

Pump Relationships

The following formulas describe relationships between the bore, stroke, number of cylinders, rpm, and flow rate in a piston or plunger pump. Calculations should be considered approximate because real-life pump operation involves various efficiency factors not included here. The basic relationship can be stated in either of these two ways:

$$\text{rpm} = \frac{0.785 \times \text{flow}}{(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})} \quad \text{OR} \quad \text{flow} = \frac{(\text{rpm})(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})}{0.785}$$

Expressed in English units

Bore and stroke in inches
Flow in gpm

$$\text{rpm} = \frac{294 \times \text{flow}}{(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})} \quad \text{OR} \quad \text{flow} = \frac{(\text{rpm})(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})}{294}$$

Expressed in metric units

Bore and stroke in mm
Flow in lpm

$$\text{rpm} = \frac{1,273,241 \times \text{flow}}{(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})} \quad \text{OR} \quad \text{flow} = \frac{(\text{rpm})(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})}{1,273,241}$$

Expressed in mixed units

Bore and stroke in mm
Flow in gpm

$$\text{rpm} = \frac{4,820,604 \times \text{flow}}{(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})} \quad \text{OR} \quad \text{flow} = \frac{(\text{rpm})(\text{bore})^2 (\text{stroke})(\text{no. of cylinders})}{4,820,604}$$