**CO-EFFICIENT OF DISCHARGE OF AN ORIFICE-METER**

**INTRODUCTION:**

An orifice is an opening in the side or bottom of a vessel or a tank, through which the liquid will flow under the condition that the liquid surface is always above the top edge of the opening. The orifices are used for the measurement of flow of liquids. The measurement of flow depends on the velocity of flow liquid and the form in which liquid d flows.

In an orifice the liquid flows in the form of a jet caused by the opening of the orifice, and the velocity of flow is caused due to conversion of pressure energy of liquid in to kinetic energy.

**OBJECTIVE:**

To determine the coefficients of discharge (Cd) for the given orifice meter

**GRAPHS:**

A Vs

A Vs h

Taking h and on x-axis an on y- axis.

**EQUIPMENT:**

a) Measuring tank of Size 0.6 x 0.6 x 0.8 meter with overflow arrangement, gauge glass, scale arrangement and a drain valve.

b) Stop Watch.

c) Orifice meters fitted onto horizontal pipes of diameters 20mm, 25mm and 40mm with pressure tapping are and gate valves to regulate flow rate.

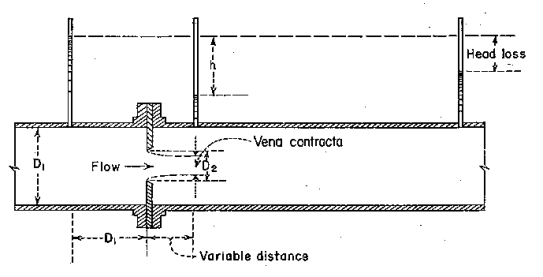
d) Differential mercury manometer with wooden scale of 1m length and scale graduations of 1mm to measure the loss of head.

e) The orifice diameter corresponding to the pipe diameters are as follows:

|  |  |  |
| --- | --- | --- |
| Sir no | Pipe diameter(mm) | Orifice diameter(mm) |
| 1 | 20 | 13.41 |
| 2 | 25 | 16.77 |
| 3 | 40 | 26.83 |

**THEORY:**

Orifice meter or orifice plate is a device used for measuring the rate of flow of a fluid through a pipe. It works on the same principle as a venturimeter. It consists of a flat circular plate which has a circular sharp edged hole called orifice. It is an opening in the side or bottom of a vessel or a tank through which liquid will flow under the condition that the liquid surface is always above the top edge of the opening. The orifice diameter is 0.5 times the diameter of the pipe. A differential manometer is connected at section 1 which is at a distance of about 1.5 to 2 times the pipe diameter upstream from the orifice plate, and at section 2, which is at a distance of about half the diameter of the orifice on the downstream side from the orifice plate.



**CO-FFICIENT OF DISCHARGE:**

**The actual discharge,**

image9.png

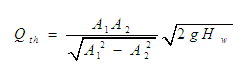
Where

a – Area of measuring tank in cm2

h – Height differences in pyrometer in cm.

t – Time to collect water for a height difference of h cm, measured in seconds.

Theoretical discharge,



Where

A1 – The area at inlet side in cm2

A2 – The area at throat in cm2

Hw - Head difference in the manometer, converted to cm of water.

g – Acceleration due to gravity (9.81).

Coefficient of discharge,

image11.png

**OBSERVATIONS:**

**CO-FFICIENT OF DISCHARGE:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl No** | **Manometer readings in (cm)**  **Hug** | | **Head loss in cm of water h=(H1-H2)** | **Time taken for 10 cm rise of water in sec (t)** | **Actual discharge (A) in m3/sec** | **Theoretical discharge (Qt) in m3/sec** | **Co-efficient of discharge (Cod)** |
| **H1** | **H2** |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |

**MANUAL:**

Start the experiment by pressing start button with default values of dia of orifice and size of collecting tank, and discharge then pass the experiment after few cycles and note the observation.

**Observation1:**

1) After pressing the start button, water should allow flowing in to the balancing tank through the inlet and it should fill up to level of orifice. Maintain a steady head in the balancing tank.

2) After filling of water in the balancing, the water level of pyrometer is slightly increasing then measure the pressure head.

**Observation 2:**

1) After the balancing tank is filled up to certain height the water shall start flowing in to the collecting tank through the orifice.

2) Measure the head causing flow in the collecting tank.

**Observation 3:**

1) Note the time taken for rise of water in collecting tank for certain interval.

2) Repeat the procedure by changing the die of orifice and discharge and head causing flow.

### MAINTENANCE:

1. After completing the experiment close the inlet valve and open all the gate valves & needle valves then close them.
2. Drain the water from measuring tank after completing the experiment

#### RESULT:

The coefficient of discharge Cod=

**QUIZ:**

1. Venacontracta is at a distance of half the diameter of the orifice
2. True
3. False
4. The orifice diameter is 0.5 times the diameter of the pipe
5. True
6. False
7. The principle of orifice meter is different from that of the venturimeter
8. True
9. False

4) The approximate distance of venacontracta from the centre of orifice is d

1. True
2. False

5) The standard values of Cod ranges from (0.85-0.99)

1. True
2. False

**REFERENCES:**

1. FLUID MECHANICS - RK BANSAL
2. EXPERIMENTS ON FLUID MECHANICS - SARABJIT SINGH
3. WIKIPEDIA
4. The constructor - http://theconstructor.org/