

52.7: The Reynolds Number

Experiments have shown that there is a combination of four factors that determines whether flow of a viscous fluid through a pipe is laminar or turbulent. These four factors can be combined into a single dimensionless number called the Reynolds number Re , whose value gives an indication of whether flow will be laminar or turbulent:

$$Re = \frac{\rho v D}{\mu} \quad (52.7.1)$$

Here ρ is the fluid density, v is the average velocity, D is the diameter of the pipe, and μ is the dynamic viscosity. Experience shows that, as a general rule of thumb:

- $Re < 2000$: laminar flow
- $2000 < Re < 3000$: transition region
- $Re > 3000$: turbulent flow

In the transition region (Re between 2000 and 3000), the fluid is unstable and may change back and forth between laminar and turbulent flow.

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