Pipe Flow Equations

Bernoulli and Navier Stokes Equations | Control Volume Equations | Dimensional Analysis Equations | Equations | Flocculation Equations
Flow Measurement Equations | Open Channel Flow Equations | Pipe Flow Equations | Process Controller equations | Sedimentation Equations
Statics Equations | Using Confluence - Tips and Tricks

$$R_h = \frac{A}{P}$$
Hydraulic radius

$$\tau = -\frac{r}{2}\left(\frac{\rho g h_f}{l}\right)$$
Shear in pipe flow

$$K_{ex} = \left(1 - \frac{A_{in}}{A_{out}}\right)^2$$
Kex expansion loss

Darcy Weisbach

$$h_f = f\frac{L}{D}\frac{V^2}{2g}$$
Darcy-Weisbach

$$h_f = f\frac{8}{g\pi^2}\frac{LQ^2}{D^5}$$
Darcy-Weisbach (Q)

Laminar Flow

$$Q = \frac{\pi D^4}{128\mu}\frac{\rho g h_f}{l}$$
Q Hagen-Poiseuille

$$D = \left(\frac{128\nu QL}{g h_f \pi}\right)^{\frac{1}{4}}$$
D Hagen-Poiseuille

$$f = \frac{64\mu}{\rho V D} = \frac{64}{Re}$$
laminar flow friction

$$h_l = \frac{K8Q^2}{D^4\pi^2 g} + \frac{128\nu QL}{g\pi D^4}$$
hl Hagen-Poiseuille and Minor Loss

$$D = \left(\frac{K8Q^2 + 128\nu QL\pi}{h_l g \pi^2}\right)$$
d Hagen-Poiseuille and Minor Loss

Maximum laminar flow rate

$$Q_{max} = \left(\frac{L_{max} Re_{max}^4 \pi^3 \nu^5}{2 g h_f}\right)^{1/3}$$
Maximum laminar flow

Turbulent Flow

$$Q = \frac{-\pi}{\sqrt{2}} D^{5/2}\sqrt{\frac{g h_f}{L}}\log\left(\frac{\varepsilon}{3.7D} + 2.51\nu\sqrt{\frac{L}{2 g h_f D^3}}\right)$$
Colebrook

$$f = \frac{0.25}{\left[\log\left(\frac{\varepsilon}{3.7D} + \frac{5.74}{Re^{0.9}}\right)\right]^2}$$
f Swamee-Jain

$$D = 0.66\left[\varepsilon^{1.25}\left(\frac{LQ^2}{g h_f}\right)^{4.75} + \nu Q^{9.4}\left(\frac{L}{g h_f}\right)^{5.2}\right]^{0.04}$$
Swamee-Jain D

$$D_{manifold} = \left(\frac{8Q_{manifold}^2}{g h_f \pi^2}\frac{1 + \left(f\frac{L_{manifold}}{D_{manifold}} + \sum K\right)\left(\frac{1}{3} + \frac{1}{2n} + \frac{1}{6n^2}\right)}{1 - Q_{ratio}^2}\right)^{\frac{1}{4}}$$
Manifold diameter