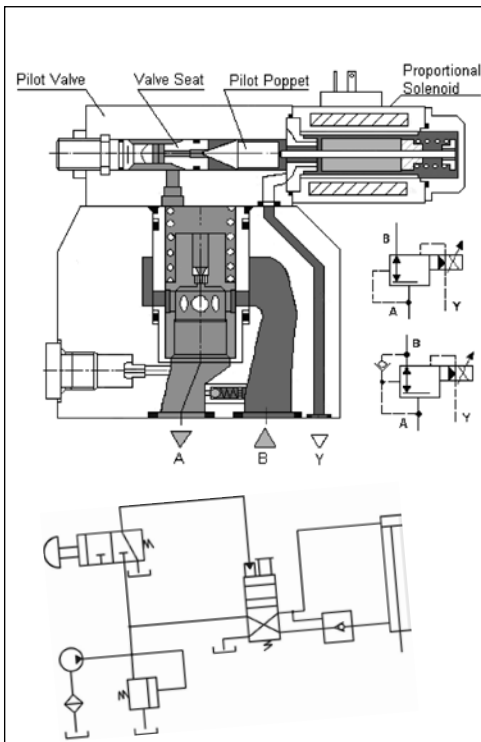


PRACTICAL HYDRAULIC AND PNEUMATIC SYSTEMS: OPERATIONS AND TROUBLESHOOTING



YOU WILL LEARN HOW TO:

- Work with basic hydraulic and pneumatic components
- Understand essential hydraulic and pneumatic terms and understand their key applications
- Describe the characteristics of fluid used in hydraulic systems and air used in pneumatic systems
- Understand how the basic hydraulic components function in a hydraulic circuit and how the basic pneumatic components function in a pneumatic circuit
- Read hydraulic and pneumatic schematics
- Perform simple circuit design using standard symbology and functions such as automatic return, logic control, speed control, pressure sequencing, reduced actuator forces and timing
- Discuss the correct operation, control sequences and procedures for the safe operation of various simple hydraulic and pneumatic systems
- Troubleshoot simple hydraulic and pneumatic system problems
- Make simple repairs to hydraulic and pneumatic systems
- Minimise forced outages and prevent serious damage to hydraulic and pneumatic equipment
- Outline the latest technologies available for electro hydraulic and pneumatic systems

This is not an advanced workshop but one focusing on the fundamentals. You are however expected to have some knowledge of the topic of hydraulics and pneumatics. Pre-course reading will be provided for you if you have no knowledge whatsoever.

WHO SHOULD ATTEND:

- All those who plan to make career in hydraulics and pneumatics
- All those working with hydraulics and pneumatics systems
- Consulting engineers
- Design engineers
- Mechanical engineers
- Mechanical technicians
- Operation, maintenance, inspection and repair managers, supervisors and engineers Plant engineers
- Plant operations and maintenance personnel
- Process technicians



Technology Training that Works

The Workshop

This information packed practical course on hydraulics and pneumatics would enhance your knowledge of the fundamentals, improve your maintenance programs and help you become excellent troubleshooter of the problems in this area. No matter what hydraulics or pneumatics applications you are working on, and what the level of your knowledge, the workshop will be highly beneficial to you.

The practical hydraulics and pneumatics workshop is a comprehensive, highly practical and interactive two-day course. You will have an opportunity to discuss construction of hydraulic and pneumatic systems, design-applications, and learn operations, maintenance and management issues. You will be provided with the most up-to-date information and best practice in dealing with the subject.

During the course sessions cutaways of all major components are brought 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 and pneumatic systems as possible. Towards the end of the workshop, you will have developed the skills and ability to recognise and solve hydraulic and pneumatic problems in a simple, structured and confident manner.

Pre-requisites

A fundamental knowledge of basic mechanical plant and operation thereof and some exposure to hydraulic and pneumatic systems would be helpful but is not essential.

The Program

DAY ONE

HYDRAULIC SYSTEMS

INTRODUCTION TO HYDRAULICS

- Origin of hydraulics and classification

FUNDAMENTALS

- Force, work, power, energy, mass, weight, torque, density, specific gravity, specific weight, basic hydraulic principles, properties of fluids, viscosity

PRESSURE, LAWS AND FLOW

- Hydrostatic principles
- Pascal's Law and applications
- Pressure-force relationship
- Fluid flow and flow rate
- Bernoulli's equation

Practical Exercise

HYDRAULIC PUMPS

- Principle of pump operation
- Classification (positive and non-positive displacement)
- Standard parameters for pump selection
- Gear, vane, gerotor, lobe pump
- Piston: radial piston, axial piston, fixed displacement and variable volume, bent axis pumps
- Pressure, flow and efficiencies of pumps

Practical Exercise

HYDRAULIC MOTORS

- Principle of motor operation
- Performance characteristics
- Classification of hydraulic motors
- Gear, vane, piston motors
- Difference between hydraulic motors and hydraulic pumps
- Specifications of hydraulic motors
- Efficiency of hydraulic motors and their sizing

Practical Exercise

HYDRAULIC CYLINDERS

- Classification (single and double acting)
- Construction of cylinders
- Sealing systems used in cylinders
- Design of cylinders
- Common cylinder problems

Practical Exercise

DIRECTION CONTROL VALVES

- Functions of direction control valves and their classification
- Valve symbols
- Valve elements: reciprocating spools, rotary spools, poppet type
- Spool valve element: characteristics and position changeover
- Centre conditions

- Non-Return Valves (NRV)
- Check valve
- Spool valve (rotary and sliding valves)

Practical Exercise

PRESSURE CONTROL VALVES

- Classification of pressure control valves
- Pressure relief valves (pressure regulating and emergency relief)
- Pressure reducing valves

Practical Exercise

FLOW CONTROL VALVES

- Functions of flow control valve
- Classification of flow control valves (Non-pressure compensated and pressure compensated)
- Location of flow control valve (metre-in, metre-out and bleed-off circuits)

Practical Exercise

ELECTRO-HYDRAULIC SYSTEMS

- Proportional solenoid valves: technology and operation
- Types of proportional valves (direction control, flow control and pressure control valves)
- Servo valves: first and second stage use of transducers in hydraulic systems
- Comparison of proportional and servo valves

Practical Exercise

HYDRAULIC ACCESSORIES

- Hydraulic oil reservoirs types (pressure and non-pressure types)
- Hydraulic filters
- Hydraulic tubes and fittings
- Hydraulic hoses and fittings
- Hydraulic accumulators

Practical Exercise

HYDRAULIC FLUIDS

- Types of hydraulic oils
- Oil additives
- Common problems with hydraulic oils (cavitation, aeration, foaming)
- Oil sampling and oil cleanliness
- Monitoring oil and removing contamination

Practical Exercise

SEAL DESIGN IN HYDRAULIC SYSTEMS

- Classification and types
- O-rings and their applications
- Common seal materials
- Reasons for seal failures

Practical Exercise

DAY TWO

HYDRAULIC CIRCUITS

- Types of hydraulic circuits
- Symbols used in hydraulic circuits
- Pump unloading circuit
- Pressure control circuit
- Counterbalance circuit
- Regenerative circuit
- Pre-fill and compression relief circuit

Practical Exercise

MAINTENANCE AND TROUBLESHOOTING

- Commissioning
- Maintenance
- Troubleshooting

Practical Exercise

PNEUMATIC SYSTEMS

AIR PREPARATION, GENERATION AND DISTRIBUTION

- Characteristics of air
- Air generation, preparation and distribution
- Characteristics of pneumatic systems

Practical Exercise

SYMBOLS AND STANDARDS

- Standards for pneumatic systems
- Symbols used in pneumatic systems

Practical Exercise

PNEUMATIC ELEMENTS

- Basic structure of pneumatic control system
- Components of pneumatic systems
- Compressors
- Directional control valves
- Flow control valves
- Other control valve types
- Actuators and output devices
- Cylinders (single and double acting)

Practical Exercise

BASIC CIRCUIT DESIGN

- Operation of single and double-acting cylinders
- Timing system for cylinder extend and retract cycle
- Speed and safety control systems

Practical Exercise

TROUBLESHOOTING AND FAULT FINDING PNEUMATIC SYSTEMS

- Maintenance requirements
- Guidelines for maintenance of system components
- Troubleshooting problems

Practical Exercise

SUMMARY AND OPEN FORUM