

Mechanical Power In

Given:

$$\frac{\text{Ft-lb}}{\text{Sec}} \times \frac{1}{550} = \text{HP}$$

$$\text{HP} \times 746 = \text{Watts}$$

$$\frac{\text{Lb}}{\text{In}^2} \times \frac{\text{Ltr}}{\text{Min}} \times \frac{\text{in}^3}{\text{Ltr}} \times \frac{\text{ft}}{\text{in}} \times \frac{\text{Min}}{\text{Sec}} \times \frac{1}{550} = \text{HP}$$

Where;

$$\frac{\text{Lb}}{\text{In}^2} = \text{PSI (Column A)}$$

$$\frac{\text{Ltr}}{\text{Min}} = \text{LPM (Column B)}$$

$$\frac{\text{In}^3}{\text{Ltr}} = \text{cubic inches / liter} = 61 \text{ (Known)}$$

$$\frac{\text{Ft}}{\text{In}} = \text{feet / inch} = 1/12 = .08333 \text{ (Known)}$$

$$\frac{\text{Min}}{\text{Sec}} = \text{minutes / second} = 1/60 = .01667 \text{ (Known)}$$

$$\text{psi} \times \text{lpm} \times 61 \times .08333 \times .01667 \times (1/550) = \text{HP} \times 746 = \text{Watts}$$

$$\text{psi} \times \text{lpm} \times .1149 = \text{Watts}$$

$$(\text{Column A}) \times (\text{Column B}) \times .1149 = \text{Watts (Column 1)}$$

Mechanical Power Out

Given:

$$\frac{\text{Ft-lb}}{\text{Sec}} \times \frac{1}{550} = \text{HP}$$

$$\text{HP} \times 746 = \text{Watts}$$

$$H \times \frac{\text{Ltr}}{\text{Min}} \times 61 \times \frac{\text{lbs}}{\text{In}^3} \times \frac{1}{12} \times \frac{1}{60} \times \frac{1}{550} \times 746 = \text{watts}$$

Where:

H = Head in inches

$$\frac{\text{Ltr}}{\text{Min}} = \text{Liquid flow in liters / minute (lpm)}$$

$$\frac{\text{In}^3}{\text{Ltr}} = \text{cubic inches / liter} = 61 \text{ (Known)}$$

$$\frac{\text{Lbs}}{\text{In}^3} = \text{weight of water in pounds / cubic inch} = .0361 \text{ (Known)}$$

$$\frac{\text{Ft}}{\text{in}} = \text{feet / inch} = 1/12 = .08333 \text{ (Known)}$$

$$\frac{\text{Min}}{\text{Sec}} = \text{minutes / second} = 1/60 = .01667 \text{ (Known)}$$

$$H \times \text{lpm} \times 61 \times .0361 \times .08333 \times .01667 \times .0018182 \times 746 = \text{watts}$$

$$H \times \text{lpm} \times .0041 = \text{watts}$$

$$(\text{Column C}) \times (\text{Column D}) \times .0041 = \text{Watts (Column 2)}$$

Mechanical Efficiency

$$\text{Output Power} \div \text{Input Power} \times 100 = \text{Mechanical Efficiency \% (Column 3)}$$