



المركز العالمي للتدريب والتطوير
International Centre For Training & Development



MUE165

Practical Hydraulic Systems: Operation & Troubleshooting



ACTVET
Abu Dhabi Centre for
Technical and Vocational
Education and Training
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Course Introduction:

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.

This hydraulics five-day is highly practical, comprehensive and interactive course. You will have an opportunity to discuss Hydraulic Systems construction, design-applications, and 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 recognize and solve hydraulic problems in a structured and confident manner.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Identify hydraulic systems components
- ✓ Describe essential hydraulic terms and understand their key applications
- ✓ Recognize the impact hydraulic fluids have on components
- ✓ Describe the correct operation, control sequences and procedures for the safe operation of various simple hydraulic systems
- ✓ Initiate an effective inspection and maintenance program
- ✓ Minimize forced outages and prevent series damage to hydraulic equipment
- ✓ Explain the latest technologies available for electro hydraulic systems

Who Should Attend?

This course is intended for plant engineers, mechanical engineers, design engineers, consulting engineers, operation maintenance, inspection and repair managers, supervisors, plant operations and maintenance personnel, process and mechanical technicians.

Course Outline:

Day 1:

Introduction to Hydraulics

- Origin of Hydraulics & Classifications

Fundamentals

- Force, Work, Power, Energy, Mass, Weight, Torque, Density, Specific Gravity & Specific Weight

Pressure & Flow

- Definition and 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

Day 2:

Hydraulic Pumps

- Principles of Pump Operation
- Classification (Positive & Non-Positive Displacement) Gear Pump
- Vane Pump (Variable Volume & Pressure Compensated Variable Volume Pumps)
- Position Pump (Axial/Inline, Bent Axis, Radial, Variable Volume, Pressure Compensated & Over Center Axial Pumps)
- Gerotor Pump
- Rating of Pumps
- Pressure, Flow & Efficiencies of Pumps

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

Hydraulic Cylinders

- Classification (Single & Double Acting)
- Construction of Cylinders

- Cylinder Mounting
- Seals
- Cylinder Design Checklist
- Common Cylinder Problems

Day 3:

Control Valves

- Purpose
- Classification (Direction, Pressure & Flow Control Valves)
- Valves Symbols

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)

Day 3:

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Pressure Control Valves

- Relief Valves (Pressure Regulating & Emergency Relief)
- Meaning of Surge Pressure
- Meaning of Surge Pressure
- Sequence Valves
- Counterbalance Valves
- Pressure Reducing valves
- Unloading Valves

Flow Control Valves

- Classification (Non-Pressure Compensated & Pressure Compensated)
- Location of Flow Control Valve (Meter-in, Meter-out & Bleed-off Circuits)

Day 4:

Electro-Hydraulic Systems

- Proportional Solenoid
- Proportional Valves (Direction & Pressure Servo Valves, Single Stage & Multi Stage Servo Valves)
- Use of Transducers in Hydraulic Systems

Day 5:

Hydraulic Accessories

- Reservoirs – Pressure & Non-Pressure Types)
 - Need for Breather & Baffle Plates
 - Role of Hydraulic Oil Tank in Heat Dissipation
- Accumulators
 - Function & Types (Dead weight, Spring load & Hydro-Pneumatic)
 - Accumulator Sizing
 - Application of Accumulators in Hydraulic Circuits
- Heat Exchangers
 - Function & Types (Air Cooled & Water Cooled)
- Hydraulic Pipes & Hoses
 - Pipe Specification & Materials
 - Pipe Fittings
 - Recommended Oil Speeds for Selecting Pipe Sizes
 - Construction of Hoses
 - Reinforcement of Cover Variations
 - Criteria for Hose Selection
 - Sizing of Hoses
 - Maintenance of Pipes & Hoses
- Hydraulic Fluids
 - Capitation
 - Aeration
 - Locations of Filters & Strainers
 - Filter Terminology
 - Measurement of Contamination Levels
- Application of Hydraulic Circuits
 - 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
- Hydraulics Circuits of Various Machines
- Troubleshooting Hydraulic Systems
 - Flow Chart Analysis of Hydraulic Circuits Maintenance

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee/Tea
08:20 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Coffee/Tea/Snacks)
13:30 - 15:00	Last Session

