$\Delta P = K \rho \frac{v^2}{2} = \lambda \frac{L}{D} \rho \frac{v^2}{2}$ or $\left| \begin{array}{l} m = \rho v S = \rho v \pi D^2 \\ v = \frac{m}{\rho \pi D^2} \end{array} \right.$ $\Rightarrow \Delta P = \lambda$

$$P_A + \rho g z_A + \frac{\rho U_A^2}{2}$$

$Re < 2000 \Rightarrow$ Laminaire

$$Re = \frac{\rho U D}{\mu} = \frac{4 \rho Q_v}{\mu \pi D}$$

$Re > 3000 \Rightarrow$ Turbulent

Pertes de charge générale $\quad J = \lambda \frac{U^2}{2g} \frac{L}{D}$

$\rightarrow$ Laminaire $\quad \lambda = \frac{64}{Re}$

$\rightarrow$ Turbulent : $\left| \begin{array}{l} \text{Tubes lisses} \\ Re < 10\,000 \end{array} \right.$ $\quad \lambda = 0,316\, Re^{-0,25}$ (Blasius)

Pour $Re > 10\,000 \quad \frac{1}{\sqrt{\lambda}} = 2 \ln\left(Re\sqrt{\lambda}\right) - 0,8$

Rugosité $\frac{\varepsilon}{D} \Rightarrow$ Moody.

Pertes de charges Singulière

$$\Delta P = \frac{K U^2 \rho}{2} = K \frac{\rho v^2}{2} = \lambda \left(\frac{L}{D_H}\right) \frac{\rho v^2}{2}$$

$$\varepsilon = \frac{k}{D_H}$$

Pour $Re > 30\,000$ et $\varepsilon > 0,004$

$$\lambda = \frac{1}{4} \left(\log_{10} \left(\frac{13}{Re} + \frac{\varepsilon}{3,7} \right) \right)^2$$

$\varepsilon_{inox} = 0,002 - 0,001$

$$\Delta P = K \rho v^2 .$$

$$m = \rho v S = \rho v \pi D^2 \quad \Rightarrow \quad v = \frac{m}{\rho \pi D^2}$$

$$\Delta P = K \rho \frac{m^2}{\pi^2 D^4} = \lambda' \left(\frac{L}{D}\right) \rho \frac{m^2}{D^4}$$

pour $\dot{m} = cte$ et $L \sim cte$ $\Rightarrow$ $\Delta P = \dfrac{\lambda'}{D^5}$