Measurements & Conversions

Measurement Conversion Tables

From	To	Multiply by
Meters	Feet	3.281
Feet	Meters	.3048
Millimeters	Inches	.0394
Inches	Millimeters	25.4
Liters/min	GPM (US)	.2624
Liters/min	GPM (Brit)	.2200
GPM (US)	Liters/min	3.785
GPM (Brit)	Liters/min	4.546
GPM (US)	GPM (Brit)	.8327
GPM (Brit)	GPM (US)	1.201

From	To	Multiply by
Bar	Lbs/sq. in.	14.5
Lbs./sq. in.	Bar	.0689
Kilograms	Pounds (Mass)	2.205
Pounds (mass)	Kilograms	.4536
Newtons	Pounds (Force)	.2248
Pounds (Force)	Newtons	4.448
Kilowatts	Horsepower	1.341
Horsepower	Kilowatts	.7457

Q = Flow in gpm	$Q = 29.92 \times d^2 \times P^{1/2} \times Cd$
V = Velocity in ft/sec	$V = 12.186 \times P^{1/2} = Cd \times .4085 \times Q/d^2$
P = Pressure in psi	$P = .00112 \times Q^2/(d^4 \times Cd^2)$
hp = Horsepower	$hp = .0174 \times d^2 \times P^{3/2} \times Cd = P \times Q/1714$
Cv = Flow Coefficient	$CV = Q/\Delta P^{1/2} = 53 \times (D^{2.5}/L^{1/2})$
ΔP = Pressure Drop	$\Delta P = (Q/Cv)^2$
F = Thrust in Lbs.	$F = Pi/2 \times d^2 \times P \times CD = .052 \times P^{1/2} \times Q + .0018 \times (Q/D)2 \times Cd$
ΔT = Temp Change ˚F	$\Delta T = \Delta P/337.6$

Key: L = Tube length in feet, D = Tube ID in inches, d = Orifice diameter in inches, Cd = Discharge Coefficient, Cd = 0.90 for long cone orifice, Cd = 0.70 for drilled steel orifice, Cd = 0.65 for sapphire orifice

Tool Talk™ - Consider Us Your Waterblast Partner

Understanding Pressure Loss

Pressure loss is an often overlooked and poorly understood aspect of waterblasting. Pressure loss occurs through the hose, fittings and swivels in the system. It is a function of the flow rate; it is not dependent on the pressure being used. The inside diameter and the length of the hose along with the flow rate determine the pressure loss. The maximum pressure and maximum flow rate are determined by the capacity of the pump. The power of the water reaching the surface to be cleaned is the combination of the pressure and the flow in direct proportion. Assuming the maximum pressure is fixed by the pump or component rating, but that flow rate can be increased, you will apply the maximum combination of pressure and flow rate (maximum power) if you increase the flow rate to the point where the pressure loss through the hoses and fittings in the system reaches one-third of the operating pressure.

Another case to consider is making extremely long runs where a tool is pulled along a pipe by jet thrust. Jet thrust is directly proportional to the flow rate, but only to the square root of the pressure. Again assuming that the maximum pressure is fixed by the pump or component capacity but the flow rate can still be increased, to achieve the maximum pulling force the flow rate can be increased until the pressure loss through the hose reaches one-half of the operating pressure. Do not go below this, though, as pulling force drops off rapidly beyond this point.