

Useful Formulas

NPSH

Net positive suction head available (NPSH_a) is the total suction head minus the vapor pressure (both expressed in feet)

$$\text{NPSH}_a = \frac{2309(P_a - P_{vp})}{\text{S.G.}} \pm H_e - H_f$$

P_a is the atmospheric or tank pressure (psi absolute), P_{vp} is the vapor pressure (psi absolute), H_e is the elevation head (negative if suction lift) expressed in feet and H_f is the friction loss thru the suction piping expressed in feet.

HEAD

$$\text{psi} = (14.50) (\text{bar})$$

$$\text{psi} = (.4912) (\text{in. Hg})$$

$$\text{psi} = (.4331) (\text{ft.}) (\text{S.G.})$$

$$\text{in. Hg} = (2.036) (\text{psi})$$

$$\text{in. Hg} = (.8819) (\text{ft}) (\text{S.G.})$$

$$1 \text{ atm} = 760 \text{ mm Hg}$$

$$1 \text{ atm} = 29.92 \text{ in. Hg}$$

$$\text{ft.} = \frac{2.309 (\text{psi})}{\text{S.G.}}$$

$$\text{ft.} = \frac{(1.134) (\text{in. HG})}{\text{S.G.}}$$

CAPACITY

$$\text{GPM} = (7.481) (\text{Cu. ft. / min.})$$

$$\text{GPM} = (.2642) (\text{Liter / min.})$$

$$\text{GPM} = (264.2) (\text{Cu. meter / min.})$$

$$\text{GPM} = (4.403) (\text{Cu. meter / hr.})$$

HP

$$\text{BHP} = \frac{(\text{GPM}) (\text{ft}) (\text{S.G.})}{(3960) (\text{E})}$$

$$\text{HP} = (1.341) (\text{KW})$$

$$\text{KW} = (.7457) (\text{HP})$$

$$\text{KW}_{\text{input}} = \frac{(\text{GPM}) (\text{ft}) (\text{S.G.})}{(5308) (\text{E}) (\text{M.E.})}$$

$$\text{HP} = \frac{(\text{lb.ft.}) (\text{RPM})}{5250}$$

E = pump efficiency M.E. = motor efficiency.

TEMPERATURE

$$^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

Heat added to fluid due to pump inefficiency.

$$\text{Total Heat (BTU per hr.)} = \frac{(\text{ft.}) (\text{GPM}) (\text{S.G.})}{1.557} \left(\frac{1}{\text{E}} - 1 \right)$$

LENGTH

$$(\text{mm}) = (25.40) (\text{inches})$$

$$\text{meters} = (.3048) (\text{ft.})$$

SPECIFIC GRAVITY

$$\text{Water} = 1.0 \text{ S.G.} = 62.43 \text{ lb. / Cu. ft.}$$

$$1 \text{ gallon water} = 8.3453 \text{ lb.}$$

$$1 \text{ Cu. ft. water} = 7.48052 \text{ gal.}$$

VISCOSITY

$$\text{Centistokes} = \frac{(\text{centipoise})}{\text{Specific Gravity}}$$

$$\text{Above 50 centistokes, SSU} = 4.55 (\text{centistokes})$$

If over 2500 SSU, a centrifugal pump smaller than 2-1/2" is impractical. If over 5000 SSU, any centrifugal pump is impractical