**VERIFICATION OF BERNOULIS THEOREM**

**OBJECTIVE:**

To verify Bernoulli’s theorem

**EQUIPMENT:**

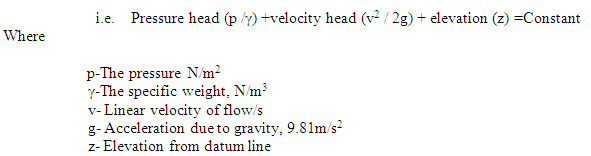
a) Apparatus for the verification of Bernoulli’s theorem

b) Measuring tank and

c) A stop watch

**THEORY:**

Bernoulli’s theorem states that for a stream lined, steady, frictionless and incompressible fluid flow, the sum of pressure head, velocity head and potential head is a constant

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Water at constant head from a tank is allowed to flow through a horizontal pipe line of varying cross section. The pressure heads Hp1,Hp2, etc are noted from piezometers fitted at cross sections A1,A2Etc .By measuring the actual discharge ,the actual velocities of flow at A1,A2 etc are calculated.

The actual discharge Qa= ax h/t m3/s

Where

A-area of measuring tank in cm 2.

H-Level difference of water in the measuring tank in cm.

t-The mean time to collect water

The velocity of flow at the cross section A1 is given by

V1=Qa/A1

The velocity head is given by Hv1=V12/2g

Assuming that the pipe line has negligible frictional loss in flow, Bernoulli’s equation for the horizontal pipe at cross section A1 can be verified as:

Pressure head Hp1+ velocity head Hv1=constant

**OBSERVATIONS:**

**Constants**

1. Measuring tank size, a m2
2. The height (hm )for which the time t1 and t2 are noted to collect water in the measuring tank.
3. The areas of cross section A1,A2, etc

**Variables**

1. The piezometer readings HP1,HP2 etc in m of water
2. Time tm seconds required to collect water for a height of hm in the measuring tank as mean value of readings t1 and t2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sno | h(m) | t1(s) | t2(s) | Qa(m3/s) | A(m2) | V(m/s) | Hv(m) | Hp(m) | Total |
| 1 |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |

**PROCEDURE:**

1. Open the inlet valve to supply tank and allow water to fill up to a maximum head of hm.
2. Open the outlet valve of the apparatus to have flow through the testing pipe. Then regulate both the inlet and outlet valves so that the head H is maintained constant. This condition is reached only if the inlet is equal to outlet.
3. Note the time in seconds to collect water for a rise of h m in the measuring tank twice as t1 and t2.If the difference in readings exceeds 10%, take a third reading within the range.
4. Note the pressure head Hp at the cross sections A1,A2 etc.
5. Repeat the experiment for medium and low heads in the supply tank

**QUIZ:**

* 1. Bernoulli’s equation holds good for non ideal fluids
     1. True
     2. False
  2. The pressure head is given by
     1. P/γ
     2. V2/2g
  3. Bernoulli’s theorem deals with law conservation of momentum
     1. True
     2. false

**REFERENCES:**

1. Fluid mechanics - Dr.R.K.Bansal
2. Experiments in fluid mechanics - Sarabjit Singh
3. Wikipedia