

Pipe Head Loss

Mechanical Engineering

Darcy-Weisbach for the pipe, K factors for the fittings.

Friction loss in a pipe grows with the square of velocity and with length over diameter.

$$hf = f (L \div D)(V^2 \div 2g) \cdot \text{fittings: } hL = K V^2 \div 2g$$

Double the flow rate

Turbulent, f steady.

About four times the loss

$$f = 0.02, L \div D = 500$$

f times $L \div D$.

$$hf = 10 \text{ velocity heads}$$

One 90 degree elbow

One K per fitting.

K is about 0.3

THE COMMON MISTAKE

✗ Ignoring fittings on a short run

✓ Always add the minor losses

On a short, fitting-heavy run the bends and valves dominate the total. Calling them minor losses is a name, not a size.

The friction factor comes from Reynolds number and relative roughness. Roughness rises with age and scale.