MU160:
Practical Hydraulic Systems:
Operation & Troubleshooting
Training Description:

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.

Training Objectives:

By the end of the training, participants will be able to:
✓ Identify hydraulic system component
✓ 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

Training Designed for:

This course is intended for Plant Engineers, Mechanical Engineers, Design Engineers, Consulting Engineers, Operation Maintenance, Inspection and Repair Managers, Supervisors, Plant Operation and Maintenance Personnel, Process and Mechanical Technicians.

Training Program:

DAY ONE:
❖ PRE-TEST
❖ Introduction to Hydraulics
  • Origin of Hydraulics & Classification
❖ Fundamentals
  • Force, Work, Power, Energy, Mass, Weight, Torque, Density, Specific Gravity & Specific Weight
Pressure & Flow
- Definition and Units of Pressure Measurement
- Pascal’s Law & Application
- Pressure-Force/Discharge
- Steady & Unsteady Flows
- Bernoulli’s Principle
- Laminar & Turbulent Flows
- Pressure Flow Relationship

DAY TWO:
- Hydraulic Pumps
  - Principle 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
  - Differences between Hydraulic Motors & Hydraulic Pumps
  - Specification of Hydraulic Motors
  - Efficiency of Hydraulic Motors
  - Motor Slippage

- Hydraulic Cylinders
  - Classifications (Single & Double Acting)
  - Construction of Cylinders
  - Cylinder Mounting
  - Seals
  - Cylinder Design Checklist
  - Common Cylinder Problems

- 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 THREE:**
- Pressure Control Valves
  - Reliefs Valves (Pressure Regulating & Emergency Relief)
  - 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 and Bleed-off Circuits)

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

**DAY FIVE:**
- 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 Exchanger
    - Function and Types (Air Cooled & Water Cooled)
  - Hydraulic Pipe & Hoses
    - Pipe Specification & Materials
    - Pipe Fittings
    - Recommended Oil Speeds for Selecting Pipe Sizes
    - Constructions of Hoses
    - Reinforcement of Cover Variations
    - Criteria for Hose Selection
- Sizing Hoses
- Maintenance of Pipes & Hoses

### Hydraulic Fluids
- Capitation
- Aeration
- Locations of Filters & Strainers
- Filter Terminology
- Measurement of Contamination Levels

### Application of Hydraulic Circuits
- Symbol 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

### Troubleshooting Hydraulic Systems
- Flow Chart Analysis of Hydraulic Circuits Maintenance

❖ **Course Conclusion**
❖ **POST-TEST and EVALUATION**

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### Training Requirements:

“**Hands-on practical sessions, equipment** and **software** will be applied during the course if required and as per the client’s request”.

### Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- **30%** Lectures, Concepts, Role Play
- **30%** Workshops & Work Presentations, Techniques
- **20%** Based on Case Studies & Practical Exercises
- **20%** Videos, Software & General Discussions
- Pre and Post Test

### Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.
Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:
- 07:45 - 08:00  Morning Coffee / Tea
- 08:00 - 10:00  First Session
- 10:00 - 10:20  Recess (Coffee/Tea/Snacks)
- 10:20 - 12:20  Second Session
- 12:20 - 13:30  Recess (Prayer Break & Lunch)
- 13:30 - 15:00  Last Session

For training registrations or in-house enquiries, please contact:
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Training & Career Development Department