FLUID POWER FORMULAS

FORMULA FOR	WORD FORMULA	LETTER FORMULA
FLUID PRESSURE In Pounds per Square Inch	$\text{PRESSURE} = \frac{\text{FORCE (pounds)}}{\text{UNIT AREA (Sq.In.)}}$	$P = \frac{F}{A}$ or $psi = \frac{F}{A}$
CYLINDER AREA In Square Inches	$\text{AREA} = \pi \times \text{RADIUS}^2$ (Inches)	$A = \pi r^2$
	$\text{AREA} = \frac{\Pi \times \text{DIAMETER}^2}{4}$ (Inches)	$A = \frac{\Pi D^2}{4}$ or $A = .785\text{D}^2$
CYLINDER FORCE In Pounds, Push or Pull	FORCE = PRESSURE (psi) x NET AREA (Sq. In.)	$F = psi \times A$ or $F = PA$
CYLINDER VELOCITY or **SPEED** In Feet per Second	$\text{VELOCITY} = \frac{231 \text{ x FLOW RATE (gpm)}}{12 \text{ x } 60 \text{ x NET AREA (Sq. In.)}}$	$V = \frac{231Q}{720A}$ or $V = \frac{.3208Q}{A}$
CYLINDER VOLUME CAPACITY In Gallons of Fluid	$\text{VOLUME} = \frac{\pi \text{ x RADIUS}^2 \text{x STROKE (Inches)}}{231}$	$V = \frac{\pi r^2 t}{231}$ t = stroke
	$\text{VOLUME} = \frac{\text{NET AREA (Sq. In.) x STROKE (Inches)}}{231}$	$V = \frac{At}{231}$ t = stroke
CYLINDER FLOW RATE In Gallons per Minute	$\text{FLOWRATE} = \frac{12\text{x}60\text{x VELOCITY (Ft/Sec) x NET AREA (Sq.In)}}{231}$	$Q = \frac{720vA}{231}$ or Q = 3.117vA
FLUID MOTOR TORQUE In Inch Pounds	$\text{TORQUE} = \frac{\text{PRESSURE(psi)xF.M.DISPLACEMENT (Cu.In./Rev.)}}{2\pi}$	$T = \frac{psid}{2\pi}$ or $T = \frac{Pd}{2\pi}$
	$\text{TORQUE} = \frac{\text{HORSEPOWER x 63025}}{\text{RPM}}$	$T = \frac{63025HP}{n}$
	$\text{TORQUE} = \frac{\text{FLOW RATE (GPM) x PRESSURE (psi) x 36.77}}{\text{RPM}}$	$T = \frac{36.77QP}{n}$ or $T = \frac{36.77Qpsi}{n}$
FLUID MOTOR TORQUE Per 100 PSI In Inch Pounds	$\text{TORQUE per 100 psi} = \frac{\text{F.M.DISPLACEMENT (Cu.In./Rev.)}}{.0628}$	$T_{100psi} = \frac{d}{.0628}$
FLUID MOTOR SPEED In Revolutions per Minute	$\text{SPEED} = \frac{231 \text{ x FLOW RATE (GPM)}}{\text{F.M. DISPLACEMENT (Cu.In./Rev.)}}$	$n = \frac{231Q}{d}$
FLUID MOTOR POWER In Horsepower Output	$\text{HP OUTPUT} = \frac{\text{TORQUE OUTPUT (inch Pounds) x RPM}}{63025}$	$HP = \frac{Tn}{63025}$
PUMP OUTLET FLOW In Gallons per Minute	$\text{FLOW} = \frac{\text{RPM x PUMP DISPLACEMENT (Cu.In./Rev.)}}{231}$	$Q = \frac{nd}{231}$
PUMP INPUT POWER In Horsepower Required	$\text{HP INPUT} = \frac{\text{FLOW RATE OUTPUT (GPM) x PRESSURE (psi)}}{1714 \text{ x EFFICIENCY (Overall)}}$	$HP = \frac{QP}{1714 \times Eff}$ or $\frac{GPM \times psi}{1714 \times Eff}$
FLOW RATE THROUGH PIPING In Feet per Second	$\text{VELOCITY} = \frac{.3208 \text{ x FLOW RATE THROUGH I.D. (GPM)}}{\text{INTERNAL AREA (Square Inches)}}$	$v = \frac{.3208Q}{A}$
COMPRESSIBILITY OF OIL In Additional Required Oil to Reach Pressure	$\text{Additional Oil Volume} = \frac{\text{Pressure (psi) x Volume of Oil Under Pressure}}{250{,}000}$	$V = \frac{PV}{250,000}$ (Approx. 1/2% per 1000 psi)