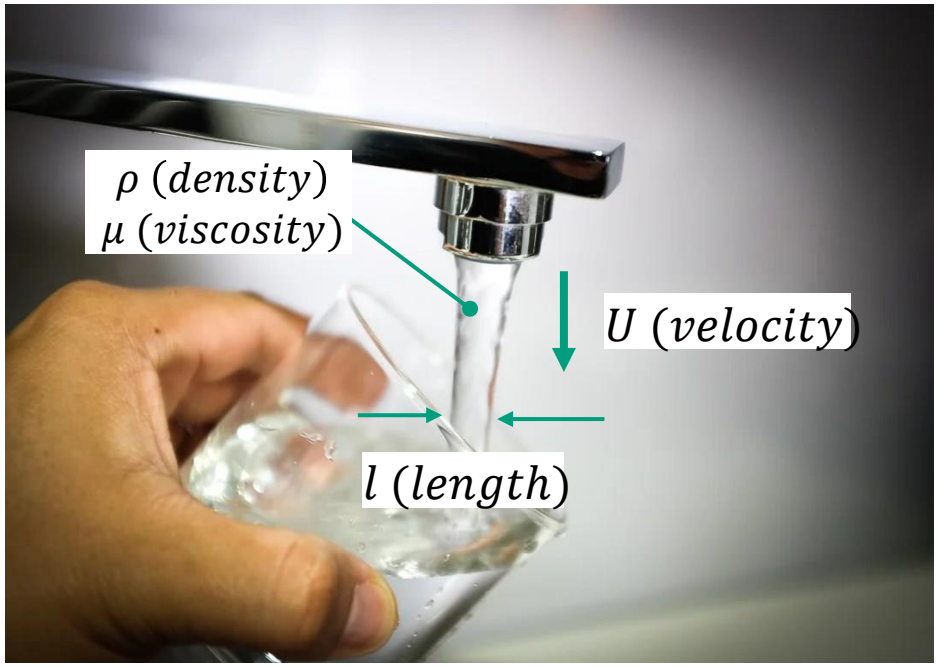
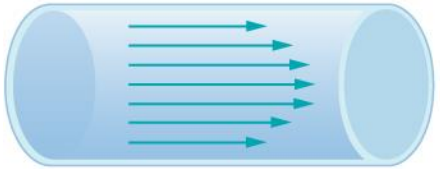
The kinetic energy of the flow is $E_k = \frac{1}{2}mU^2$. We let the volume go to 0, which gives $\sim \rho U^2$

$$Kinetic\ energy\ of\ a\ tiny\ fluid\ element\ (inertia) = \frac{dE_k}{dV} \sim density \times velocity^2 = \rho U^2$$





$\mu[=]Ns/m^2$

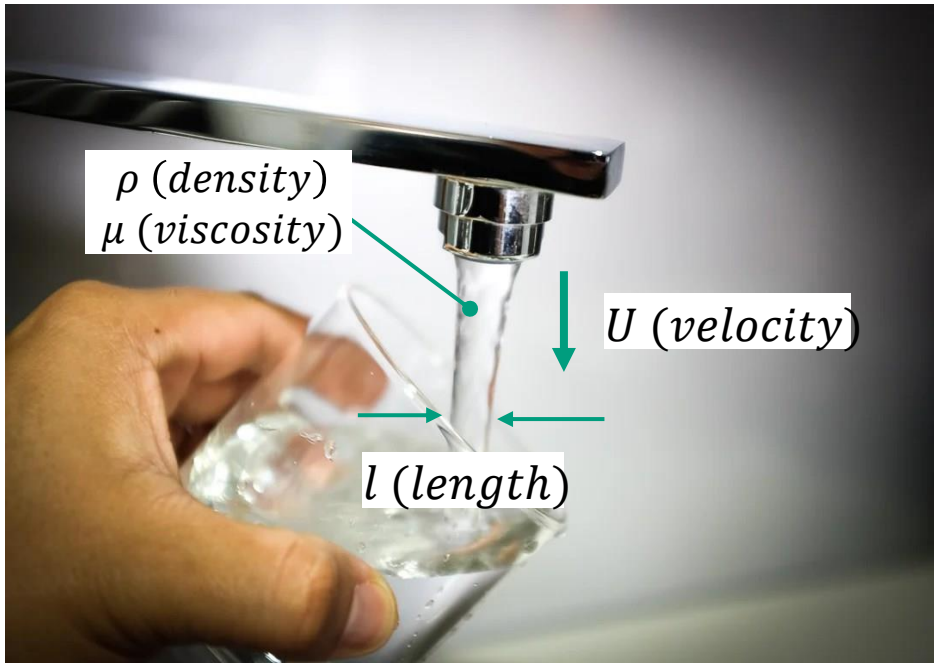
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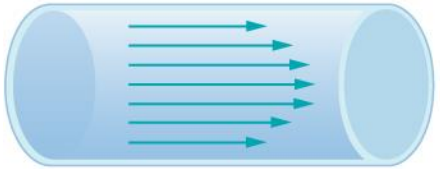
Inertia = treghet

The kinetic energy dissipates to heat via viscous dissipation due to shear stress: $\tau = \mu U \backslash l$.

$$Kinetic\ energy\ of\ a\ tiny\ fluid\ element\ (inertia)$$
$$= \frac{dE_k}{dV} \sim density\ \times\ velocity^2 = \rho U^2$$

$$\tau = viscous\ dissipation \sim viscosity\ \times \frac{velocity}{length} = \mu U/l$$





$\mu[=]Ns/m^2$

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Inertial forces = treghetskrefter

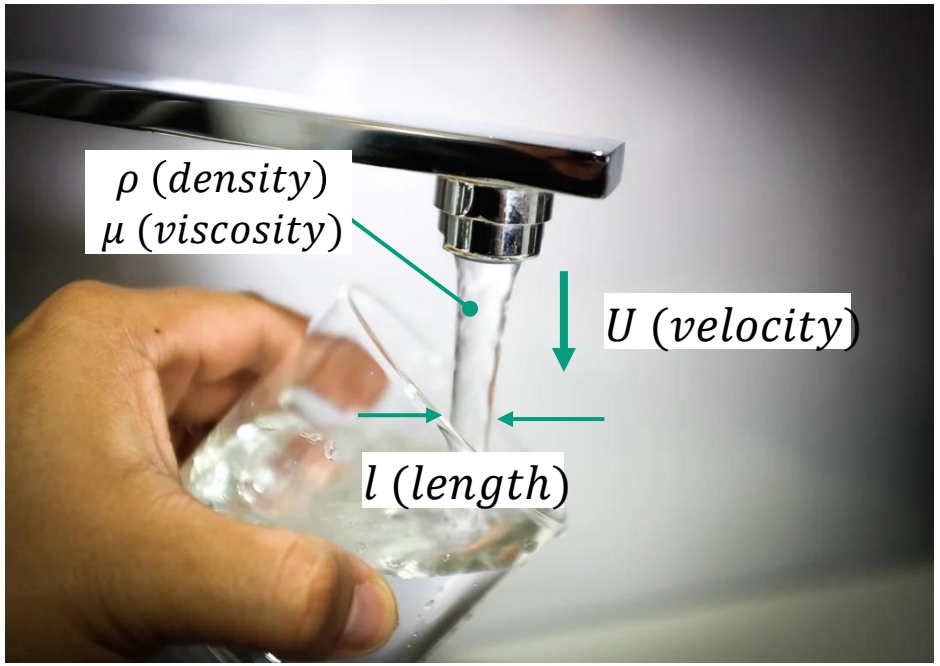
The ratio of inertia to viscous dissipation is called the Reynolds number (Re).

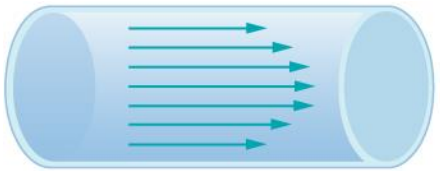
$$Kinetic\ energy\ of\ a\ tiny\ fluid\ element\ (inertia) = \frac{dE_k}{dV} \sim density \times velocity^2 = \rho U^2$$

$$\tau = viscous\ dissipation \sim viscosity \times \frac{velocity}{length} = \mu U/l$$

$$Re = \frac{inertia}{viscous\ dissipation}$$

$$Re = \frac{density \times length \times velocity}{viscosity} = \frac{\rho U l}{\mu} = \frac{U l}{\nu}$$



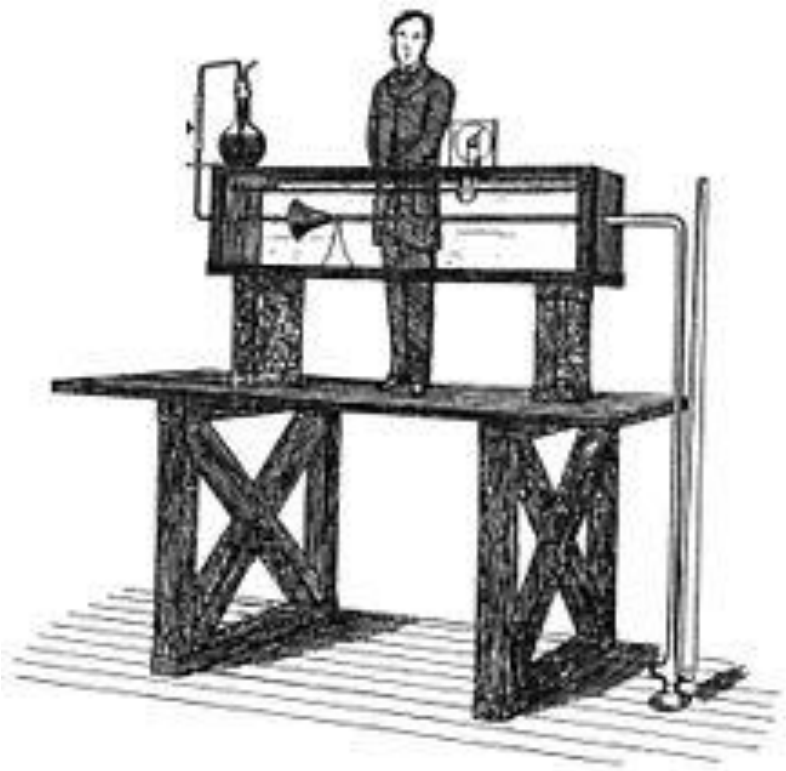


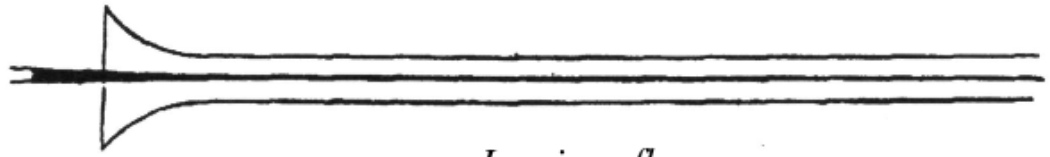
$\mu[=]Ns/m^2$

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Inertial forces = treghetskrefter

Osborne Reynolds' (1841–1912) famous experiment



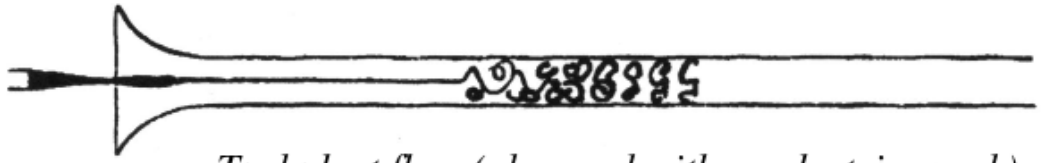


Laminar flow



Turbulent flow

$$Re = \frac{density \times length \times velocity}{viscosity} = \frac{\rho U l}{\mu} = \frac{U l}{\nu}$$



Turbulent flow (observed with an electric spark)

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