DEVICE   Venturi Meter Demonstrator

TOPIC   Fluids

THEORETICAL   Bernoulli's equation as applied to a nonviscous, incompressible fluid in
BACKGROUND   steady flow states that the sum of the pressure P, the kinetic energy

per unit volume $\frac{1}{2}\rho v^2$, and the potential energy per unit volume

ρgy has the same value at all points along a streamline. In general,

$$P + \frac{1}{2}\rho v^2 + \rho gy = \text{constant.}$$

A Venturi tube can be used to measure flow velocities in an
incompressible fluid. The tube has a cross-sectional area greatest on
the outer edges but the center of the tube has a small cross-sectional
area. This would suggest that the fluid's speed at the ends is small
compared to the its speed at the center. The equation of continuity for
an incompressible fluid states that the product of the area and the fluid
speed at all points along the pipe is a constant

$$A_1 v_1 = A_2 v_2 = \text{constant.}$$

If the pipe is held horizontally the pressures at each end and the
pressure at the center can be found by

$$P_1 + \frac{1}{2}\rho v_1{}^2 = P_2 + \frac{1}{2}\rho v_2{}^2$$

The principle of the Venturi tube is analogous to a situation where a
small living room is overcrowded with people. Once a door opens and
people begin to exit, the pressure or compactness of the living room is
lowest near the door where the flow or exiting of people is the greatest.
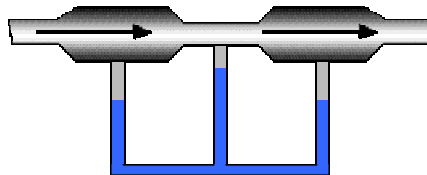
DESCRIPTION   The item in stock demonstrates Bernoulli's Law by illustrating a change
in pressure in terms of a height difference in the water columns. The
Venturi Tube is a glass rod held horizontally. A three-legged manometer
is attached to the apparatus.

PROCEDURE   1. Pour some water into the manometer and attach to the Venturi
Tube.
2. Blow into the tube and observe a change in the water level through
each point of the manometer.

SUGGESTIONS   Food coloring may be applied to the water for a more colorful
demonstration.