

Title: Calibration of orifice meter.

Aim : To Calibrate orifice meter.

Objective :

1. To study the working of orifice meter.
2. To calibrate orifice meter.

Theory :

It is device used for measuring flow of fluid through a pipe. It works on Bernoulli's principle. It consists of a flat circular plate which has a circular sharp edge hole for an orifice, which is concentric with the pipe. Generally, the orifice diameter is kept 0.5 times the diameter of the pipe. A water mercury manometer is connected to measure the pressure difference between two points, i.e. at inlet & after the orifice meter.

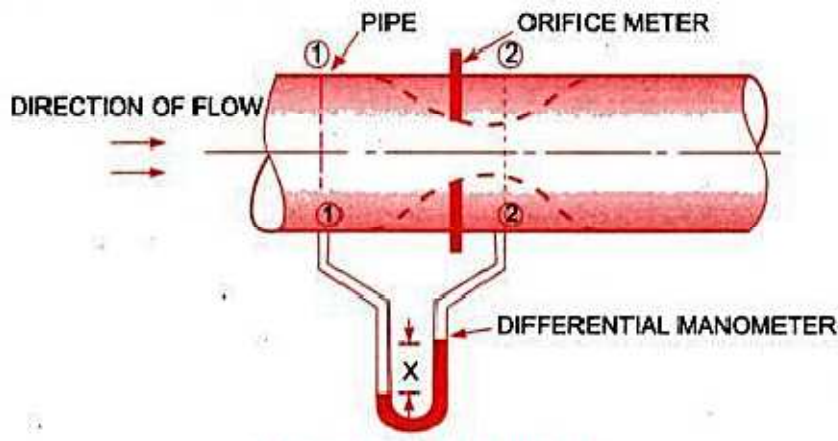


Figure: Flow through orificemeter

Apparatus :

Orifice meters are widely used for the determination of flow of fluid. While using an orifice meter, its calibration is important. The equipment enables the determination of the coefficient of discharge of the orifice meter.

Specification :

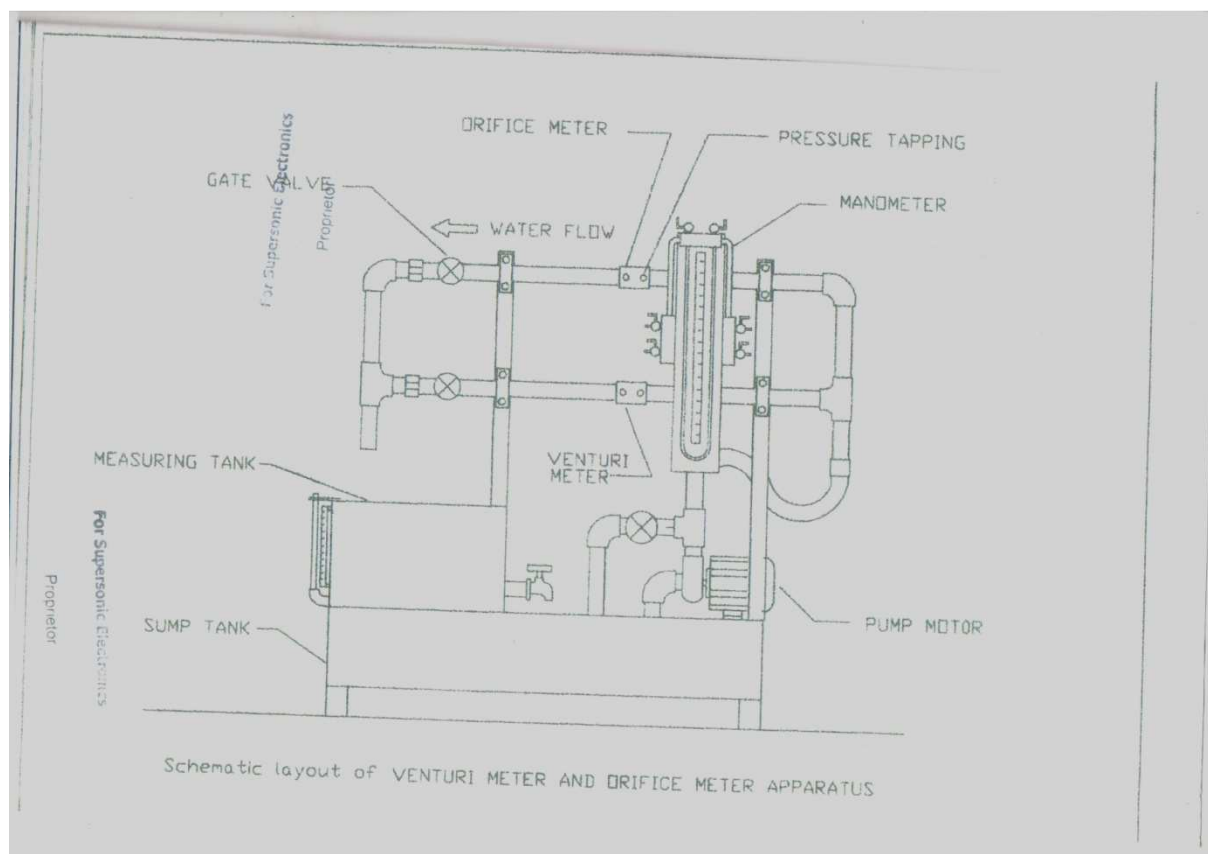
1. Supply pipe of $\Phi 28\text{mm}$ connected to inlet manifold.
2. Orifice meter size inlet $\Phi 28\text{mm}$ & throat $\Phi 14\text{mm}$.
3. Differential mercury manometer tapping provided at inlet and throat of orifice meter. Manometer size 30cm height.
4. Measuring tank size = 500mm x 300mm x 300mm.

Experimental procedure :

Before starting experiment see that

1. Clean water in sump tank is filled to approx 3/4 of its height.
2. Pressure relief valves above the manometer tubes are open.
3. Pressure valve of orifice meter is fully closed.
4. The bypass gate valve drain value of the measuring tank and gate value of meter which is to be calibrated is kept open while that of gate value of other meter is kept fully closed. Now start flow.
5. Open manometer pressure cocks of orifice meter. Let water flow through pressure relief valve above manometer. Remove all air bubble and then close both pressure relief cocks slowly & simultaneously so that mercury does not get lifted out from manometer.
6. Close gate valve of measuring tank & measure time required for 10cm rise of water in measuring tank. Repeat procedure by changing discharge.

Experimental Setup Diagram:-



Observation table :

Sr.No.	Manometer Reading		Measuring Tank			Q_{th}	C_d	Average
	h (Hg)	h (water)	Height	Time	Q_{act}	cm^3/sec	Q_{act}/Q_{th}	C_d
1								
2								
3								
4								
5								

Observation :

1. Inlet diameter of pipe $d_1 = 2.80cm$
2. Inlet diameter of orifice meter $d_0 = 1.40cm$
3. Inlet area of pipe $a_1 = 6.1575cm^2$
4. Inlet area of orifice $a_2 = 1.5393cm^2$
5. Area of tank $= 30 \times 30 = 900cm^2$

Calculations :-

1. Reading of differential manometer = h of Hg =
2. h of water = h of Hg $\times [S_{Hg} / S_w - 1]$
3. $Q_{actual} = \text{Area of tank} \times \text{Height in cm} / \text{Time}$
4. $Q_{th} = a_1 a_2 (2ghw)^{1/2} / (a_1^2 - a_2^2)^{1/2}$
5. $C_d = Q_{actual} / Q_{therotical}$

Conclusion :

Calibrated values of coefficient of discharge for orifice meter =

Precautions :

1. Operate manometer valve gently while removal of air bubble so that mercury in manometer does not get lifted out from manometer.
2. Drain all water from sump tank after completion of experiment.