* Since most pipe flow designs use turbulent flow, there is not much information about $k = k(Re)$. You can almost always assume it will be turbulent flow & k will be a function of geometry (e.g. β) or a constant.

Example: Calculate the pressure drop in a pipe with:

$D = 0.1\,m$, $L = 50\,m$, $Q = 0.016\ m^3/s$, $\rho = 10^3\ kg/m^3$

14 elbow joints, $\mu = 10^{-3}\ kg/m \cdot s$

* Calculate $E_{v,tot} \rightarrow |\Delta P| = \dfrac{E_v}{Q}$

$$E_{v,tot} = \sum E_{v,i} = 14\left(\frac{k_{elbow}}{2} w u^2\right) + \frac{2Lf}{D} w u^2$$

$$|\Delta P| = 7 k_{elbow} \rho u^2 + \frac{2Lf}{D} \rho u^2 = \left(7 k_{elbow} + \frac{2Lf}{D}\right) \rho u^2$$

* Need u: $u = \dfrac{4Q}{\pi D^2} = \dfrac{4\,(0.016)\,m^3/s}{\pi\,(0.1\,m)^2} = 2.04\ m/s$

* Need Re: $Re = \dfrac{\rho u D}{\mu} = 2.04 \times 10^5$ (turbulent)

* Look up kelbow: $k_{elbow} = 0.75$ (Table 12.1, p. 327 in Deen)

* calculate f: $f = \left[3.6 \log (Re/6.9)\right]^{-2}$

$f = 0.0039$

Notice: similar magnitude

* $$|\Delta P| = \left(5.25 + \underbrace{\frac{2 \cdot 50\,m}{0.1\,m} \cdot 0.0039}_{3.9}\right)\left(10^3\ \frac{kg}{m^3} \cdot (2.04\ m/s)^2\right)$$

$$|\Delta P| = 3.81 \times 10^4\ Pa = \boxed{38.1\ kPa}$$