

COURSE OVERVIEW ME0592-4D Diesel Engine & Crane Maintenance

Course Title

Diesel Engine & Crane Maintenance

Course Date/Venue

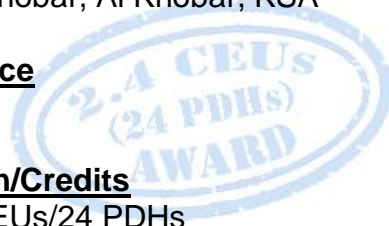
September 16-19, 2024/Al Aziziya Hall, The Proud Hotel Al Khobar, Al Khobar, KSA

Course Reference

ME0592-4D

Course Duration/Credits

Four days/2.4 CEUs/24 PDHs



Course Description



This practical and highly-interactive course includes practical sessions and demonstration where participants carryout diesel engine and crane maintenance. Theory learnt in the class will be applied using a mobile crane through hands-on practical sessions.



The diesel engine produces far more useful torque per rated horsepower than spark ignition (SI) gasoline engines or gas turbines. Diesel engines are much more efficient, durable and reliable than any other heat engine. US diesel engine manufacturers warranty their Class 7 & 8 heavy-duty truck engines for 500,000 miles! In other words, the diesel engine powered vehicles are the most economical to own and operate.

Like most other construction equipment, cranes of all types are powered by diesel engines.



This course is designed to provide a good overview of the maintenance, troubleshooting and service of diesel engines and cranes. It will cover system operation, engine specifications, hydraulic system, troubleshooting, lubrication and maintenance, testing and adjusting as well as a detailed account of the causes of engine malfunctions and their solutions. In addition to the diesel engine, the course will discuss all maintenance issues related to crane components.

Through interactive lectures, discussions, case studies, exercises and videos, the first four days of the course will cover everything related to diesel engines from components up to maintenance. The last day of the course (day 5) will be conducted in a workshop where participants will be given hands-on experience on operating, testing, troubleshooting and maintenance of a diesel engine.

Course Objectives

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

- Carryout maintenance activities for diesel engines and cranes in a professional manner
- Recognize the different diesel engine types including in line engines, v-type engines, slant engines, opposed engines and various numbers of cylinders according to classification by title, speed, piston format and fuel used
- Discuss the basic terminology of force, torque, power, top and bottom dead center and determine the aspects of 2-stroke and 4-stroke of engine cycles
- Interpret timing mechanism construction and engine indicator diagrams as well as engine construction and maintenance
- Differentiate HP fuel pumps and maintenance including delivery valves, rack & pinion, barrel & plunger and injection pump timing and recognize the importance of fuel injectors and maintenance in actuations including hydraulic, mechanical, and electronic as well as injector faults
- Identify the various types of governors including constant and variable speed, mechanical and hydraulic governors and apply the proper procedures in maintenance
- Demonstrate the functions of starting systems and maintenance in relation to hand cranking, electric, pneumatic, hydraulic and spring tension start as well as crankshafts and its maintenance
- Specify the various cooling systems (air, water, oil) troubleshooting & maintenance in connection to overheating, overcooling, fan service & testing and recognize the different lubrications system troubleshooting & maintenance during high oil consumption, oil pressure problems and oil & filter changes
- Evaluate the features of air system service, turbo charging systems and transmission systems
- Discuss the different types of crane hydraulic pumps, crane hydraulic motors and crane hydraulic cylinders and recognize the purpose and classifications of crane control valves, crane direction control valves and crane flow control valves
- Identify crane electro-hydraulic systems, crane hydraulic accessories, hydraulic fluids and crane hydraulic circuit and employ proper troubleshooting and maintenance of crane hydraulic and other crane systems
- Acquire practical knowledge through various hands-on practical sessions in diesel engine & crane maintenance and through several group discussions on fault identity table performed during the course

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 diesel engine and crane maintenance for those who are involved in the maintenance, operation or inspection of diesel engines and cranes including engineers, supervisors, inspectors, foremen 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

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 who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations


Haward Technology is accredited by the following international accreditation organizations: -

- 
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.

- 
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:



Dr. Sayed Shaaban, PhD, MSc, BSc, is a Senior Mechanical Engineer with over 30 years of integrated **industrial experience** as a consultant and academic experience as a University Professor. His wide expertise includes **Machinery Vibrations Analysis, Maintenance & Reliability Management, Machinery Failure Analysis & Prevention**, Computerized Maintenance Management Systems (**CMMS**), Root Cause Failure Analysis (**RCFA**), **Preventive Maintenance, Predictive Maintenance, Total Productive Maintenance, Industrial Hydraulics, Mechanical Troubleshooting Maintenance, Pumps, Compressors, Bearings, Lubrication and Mechanical Shaft Alignment**. Furthermore, he is also an expert in assets inspection & management, measurements & instrumentations, maintenance planning & scheduling, transportation planning & management, inspection & assessment of laboratory testing equipments, utility trucks, heavy equipment, diesel engines and technical report writing.

During his career life, Dr. Shaaban has gained his practical and field experience through his various significant positions and dedication as the **Head of Automotive and Tractors Engineering Department, Project Manager, Technical Consultant, Team Leader and Material Testing Engineer** for international companies, universities, colleges, institutes and research centers like the British Council, James Watt College of Scotland, Helwan University, Technical Research Center, Al Handasia Manufacturing Co., GIAD Manufacturing Co. and the Egyptian Standards Authority.

Dr. Shaaban has **PhD** degree in **Mechanical Engineering** from the **Ecole Centrale (France)** and has **Master's** and **Bachelor's** degree in **Mechanical Engineering**. Furthermore, he is an **author** of more than **40 technical books** along ten years of his work as a Technical Curricula Specialist in the Middle East and he has published **26 research papers** in local and international scientific journals and conferences.

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: Monday, 16th of September 2024

0730 – 0745	Registration & Coffee
0745 – 0800	Welcome & Introduction
0800 – 0815	PRE-TEST
0815 – 0915	Diesel Engine Types Classification by Cycle, Speed, Piston Format, Fuel Used • In Line Engines • V-Type Engines • Slant Engines • Opposed Engines • Numbers of Cylinders



0915 - 0930	Break
0930 - 1030	Basic Terminology Force, Work, Torque, Power, Top and Bottom Dead Center, Stroke, Compression Ratio, Efficiency and Swirl
1030 - 1130	Engine Cycles 2-Stroke • 4-Stroke
1130 - 1230	Timing Mechanism Construction Camshaft Drive • Cam Drive Ratio • Timing Gear Timing Chain and Sprocket • Chain Tensioner and Guide • Timing Belt and Cover • Vibration Damper
1230 - 1245	Break
1245 - 1300	Engine Indicator Diagrams
1300 - 1315	Engine Construction & Maintenance
1315 - 1330	HP Fuel Pumps & Maintenance Delivery Valves • Rack and Pinion • Barrel and Plunger • Injection Pump Timing
1330 - 1400	Fuel Injectors & Maintenance Hydraulic Actuation • Mechanical Actuation • Electronic Actuation • Injector Faults
1400 - 1420	Governors & Maintenance Constant Speed • Variable Speed • Mechanical & Hydraulic Governors
1420 - 1430	Recap
1430	Lunch & End of Day One

Day 2: Tuesday, 17th of September 2024

0730 - 0830	Starting Systems & Maintenance Hand Cranking • Electric Start • Pneumatic Start • Hydraulic Start • Spring Tension Start
0830 - 0915	Crankshafts & Maintenance
0915 - 0930	Break
0930 - 1030	Cooling Systems (Air, Water, Oil) Troubleshooting and Maintenance Overheating • Overcooling • Fan Service and Testing • Radiator and Pressure Cap Service • Water Pump Service
1030 - 1100	Lubrication System Troubleshooting & Maintenance High Oil Consumption • Oil Pressure Problems • Oil and Filter Changes
1100 - 1130	Air System Service
1130 - 1230	Turbocharging Systems Air/Fuel Ratio • Methods of Pressure Charging • Air Suction Filters and Silencers • Bearings and Lubrication • Surging • Maintenance
1230 - 1245	Break
1245 - 1300	Transmission Systems Clutch • Gearbox • Thrust Bearings • Shafts • Shaft Bearings • Shaft Couplings • Faults and Defects
1300 - 1315	Crane 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





1315 – 1400	Crane 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
1400 - 1420	Crane 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 Two

Day 3: Wednesday, 18th of September 2024

0730 – 0830	Crane Control Valves Purpose • Classification (Direction, Pressure & Flow Control Valves) • Valve Symbols
0830 – 0915	Crane 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)
0915 – 0930	Break
0930 – 1030	Crane Flow Control Valves Classification (Non-Pressure Compensated & Pressure Compensated) • Location of Flow Control Valve (Meter-In, Meter-Out & Bleed-Off Circuits)
1030 – 1130	Crane 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
1130 – 1230	Crane Hydraulic Accessories Reservoirs (Pressure & Non pressure Types) • Accumulators • Heat Exchangers • Hydraulic Pipes & Hoses • Hydraulic Pipes & Hoses
1230 – 1245	Break
1245 – 1300	Hydraulic Fluids Cavitation • Aeration • Locations of Filters & Strainers • Filter Terminology • Measurement of Contamination Levels
1300 - 1315	Crane Hydraulic Circuit Symbols of Hydraulic Components • Need for Check Valve in Hydraulic Circuits • Regenerative Circuit • Flow Equalizer • Counterbalance Circuit • Pre Fill & Compression Relief Circuit • Decompression Circuit • Circuits of Open Center, Closed Center, Tandem Center & Indirect Control • Hydraulic Circuits of Various Machines
1315 – 1400	Troubleshooting & Maintenance of Crane Hydraulic Systems Flow Chart Analysis of Hydraulic Circuits • Maintenance
1400 - 1420	Maintenance of Other Crane Systems Bearing Surface • Outrigger Blocking • Bearing Mats • Set-Up & Assembly • Boom Assembly • Boom Dismantling • Boom Inspection & Repair
1420 – 1430	Recap
1430	Lunch & End of Day Three



Day 4: Thursday, 19th of September 2024

0730 – 0915	<i>Hands-on Practical Sessions</i>
0915 – 0930	<i>Break</i>
0930 – 1100	<i>Hands-on Practical Sessions (cont'd)</i>
1100 – 1230	<i>Hands-on Practical Sessions (cont'd)</i>
1230 – 1245	<i>Break</i>
1245 – 1345	<i>Group Discussions on Fault Identity Table</i>
1345 – 1400	<i>Course Conclusion</i>
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Practical Sessions/Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-



Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org