Formulas

CYLINDERS	
CYL AREA = DIAMETER^2 x .7854 (IN^2)	Annulus Area or EREA = CYL AREA – ROD AREA (IN^2)
CYL FORCE = PRESSURE x AREA (LBS)	ADJ. GPM ON RET = $\frac{\text{CYL AREA x GPM}}{\text{EREA}}$
CYL TIME (SEC) = $\frac{\text{AREA x STROKE x .26}}{\text{GPM}}$	CYL SPEED (FT/MIN) = $\frac{\text{STROKE x 5}}{\text{TIME(SEC)}}$
CYL SPEED (FT/MIN) = $\frac{\text{GPM x 19.25}}{\text{AREA}}$	CYL HP = $\frac{\text{CYL SPEED x CYL FORCE}}{33{,}000}$
TUBE AREA (IN^2) = $\frac{\text{GPM x .3208}}{\text{OIL VELOCITY}}$	HYD HP = $\frac{\text{PSI x GPM}}{1714}$

PNEUMATICS	
P1V1T2 = P2V2T1 (Use Absolute Values)	COMP CFM = $\frac{\text{AREA x STROKE}}{\text{TIME (SEC) x 28.8}}$
PNEUMATIC HP = $\frac{\text{COMPRESSED CFM x PSI}}{229}$	

HYDRAULIC PUMPS & MOTORS	
ACTUAL PUMP GPM = $\frac{\text{THEO GPM x VOL. EFF.}}{100}$	GPM = $\frac{\text{RPM x DISP (IN}^3\text{)}}{231}$
ACTUAL TORQUE = $\frac{\text{THEO TORQUE x MECH. EFF.}}{100}$	HP OUT = $\frac{\text{HP IN x OVERALL EFF.}}{100}$
ACTUAL MOTOR RPM = $\frac{\text{THEO RPM x VOL. EFF.}}{100}$	TORQUE (IN-LBS) = $\frac{\text{PSI x DISP (IN}^3\text{)}}{6.28}$
OVERALL EFF. = $\frac{\text{MECH. EFF. X VOL. EFF.}}{100}$	TORQUE (IN-LBS) = $\frac{\text{HP x 63025}}{\text{RPM}}$

VEHICLE SIZING FORMULAS	
RPM = $\frac{\text{MPH x 168}}{\text{LR}}$	LR = LOADED RADIUS TE = TRACTIVE EFFORT WD = WEIGHT ON DRIVE WHEELS ADC = ADHESION COEFFICIENT RR = ROLLING RESISTANCE GR = GRADE RESISTANCE DP = DRAW BAR PULL
TORQ = TE x LR	
WHEEL SLIP = WD x ADC x LR TORQ	
TE = RR + GR + DP	

OTHER FLUID POWER FORMULAS

VELOCITY (Ft./Sec.) = $\frac{\text{GPM .3208}}{\text{Inside d}^2\text{ (.7854)}}$

AREA OF CIRCLE = D^2 .7854

CIRCUMFERENCE = dπ

BTU/HR. = PSI x 1-1/2

H.P. = PSI x GPM x .00058

1 CU. IN. = 16.39C

C = $\frac{(°F - 32)}{1.8}$

F = (°C x 9/5) + 32

H.P. (RADIATING CAPACITY) = .001 x A

(Surface Area Ft.2) x TΔ (Temp. Diff in °F between oil and surrounding air)

BURST PRESSURE OF PIPE OR TUBING (PSI) = $\frac{\text{2T (Wall Thick In.) x (Tensile of Mat. PSI)}}{\text{O.D. (Outside Dia. In.}}$

One Watt will raise the temperature of 1 gal. of oil by 1 °F per hour.

Pipe Schedule 80 Grad C @ 200°F:

Pipe(In.)			10 Ft/Sec	15 Ft/Sec
Size	Wall	PSI	GPM	GPM
3/8	.126	3800	4	5
3/4	.154	3850	14	20
1	.179	3860	22	33
1-1/4	.191	3330	40	60
1-1/2	.200	3100	55	83
2	.218	.2770	91	138
3	.300	2840	206	310
4	.337	2540	365	548
6	.432	2300	813	1220

Note: Above ratings are approximate

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