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## Level 2 Mobile 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. Closed loop hydrostatics systems, power steering and power beyond functions will also be covered.

**Prerequisites:** Level 1 Mobile Hydraulics or equivalent knowledge

**Textbooks:** Mobile Hydraulics Manual; CFC-Solar Lab Manual

**Course Time allocation:** 40% Hands-on, 60% power point presentation and animations

### Learning Objectives:

- Determine pressure required to move a load at 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 and retract time to determine flow rates.
- Explain remote control techniques for relief, reducing, sequence, counterbalance, and unloading valves. Use vent and drain ports to influence pressure control settings. Review Load sensing pressure controls.
- Compare pressure compensated vs. non-compensated flow control circuits. The effects of flow controls in multiple pressure systems. Review meter-in vs. meter-out operations and learn how to reduce or eliminate pressure intensification problems.
- Identify/classify the different types of hydraulic pump controls. Review adjustment procedures for pressure compensating, load sensing, and power limiting controls. Discuss diagnostic procedures for variable displacement pumps and manual displacement controls for pumps.
- Compare slip-in and screw-in cartridge valves and review circuits. How to use slip-in cartridges and pilot valves to replace a two stage directional valve. Discuss manifold trouble shooting. Identification of pilot, drain, and control ports.
- Demonstrate knowledge of hydraulic schematics to aid in diagnostics of machines. Evaluate machine response and performance with multiple simultaneous operations.