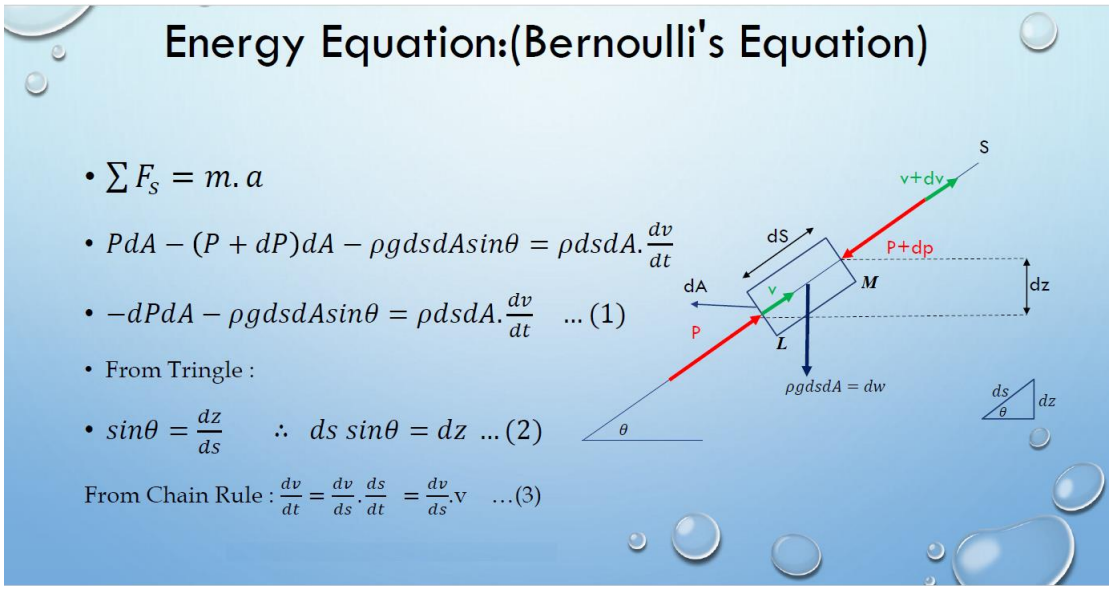
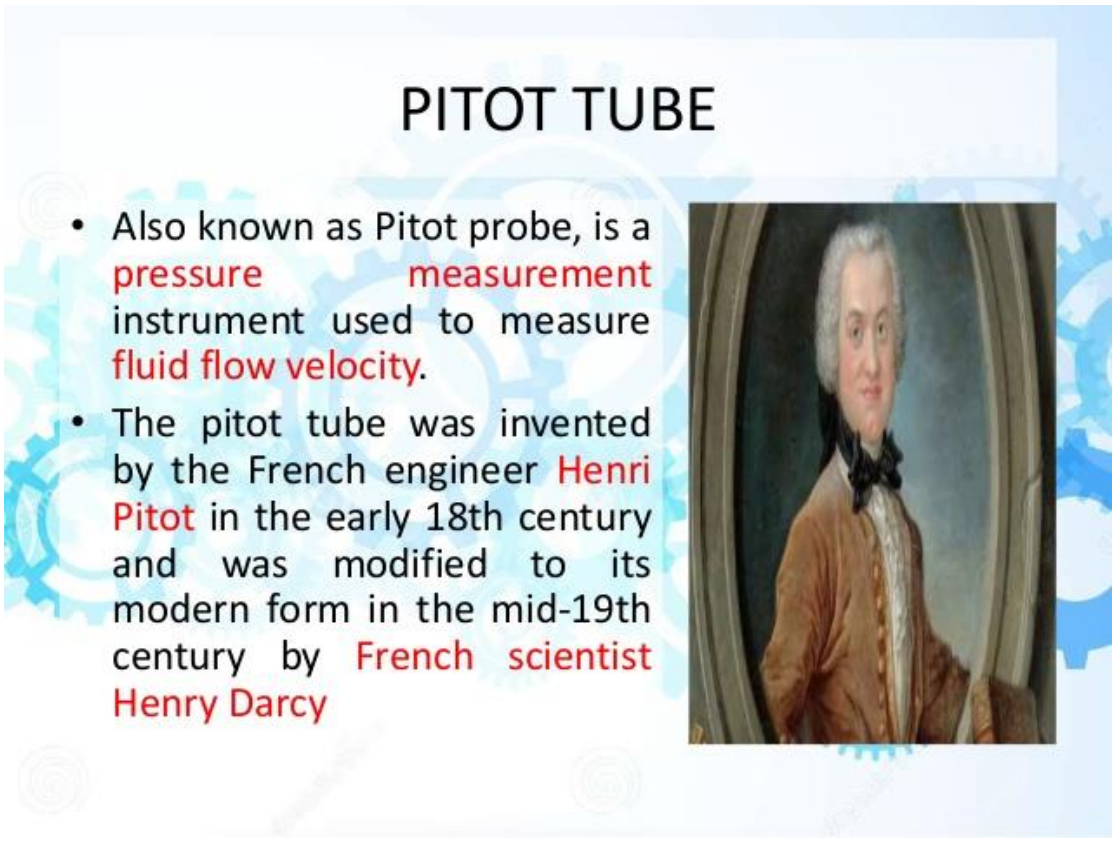
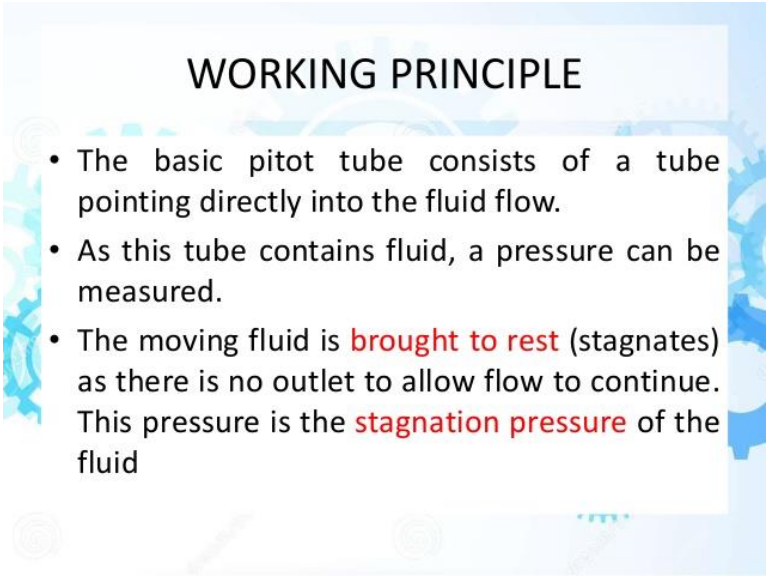


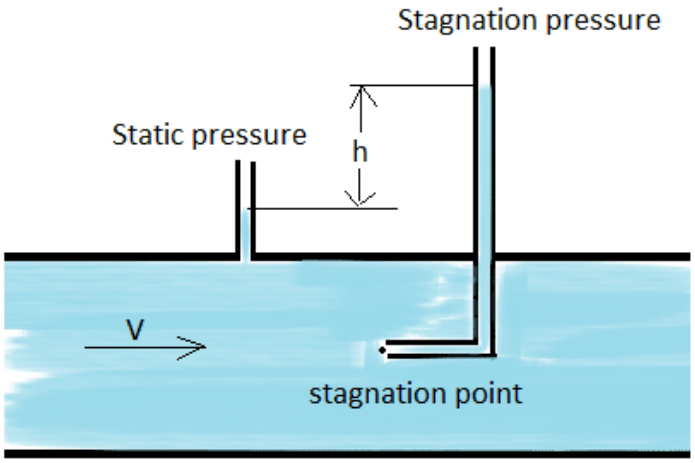
[Applications of Bernoulli's Equation - Finding Pressure ...]

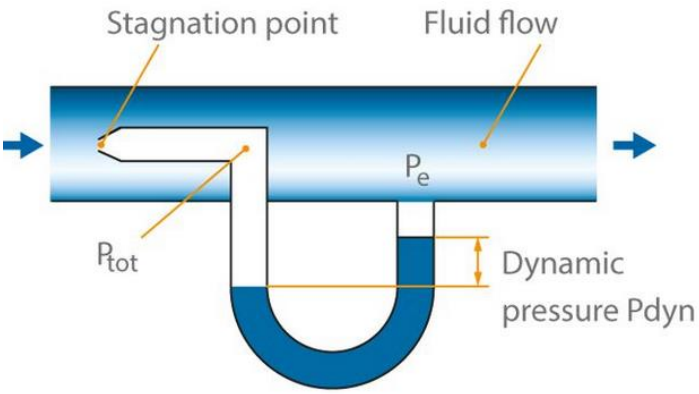


The principle of flow measurement by Pitot tube was adopted first by a French Scientist Henri Pitot in 1732 for measuring velocities in the river. A right angled glass tube, large enough for capillary effects to be negligible, is used for the purpose. One end of the tube faces the flow while the other end is open to the atmosphere.

It is basically a fluid velocity measuring instrument that can also be used for flow measurement of liquids and gases. It consists of two hollow tubes that sense pressure at different places within the pipe. This hollow tubes can be mounted separately in a pipe or installing together in one casing as a single device. One tube measures the stagnation or impact pressure and another tube measures only static pressure usually at the wall of the pipe.



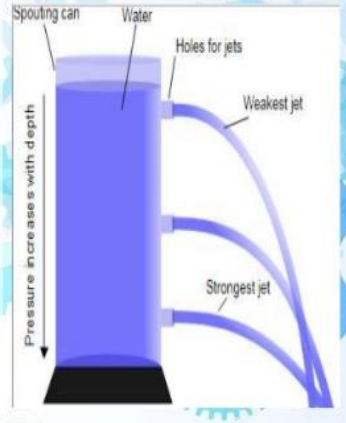




1. STATIC PRESSURE

- Static pressure, (hydrostatic pressure) is the pressure of a fluid at rest.
- Since the fluid is not moving, static pressure is the result of the fluid's weight.

$$P_{static} = Force/Area$$



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2. DYNAMIC PRESSURE

- When a fluid is moving through a pipe, there is a second component to the pressure. It is called **dynamic pressure**.
- Dynamic pressure is a pressure exerted perpendicular to the direction of the flow and is represented by the symbol q

$$q = \tfrac{1}{2}\rho v^2$$

ρ = fluid density equal to mass/volume in units of g/cm^3 or $slug/ft^3$

V = velocity of fluid in units of m/s or ft/s

a slug is a unit of mass with the units $lbf\,s^2/ft$

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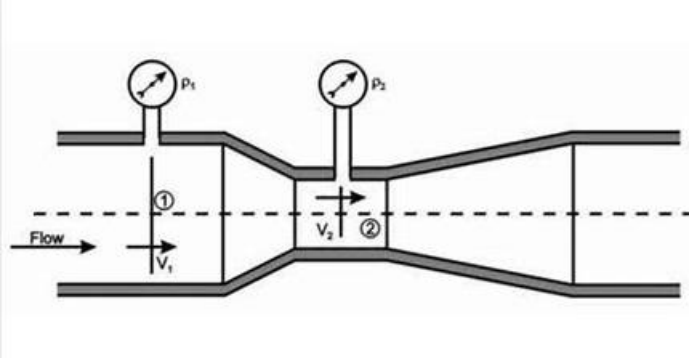
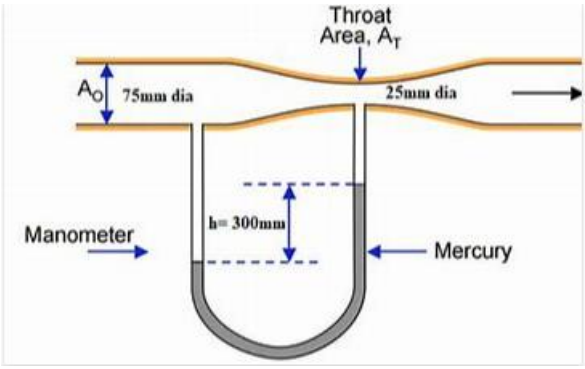
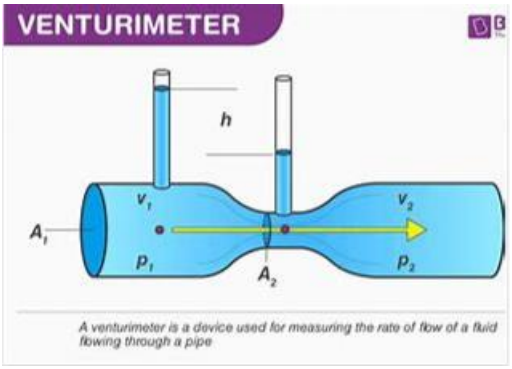
TOTAL (STAGNATION) PRESSURE

- Stagnation pressure is equal to the sum of the dynamic pressure and static pressure.
- The magnitude of stagnation pressure can be derived from a simplified form of Bernoulli Equation.
- For incompressible flow, $P_{stagnation} = \frac{1}{2}\rho v^2 + P_{static}$
- ρ is the fluid density,
- v is the velocity of fluid

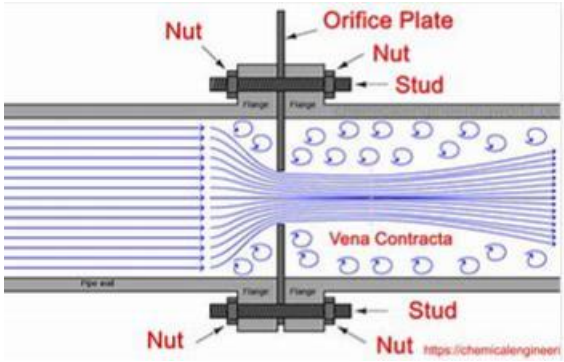
VENTURIMETER

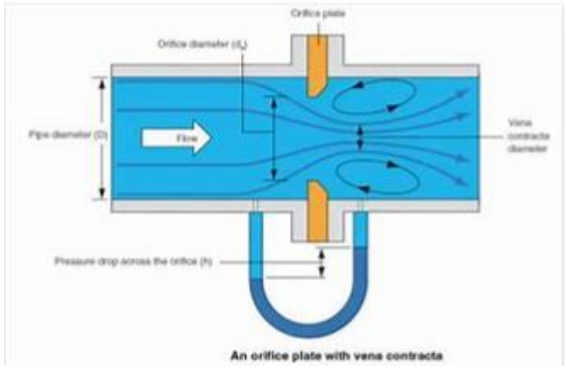


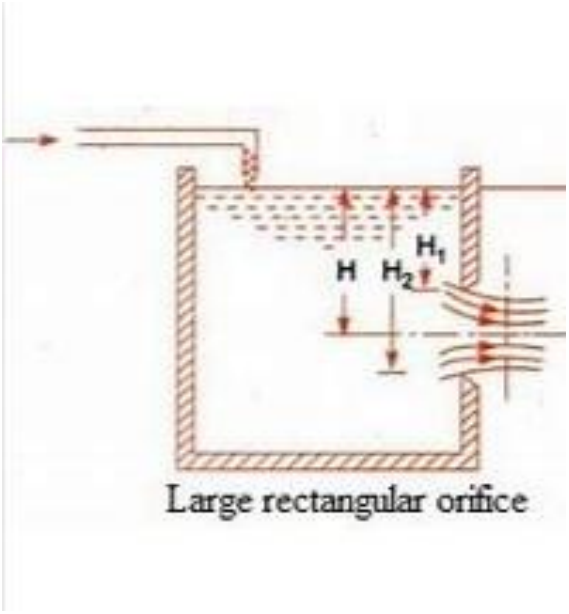




ORIFICE AND VENA CONTRACTA







Orifice and vena contracta images