Equations and Fluid Power Symbols

Note: be careful to distinguish between p and P, v and V.

$$p = \frac{F}{A}$$

$$p = \gamma h$$

$$A_{\text{circle}} = \frac{\pi}{4} d^2$$

$$\beta = \frac{-\Delta p}{\Delta V / V}$$

$$V = S\,A$$

$$v = \frac{S}{t}$$

$$\gamma = \frac{W}{V} \qquad \rho = \frac{m}{V}$$

$$\gamma_{oil} = \gamma_{water}\, S.G._{oil}$$

$$BP = \frac{2\,t\,\sigma_{TS}}{D_i}$$

$$WP = \frac{BP}{F.S.}$$

$$Q = \frac{V}{t}$$

$$Q_1 = Q_2 \frac{p_2}{p_1} \frac{T_1}{T_2}$$

$$P = pQ = \frac{F\,S}{t}$$

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

$$\eta = \frac{P_{out}}{P_{in}}$$

$$F = \mu N$$

$$\gamma_{water} = 62.4 \frac{\text{lb.}}{\text{ft.}^3} = 9800 \frac{\text{N}}{\text{m}^3}$$

$$1\text{ hp} = 745.5\text{ W}$$

$$1\text{ hp} = 1714\text{ psi}\cdot\text{gpm} = 550 \frac{\text{ft.lb.}}{\text{s}}$$

$$\text{Pa} = \frac{\text{N}}{\text{m}^2} \qquad \text{N} = \frac{\text{kg m}}{\text{s}^2} \qquad \text{W} = \frac{\text{N}\cdot\text{m}}{\text{s}}$$

1 gal. = 231 in.^{3} = 128 fluid ounces

$$1 \frac{\text{ft.}^3}{\text{s}} = 449\text{ gpm}$$

1 psi = 6895 Pa

1 lb. = 4.448 N

1 m^3 = 1000 liters

$p_{(psia)} = p_{(psig)}$ + 14.7 psi

$p_{(Pa\ abs)} = p_{(Pa\ ga.)}$ + 101,000 Pa

$T_{(°R)} = T_{(°F)}$ + 460°

$T_{(K)} = T_{(°C)}$ + 273°

$$p_f = \frac{0.1025\ \ L\ \ Q^2}{3600\ \ CR\ \ d^{5.31}}$$ for p (psi), L (ft.), Q (scfm), d (in.), $CR = \frac{p}{p_{atm}}$

$$Q = 38.1\ C\ A \sqrt{\frac{\Delta p}{S.G.}}$$ for Q (gpm), A (in.^{2}), p (psi)

Metric prefixes

M-	mega-	10^6
k-	kilo-	10^3
c-	centi-	10^{-2}
m-	milli-	10^{-3}

Topic covered in previous semesters:

- Pressure losses in pneumatic systems
- Ladder diagrams
- Fluid power diagrams & symbols
- Regenerative circuit & calculations
- Tubing pressure/size/stress relationships
- Orifice plate calculations
- Pipe size nomograph
- Block on an inclined plane
- Bernoulli...equations included in the problem statement