Table 1: How to Determine the Flow Rate. In each case the pressure drop accounts for the terminal pressures and the liquid head. The resulting units are volumetric ft^3/min or m^3/min.

Type of Discharge	Calculation for Flow Rate
Through a broken nozzle, treat as if it is an orifice	Use the orifice equation with Cd ranging from 0.62 for a sharp, thin hole to 0.82 for a short (<10 pipe diameters) pipe stub. $q_v = \frac{60 C_d A \sqrt{2 g_c \Delta P \rho}}{\rho}$ [1]
Through an open valve on a bottom nozzle	Use the valve coefficient equation with Cv being the valve coefficient. In US units conversion factor N_1 = 11.34; for SI units N_1 = 694 $q_v = \frac{C_v}{N_1}\sqrt{\frac{\Delta P}{\rho}}$ [2]
Through a length of piping, with open valves, fittings, and other components.	Determine the equivalent length of the piping and then use an equation for pressure drop due to friction. The Darcy equation, rearranged to solve for volumetric flow, is the most accurate since it uses a friction factor that varies with flow rate. Other equations, such as Hazen Williams, use a fixed friction coefficient. $q_v = 15\pi d^{2.5}\sqrt{\frac{2 g_c \Delta P}{f L \rho}}$ [3] Find the equivalent length of a valve by combining equations [2] and [3] then rearranging to solve for L. In US units conversion factor N_2 = 1.846E+7; for SI units N_2 = 2.139E+9. $L = \frac{N_2 d^5}{f C_v^2}$ [4]

Nomenclature

A = Flow area through orifice, m^2 or ft^2

C_d = Orifice plate coefficient of discharge

C_v = Valve flow coefficient defined as gpm at 1 lb/in^2 pressure drop

d = Inside diameter of discharge pipe or orifice hole, m or ft

f = Moody friction factor = Fanning friction factor x 4

g_c = Conversion factor, 1 m/s^2 or 32.17 ft/s^2

L = Equivalent length, m or ft

ΔP = Pressure drop through orifice, kg/m^2 or lb/ft^2 [*watch your units*]

q_v = Volumetric flow rate, m^3/min or ft^3/min

β = Ratio of orifice plate bore divided by the inside pipe diameter, d/D

ρ = Fluid density, kg/m^3 or lb/ft^3