Advanced Hydraulics & System Improvement

Module One – 12 hours

- Determining actuator load pressure requirements – min/max
- The total reflected mass, force and pressure to accelerate the load
- Determining required cycle time – accel/decel required times
- The V-T diagram – peak flow rate calculations
- Estimation of system pressure
- Hydraulic motor torque – pressure to accelerate a rotating load
- Relief valve characteristics and sizing – pilot operated relief valve venting options
- An active system with varying speed requirements – multiple actuators that require different system pressures – static system, i.e. clamping
- Sizing directional control valves and selecting the proper spool type – slow shift valves – pilot choking – piloting and draining options
- Speed control with flow controls – meter-in vs. meter-out – regulated speed control vs. non-regulated
- Systems requiring differing system pressures – Remote pressure controlled pumps - Load sensing with a variable displacement pump
- Cylinder protection – hydraulic motor protection circuit
- The use, application and sizing of pressure reducing valves
- Hydraulic horsepower and drive motor sizing – system efficiency considerations

Module Two – 5 hours

- Application of proportional pressure controls – sizing for flow rate requirements
- Application of proportional pressure reducing valves
- Proportional directional control valves – the 4 general classifications – choosing the proper type for the needs of actuator control
- Understanding the 1/3 – 2/3 relationship as the basis for proportional directional valve sizing
- Review valve data sheet flow – pressure drop charts
- Closed process loop proportional valve evaluation – accuracy, speed of response, circuit phase lag

Module Three – 5 hours

- Introduction and application of high flow logic cartridge valves
- Compare and contrast spool type directional controls vs. cartridge valves
- Understanding pressure relief logic cartridge valves
- Interpreting the pressure logic data sheet
- Standard relief valve poppets vs. poppet spools
- Understanding directional control logic cartridge valves and their control covers
- 7% vs. 50% cartridge valves (Rexroth area ratios)
- Flow rate sizing
- Control cover orifice selection
- Understanding directional logic circuits

Module Four – 8 hours

- Pump types and application
- Selection of the proper pump type that meets the application requirements
- Pressure regulating pump applications
- Displacement pump applications
- Electric motor HP requirements
- Suction requirements for piston pumps
- Line sizing
- Requirements and sizing of reservoirs

Module 5 – 6 Hours

- Instructor-Directed Application Problems