Level 2 Industrial Hydraulics
Advanced Maintenance & Repair

Course Description

This component and control level course will incorporate component symbols learned in Level 1 into complete schematics. Remote control of pressure valves using pilot valves, bleed off orifices, and proportional controls will be discussed. Simultaneous control of multiple actuators while maintaining pressure and flow requirements will be reviewed. Operation and setup of load sense pumps will be demonstrated. Slip-in and screw-in cartridge valve design and operation will be presented. Proportional directional control valve function and use will be introduced.

Prerequisites: Level 1 Industrial Hydraulics or equivalent knowledge

Course Length: 3 days

Textbooks: Parker Industrial Hydraulic Textbook, CFC Lab Book and Enerpac Handouts

Course Outline

Safety Considerations
- Safety equipment
- Hazardous conditions

Hydraulic Fundamentals Review Actuators
- Bent rod causes and prevention
- Area ratios for speed and force output flow systems
- Regeneration circuits and pressure intensification

Pressure Controls
- Remote control of pressure and unloading circuits
- Drain line control techniques
- Control of multiple pressure valves

Flow Controls
- Meter-in vs. Meter-out
- Pressure compensated vs. non-compensated
- Multiple speed circuits

Flow Dividers
- Various types and startup problems

Directional Controls/Slip In Controls
- Pilot operated check valve ratio problems
- Spool types and transition conditions
- Poppet type no-leak valves/flow control
- Stacking valves, modules and manifolds
- Proper stacking sequence and order
- Drain and tank line considerations

Proportional Valves/Motor, Pumps, & Pumping Principles
- Directional, flow and pressure types
- Feedback and non feedback types
- Electronic controls/load sensing

Learning Objectives

- Determine pressure required to move load at a given pressure
- Compare area ratios for speed and force output as well as output flows
- Determine actuator speeds for given flow and size
- Use cylinder's extend & retract to determine flow rates
- Explain remote control techniques for relief, reducing, sequence, counterbalance, and unloading valves
- Compare pressure compensated vs. non-compensated flow control circuits
- Review meter-in versus meter out operations and learn how to reduce or eliminate pressure intensification problems
- Identify/classify the different types of the different types of hydraulic pump controls
- Adjust procedures for pressure compensating, load sensing and power limiting controls
- Explain diagnostic procedures for variable displacement pumps
- Compare slip-in and screw-in cartridge valves and review circuits
- Use slip-in cartridges and pilot valve to replace a two stage directional valve
- Demonstrate manifold troubleshooting
- Demonstrate knowledge of hydraulic schematics to aid in diagnostics of machines
- Evaluate machine response and performance with multiple simultaneous operations