

Engineering Challenge: Pressure Drop Experiment

In the material on dimensional analysis, we derived an expression that linked pressure drop in a pipe, ΔP , to the velocity of the fluid in the pipe (u); the diameter of the pipe (d); the length of the pipe (l); the density of the fluid (ρ); and the viscosity of the fluid (μ):

$$\boxed{\frac{\Delta P}{\rho u^2} = a_1 \left(\frac{l}{d}\right)^{n_2} \left(\frac{ud\rho}{\mu}\right)^{-n_5}} \quad (1)$$

where a_1 , n_2 , n_5 are constants and members of the real numbers \mathbb{R} .

Your challenge is to devise an experimental methodology that could gain values for the constants a_1 , n_2 , and n_5 for a particular system. Your solution should contain a sketch of the experimental equipment and give a clear statement about what data would be collected during the test and how this data would be used to gain the required result.

A small number of people will be selected to present their solution to class and prepare to have their thinking challenged.

The deadline for submissions is 5pm on Friday the 4th March 2011, which should be handed in to the engineering office.