engineer**, **Deputy Officer**, **Instructor**, **Construction Manager**, **Construction Engineer**, **Consultant Engineer**, **Mechanical Engineer** and **CAESAR II Application Consultant** for numerous multi-billion companies including the **Biological Recycling Unit** and the **Department of Supplies** of **Greece**, **Alpha Bank Group**, **EMKE S.A**, **ASTE LLC** and **Polytechnic College of Evosmos**.

Mr. Dalas has a **Master's** degree in **Energy System** from the **International Hellenic University, School of Science & Technology** and a **Bachelor's** degree in **Mechanical Engineering** from the **Mechanical Engineering Technical University of Greece** along with a **Diploma** in **Management & Production Engineering** from the **Technical University of Crete**. Further, he is a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), a **Certified Project Manager Professional** (**PMI-PMP**), a **Certified Instructor/Trainer**, a **Certified Energy Auditor** for **Buildings**, **Heating & Climate Systems**, a **Member** of the **Hellenic Valuation Institute** and the **Association of Greek Valuers** and a **Licensed Expert Valuer Consultant** of the **Ministry of Development and Competitiveness**. He has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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 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*** *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

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)*
1100 – 1215	***Hydraulic Pumps (cont'd)*** *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*
1215 – 1230	*Break*
1230 – 1420	***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*
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

0730 – 0930	***Control Valves*** *Purpose ● Classification (Direction, Pressure & Flow control valves) ● Valve Symbols*
0930 – 0945	*Break*
0945 – 1100	***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)*
1100 – 1215	***Direction Control Valves (cont'd)*** *2,3- & 4-Way Direction Control Valves ● Positive & Negative Overlapping ● Center Conditions (Open Center, Closed Center, Tandem Center & Float Center Valves)*
1215 – 1230	*Break*

1230 – 1420	***Pressure Control Valves*** *Relief Valves (Pressure Regulating & Emergency Relief) ● Meaning of Surge Pressure ● Sequence Valves ● Counterbalance Valves ●Pressure Reducing Valves ● Unloading Valves*
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

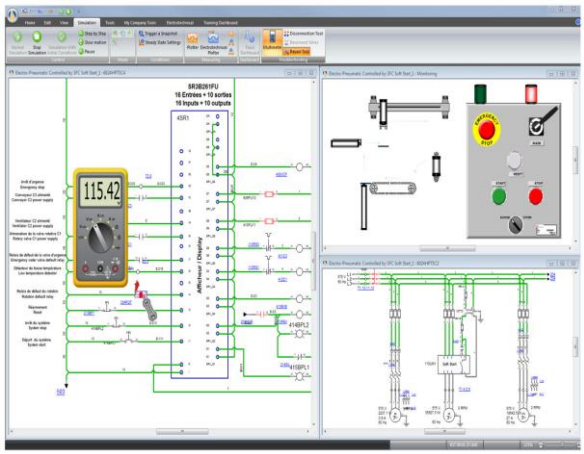
0730 – 0930	***Flow Control Valves*** *Classification (Non-Pressure Compensated & Pressure Compensated) ● Location of Flow Control Valve (Meter-in, Meter-out & Bleed-off Circuits)*
0930 – 0945	*Break*
0945 – 1100	***Electro-Hydraulic Systems*** *Proportional Solenoid ● Proportional Valves (Direction Control, Flow Control & Pressure Control Valves)*
1100 – 1215	***Electro-Hydraulic Systems (cont'd)*** *Servo Valves (Direction & Pressure Servo Valves, Single Stage & Multi Stage Servo Valves) ● Use of Transducers in Hydraulic Systems*
1215 – 1230	*Break*
1230 – 1420	***Hydrostatic Transmission*** *Overview of Hydrostatic Transmission ● Configurations of Hydrostatic Transmission ● Control of Hydrostatic Transmission ● Applications of Hydrostatic Transmission*
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*

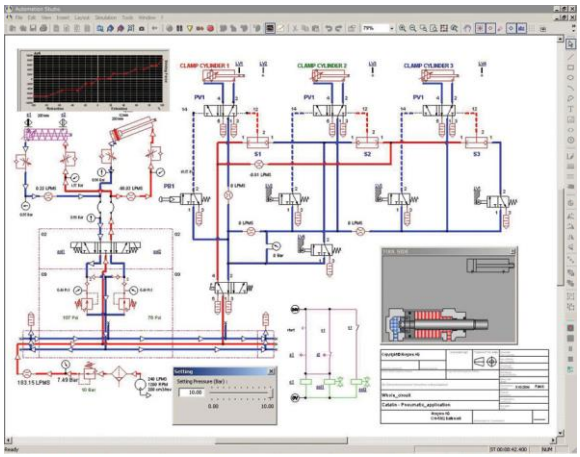
Day 5

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*** *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*

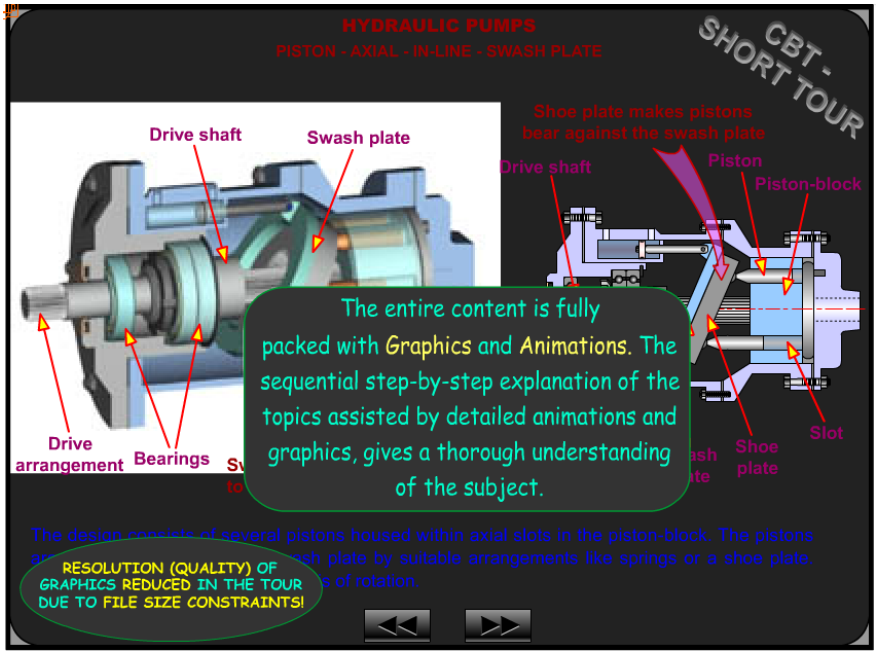
Simulator (Hands-on Practical Sessions)

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 "Automation Studio (Hydraulic & Pneumatic Software)" and "Industrial Hydraulic Software".





"Automation Studio (Hydraulic & Pneumatic Software)"



Industrial Hydraulics Software

Course Coordinator

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