



Fluid Power Training Associates

CONTINUING EDUCATION FOR AMERICAN INDUSTRY
HYDRAULICS • PNEUMATICS • ELECTRONICS

702 South 228th Drive, Buckeye, AZ 85326

ADVANCED INDUSTRIAL HYDRAULICS

1. **Fundamentals of the laws of physics and fluid behavior.**
 - Pascal's law
 - The Bernoulli principle of constant energy and pressure drop---Delta P
 - Horsepower, volume, speed, force, torque and pressure calculations
 - Twenty things to know about hydraulics
2. **Reservoirs --features, pressurized and non pressurized**
3. **Fluid types---petroleum base, synthetics, water base, bio fluids, viscosity, ISO call outs, non-conductive, specific gravity**
 - O ring and seal compatibility.
 - Filtration--suction, pressure, return. The Beta Factor and micron ratings, bypass indicators
4. **Pumps:**
 - Gear pumps (fixed displacement) for constant flow open center systems. Gpm. Rpm
 - Displacement and Pressure ratings
 - Vane pumps, both balanced and unbalanced for open center and closed center systems.Gpm,Rpm, Pressure ratings
 - Piston pumps, --- variable displacement, pressure compensated types for closed center systems. Radial and axial types for closed center systems. Gpm, Rpm, Pressure ratings
5. **Directional control valves----two way,three way, two position and three position types**
 - Spool types i.e. open center, closed center, tandem center, float center, special spools
 - Solenoid operated
 - Pilot operated
 - Lever operated
 - Proportional
 - Power beyond with mobile type directional control valves
 - Cartridge valves and man folding
6. **Flow control valves**
 - Needle valves
 - Needle valves with integral check valves
 - Adjustable flow controls with pressure compensation.
 - Meter in, meter out, bleed off for resistive loads and overrunning loads
- 7). **Pressure control valves. direct acting and pilot operated**
 - Relief valves
 - Pressure reducing valves
 - Sequence valves
 - Counterbalance and holding valves
 - Unloading valves
 - Motor brake value
 - What they all have in common and what causes them to fail

8. **Cylinders and motors, sizing, speed control, pressure ratings, rod sizing, force and torque calculations**
9. **Accumulators---- why, how, when to use them
Charging procedures**
10. **Correct plumbing
Hoses----SAE ratings and specs. pressure ratings
Tubing-----Steel and stainless steel, bending procedures, pressure ratings
Pipes---- Schedules 40, 80, 160, pressure ratings
Fittings---SAE 45 degree flare, JIC 37 degree flare, NPT, NPTF, BSP, BSPP, Straight thread
O ring boss, metric
Sizing to prevent pressure drop and heat**
11. **Accessories
Pressure gauges
Flow meters
Pressure switches
Transducers
Tachometers**
12. **Troubleshooting tips
Reading schematics is the primary troubleshooting method
Begin at the beginning
Troubleshooting tools and instruments
Remember the difference between flow and Pressure
Oil takes the path of least resistance**