Source: Australian Pump Technical Handbook 3rd Edition and reproduced in entirety with permission from PIA

Section 14—PUMPING FORMULAE

The following carefully compiled formulae have been included to assist pump users in the planning of pumping plant. See page 125 for definition of terms and units.

Head of liquid from pressure and density.

$$H = \frac{102p}{\varrho} \quad \text{or} \quad H = \frac{p}{9.8\ SG}$$

Volumetric flow from mass flow and density

$$Q = \frac{10000Q_m}{\varrho} \quad \text{or} \quad Q = \frac{Q_m}{SG}$$

Average velocity of flow through a circular section.

$$v = \frac{1273\ Q}{d^2}$$

Average velocity of flow through an area normal to the flow

$$v = \frac{1000\ Q}{A}$$

Velocity head from average velocity

$$H_v = \frac{v^2}{19.6}$$

Velocity head from volumetric flow through a circular section

$$H = \frac{82711\ Q^2}{d^4}$$

Pump Application Engineers Pty Ltd
ABN – 66 138 876 641
www.pumpapplicationengineers.com.au
sales@pumpapps.com.au

P.O. Box 7071
MOUNT CROSBY
Qld 4306

Phone: 07 3201 2485
Fax: 07 3201 2497
Mobile: 0437 734 000

Force or thrust from pressure and area.

$$F = \frac{pA}{1000}$$

Pump input power from pump performance

$$P = \frac{\varrho HtQ}{102041\ ep} \quad \text{or} \quad P = \frac{SG\ H_t\ Q}{102\ ep}$$

Torque from power and speed

$$T = \frac{9549.3P}{N}$$

Pump input power from 3 phase, alternating current electric supply.

$$P = \frac{\sqrt{3}El \cos \phi\ em}{1000}$$

Pump input power from a kilowatt-hour metre.

$$P = \frac{3600\ K_m r_{em}}{k_{md} t}$$

Motor input energy per volume of liquid pumped.

$$\frac{U}{V} = \frac{\varrho H_t}{367347\ ep.em} \quad \text{or} \quad \frac{U}{V} = \frac{SGH_t}{376.3\ ep.em}$$

Kinematic viscosity from dynamic viscosity and density.

$$v = \frac{1000\mu}{\varrho} \quad \text{or} \quad v = \frac{\mu}{SG}$$

Specific speed

$$N_s = \frac{N\sqrt{Q}}{H^{3/4}}$$

Source: Australian Pump Technical Handbook 3rd Edition and reproduced in entirety with permission from P/A

Suction Specific speed

$$Nss = \frac{N\sqrt{Q}}{(NPSH)^{¾}}$$