Sample Calculation

Using the Bernoulli Equation in hypothetical situations

Bernoulli Equation: $\frac{P_1}{\rho} + \frac{V_1^2}{2} + gz_1 = \frac{P_2}{\rho} + \frac{V_2^2}{2} + gz_2$

or

$\frac{P}{\rho} + \frac{V^2}{2} + gz = \text{constant}$

assumption: constant = 0 as $P_1 = 0$, $V_2 = 0$, $z_2 = 0$

$$-\frac{P_2}{\rho} + \frac{V_1^2}{2} + gz_1 = 0$$

calculating Bernoulli Equation in hypothetical 1:

$V_1 = \frac{1300\ gph}{A}$

$A = \pi\left(\frac{D}{2}\right)^2$ (for sample calculation D = 1 inch = 0.0254 m)

$A = \pi \cdot \left(\frac{0.0254\,m}{2}\right)^2 = 0.00202683\ m^2$

$$V = \frac{1300\ gph \cdot \frac{0.003785\ m^3}{1\ gallon} \cdot \frac{1\ minute}{60\ sec} \cdot \frac{1\ hr}{60\ minute}}{0.00202683\ m^2} = 0.674\ \frac{m}{s}$$

$z_1 = 5\ feet \cdot \frac{12\ in}{1\ foot} \cdot \frac{0.0254\ m}{1\ in} = 1.524\ m$

$\rho = 1000\ \frac{kg}{m^3}$

$g = 9.8\ m/s^2$

$$\frac{-P_2}{1000\ \frac{kg}{m^3}} + \frac{(0.674\ m/s)^2}{2} + 9.8\ m/s^2 \cdot 1.524\ m = 0$$

$\boxed{P_2 = 2.20\ psi} \leftarrow \left(15162\ Pa \cdot \frac{0.000145\ Psi}{1\ Pa}\right)$

can a 1" pipe produce a 2.20 psi pressure drop? yes. (from experimental data)