

Cheat Sheet

Rules of Thumb

Horsepower For Driving A Pump

For every 1 HP of drive, the equivalent of 1 GPM @ 1500 PSI can be produced.

Horsepower For Idling A Pump

To idle a pump when it is unloaded will require about 5% of it full rated horsepower.

Compressibility Of Hydraulic Oil

Volume reduction is approx 1/2% for every 1000 PSI of fluid pressure.

Compressibility Of Water

Volume reduction is about 1/3% for every 100 PSI of pressure.

Wattage For Heating Hydraulic Oil

Each watt will raise the temperature of 1 gallon of oil by 1 degree Fahrenheit per hour.

Flow Velocity In Hydraulic Lines

Pump suction lines 2-4 fps.

Pressure lines up to 500 PSI, 10-15 fps.

Pressure lines 500-3000 PSI, 15-20 fps.

Pressure lines over 3000 PSI, 25 fps.

All oil lines in air-over-oil systems, 4 fps.

Safe Pump Inlet Vacuum

Gear Pumps - 3-5 PSI or 6-10 In. HG

Vane Pumps - 2-3 PSI or 4-6 In. HG

Piston Pumps - 2 PSI or 4 In. HG

Formulas

Hydraulic Power

$$HP = \text{PSI} \times \text{GPM} / 1714$$

HP = Horsepower

PSI = Gauge pressure

GPM = Flow

Cylinder Force

$$F = A \times \text{PSI}$$

F = Force, lbs.

A = Piston Area, Square Inch

PSI = Gauge Pressure

Cylinder Travel Speed

$$S = V / A$$

S = Travel Speed, in./min.

V = Volume, cubic in./min.

A = Piston Area, square inch

Velocity

$$V = \text{GPM} \times 0.3208 / A$$

V = Velocity, ft. per sec.

GPM = Flow

A = pipe inside area, sq. inch

Heat of Fluid Power

$$\text{BTU per hour} = \text{PSI} \times \text{GPM} \times 1.1/2$$

BTU = British thermal unit

PSI = Gauge pressure

GPM = Flow

Conversions

Length - 1 inch = 25.4mm

Pressure - 1 bar = 14.5 PSI

Flow - 1 GPM = 3.79 l/min

Force - lb (f) = 4.44 N

Mass - 1 Kg = 2.2 lb (m)

Volume - 1 Gal. = 3.79 liters

Temperature - C = 5/9 (F-32)

Torque - 1 ft-lb = 1.356 Nm

Power - 1 HP = .746 kw

Frequency - 1 Hz = 1 cps

Disp. - 1 ml/rev = 0.061 cir

Abbreviations

abs - absolute

AC - alternating current

BTU - British thermal unit

C - degrees Celsius

cc - closed center

ccw - counter clockwise

cfm - cubic ft per minute

cfs - cubic ft per second

cir - cubic inches per rev.

cim - cubic inches per min.

com - Common

cpm - cycles per minute

cps - cycles per second

cw - clockwise

cyl - cylinder

DC - direct current

dia - diameter

disp - displacement

ext - external

F - degrees Fahrenheit

fl - fluid

fpm - feet per minute

ft - foot

ft-lb - foot pound

gal - gallon

GPM - gallons per minute

HP - horsepower

ID - inside diameter

in - inch

in-lb - inch pound

int - internal

ipm - inches per minute

ips - inches per second

lb - pound

NC - normally closed

NO - normally open

NPT - national pipe thread

NPTF - dryseal pipe thread

oc - open center

OD - outside diameter

P.O. - pilot operated

PSI - lb per square inch

psia - psi absolute

psig - psi gauge

r - radius

rpm - rev. per minute

rps - rev. per second

sol - solenoid

T - torque

vac - vacuum

visc - viscosity