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وزارةالتعليم العالي والبحث العلمي
الجامعة المستنصرية
كلية الهندسة
قسم هندسة البيئة

Experiment 5

Flow Through The Venturi Meter

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مكتب القمة
للطباعة والاستنساخ

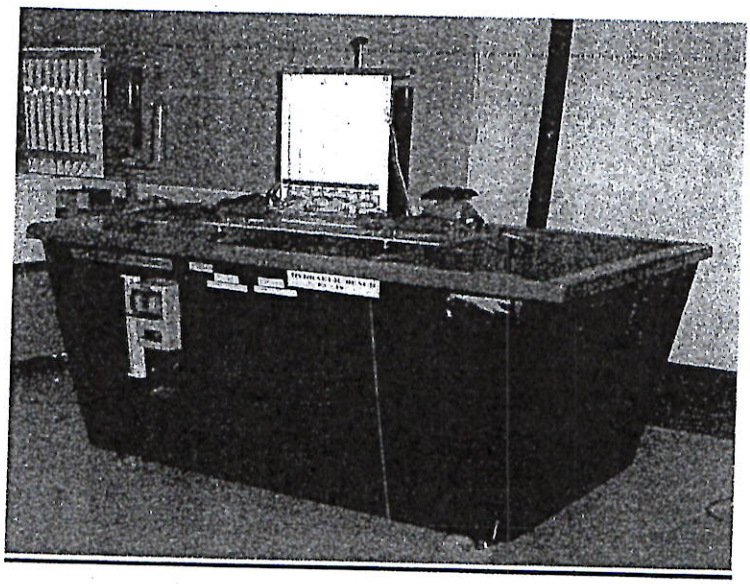
Objective:

The aim of this experiment was to:

1. Obtain the calibration curve for the meter.
2. Investigate the variation in pressure at inlet and throat at various rates of flow.
3. Present the results in a non-dimensional form so that they could be used to estimate the flow through any similar meter

Equipments and apparatus:

1. Venturi meter
2. Two supply hoses
3. Measuring tank



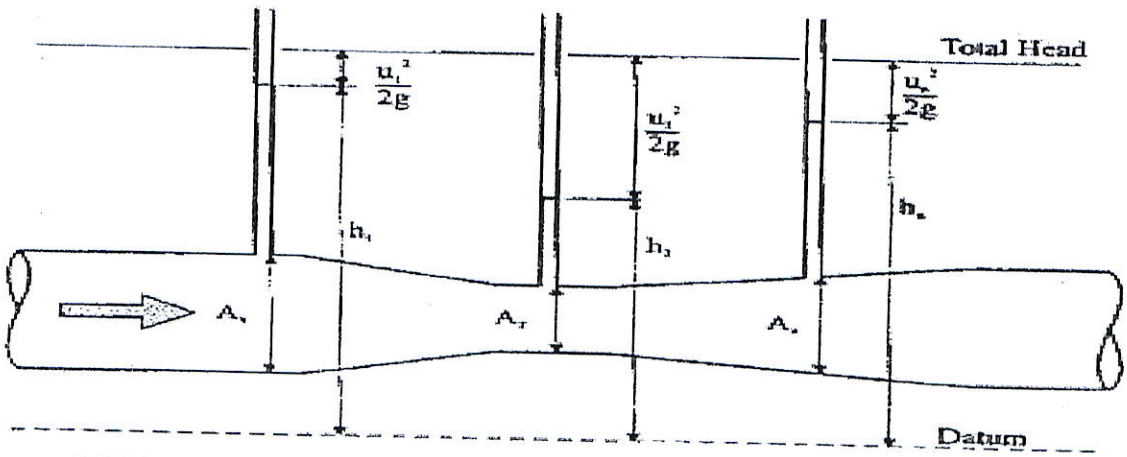
Description of experimental setup:

A tube is connected to each to the inlet and outlet of a Venturi meter. The tube connected to the outlet of the Venturi meter is connected to the measuring tank. The adjustable screws are adjusted to level the Venturi meter.

Procedure:

The apparatus was leveled by opening both the Bench Supply valve and the control valve downstream of the meter to allow water to flow and

clear air pockets from the supply hose. This was achieved by connecting the apparatus to a power supply. The control valve was then gradually closed causing water to rise up in the tubes of the manometer thereby compressing the air contained in the manifold. When the water level had risen to a convenient height, the bench valve was also closed gradually so that as both valves are finally shut off, the meter was left containing static water at moderate pressure. The adjustable screws were operated to give identical reading for all of the tubes across the whole width of the manometer board. To establish the meter coefficient measurements of a set of differential heads (h_1-h_2) and flow rate Q were made. The first reading was taken with the maximum possible value when (h_2– h_1) i.e. with h_1 close to the top of the scale and h_2 near to the bottom. This was obtained by gradually opening both the bench valve and the control valve in turn. Successive opening of either valve increased both the flow and the difference between $h_1$and h_2. The rate of flow was found by timing the collection of a known amount of water in the weighing tank, in the mean time valves h_1 and $h_2$was read from the manometer. Similarly, readings were then taken over a series of reducing values of (h_1– h_2) roughly equally spread over the available range from 250mm to zero. About ten readings sufficed.



Theoretical background and Calculation:

For a meter with the above arrangements of manometers, the quantity flowing is given by:

Applying **Continuity and Bernoulli's equations** at stations 1 and 2:

$P_1 + \rho v_1^2/2 = p_2 + \rho v_2^2/2$

$P_1 - p_2 = \rho\,(v_2^2/2 \quad v_1^2/2)$ ..... *eq. 1*

$Q = v_1 A_1 = v_2 A_2$ *eq.2*

$v_1 = v_2 A_2 / A_1$ *eq.3*

Then:

$$Q = A_1 \sqrt{\frac{2}{\rho} \cdot \frac{(p_1 - p_2)}{\left(\frac{A_1}{A_2}\right)^2 - 1}} = A_2 \sqrt{\frac{2}{\rho} \cdot \frac{(p_1 - p_2)}{1 - \left(\frac{A_2}{A_1}\right)^2}}$$

$Q_a = V/t$ (m^3/sec)

$C_d = Q_a / Q$