LAWS OF PHYSICS AND COMMON EQUATIONS

Pascal's Law
Pressure exerted on a confined fluid is transmitted undiminished in all directions, and acts with equal force on all equal areas and at right angles to them.

Hydraulics
Simply, a means of power transmission.

Work
Force acting through distance.
WORK = FORCE x DISTANCE
Example: Work = lbs. x inches,
or Force (lbs.) x Distance (ins.)

Power
The rate of doing work.
$$\text{Power} = \frac{\text{Work}}{\text{Time}} = \frac{\text{Force x Distance}}{\text{Time}}$$

Force
The Force (pounds) exerted by a piston can be determined by multiplying the piston area (sq. inches) by the pressure applied (psi).
Force = Pressure x Area

Volume
To determine volume (cubic inches) required to move a piston a given distance, multiply the piston cross sectional area (sq. inches) by the stroke required (inches).
Volume = Area x L

Compression of Hydraulic Oil
Hydraulic oil serves as an excellent lubricant, is practically non-compressible. It will compress approximately 0.4 of 1% at 1000 psi and 1.1% at 3000 psi at 1200.

Weight of Hydraulic Oil
The weight of hydraulic oil may vary with a change in viscosity; however, 55 to 58 lbs. per cubic foot covers the viscosity range from 150 SSU to 900 SSU at 1000°F.

Pressure in a Column of Oil
The pressure at the bottom of a one-foot column of oil will be approximately 0.4 psi. To find the approximate pressure in psi at the bottom of any column of oil, multiply the height in feet by 0.4.

Atmospheric pressure
Equivalent to 14.7 PSIA at sea level. ΔP means pressure difference.

Gage readings
Gage readings do not include atmospheric pressure unless marked PSIA.

Pressure drop
There must be a pressure drop (pressure difference) across an orifice or restriction to cause flow through it. Conversely, if there is no flow, there will be no pressure drop.

Pumps and fluids
Fluid is pushed, not drawn, into a pump. If pumping from an open reservoir, atmospheric pressure pushes the fluid into the pump. Some pumps are used specifically to create pressure. Any resulting flow is incidental. A pump does not pump pressure; its purpose is to create flow. A pump used to transmit power is usually positive displacement type.

Pressure
Pressure is caused by resistance to flow. A pressure gage indicates the pressure in a given unit, measured in PSI.