FLUID MECHANICS

Online Class-Applications of Bernoulli's Equation

by

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- ❖ Applications of Bernoulli’s Equation
- ❖ Bernoulli’s and Continuity Equations tool for many fluid problems.
- ❖ Venturimeter
- ❖ Principle
- ❖ Included angles
- ❖ Cavitation – Reasons and Remedies
- ❖ For no cavitation $D_2 = 0.5\ D_1$

- Discharge $Q = (Cd\ a_1 a_2 (2gh)^{1/2})/(a_1^2 - a_2^2)^{½}$
- $Cd = Q\ act / Q\ th = 0.98$
- $h = x(S_2/S_1) - 1 = p_1/w - p_2/w$
- Z1 = Z2 (horizontal Venturimeter)
- Inclined Venturimeter

Z1 is not equal to Z2

- $h = x(S_2/S_1) - 1 = ((p_1/w) + Z_1) - ((p_2/w) + Z_2)$

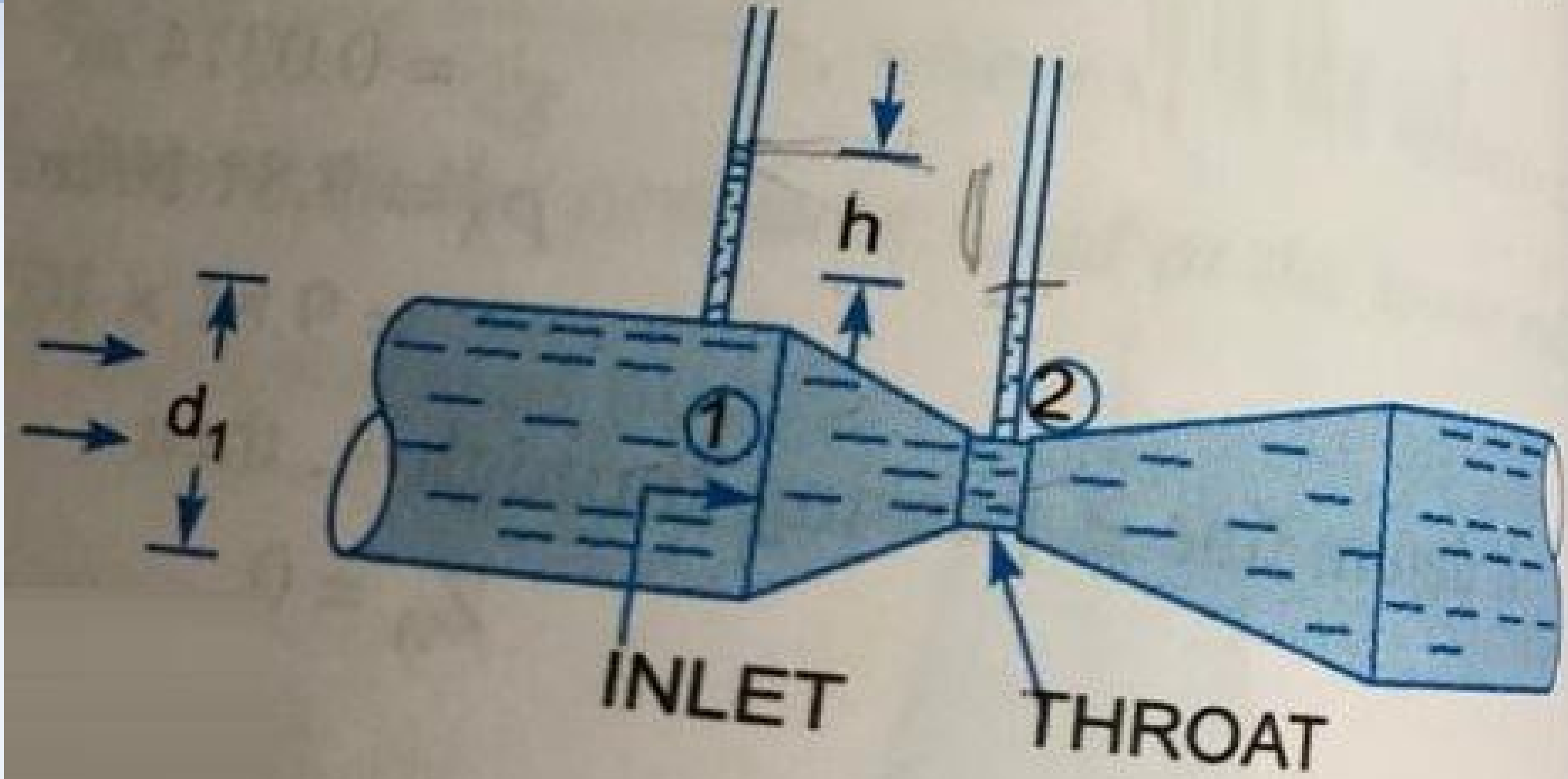

Fig. *Venturimeter.*

- Orifice Meter
- Cheaper Arrangement and requires less space
- Principle
- $D2=0.5D1$
- Vena Contracta
- Jet has smallest cross section area

- Discharge $Q = (Cd\ a_1 a_2\ (2gh)^{1/2})/(a_1^2 - a_2^2)^{½}$
- $Cd = Q\ act / Q\ th$
- $h = x(S_2/S_1) - 1 = p_1/w - p_2/w$
- Z1=Z2 for Horizontal Position
- Inclined Orifice Meter
- $h = x(S_2/S_1) - 1 = ((p_1/w) + Z_1^{)} - ((p_2/w) + Z_2^{)}$
- 0.6 to 0.7 Coeff of discharge

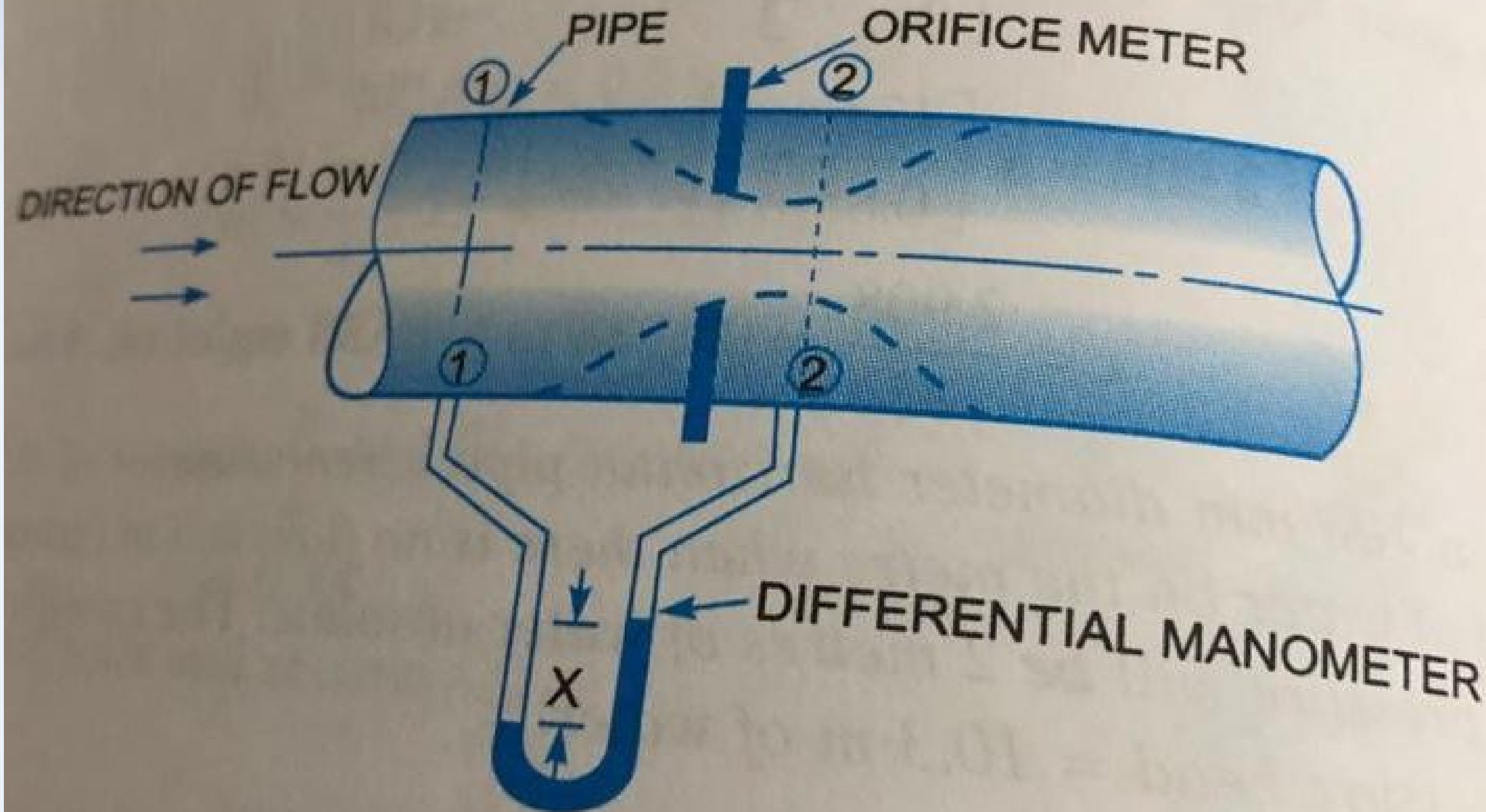

Fig. 6.12. *Orifice meter.*

- Pitot Tube
- Principle
- Stagnation Point
- Static Pressure Head
- Dynamic Pressure Head
- Stagnation Pressure Head
- $V\ act = C\ (2gh)^{1/2}$
- $h = x(S_2/S_1) – 1$

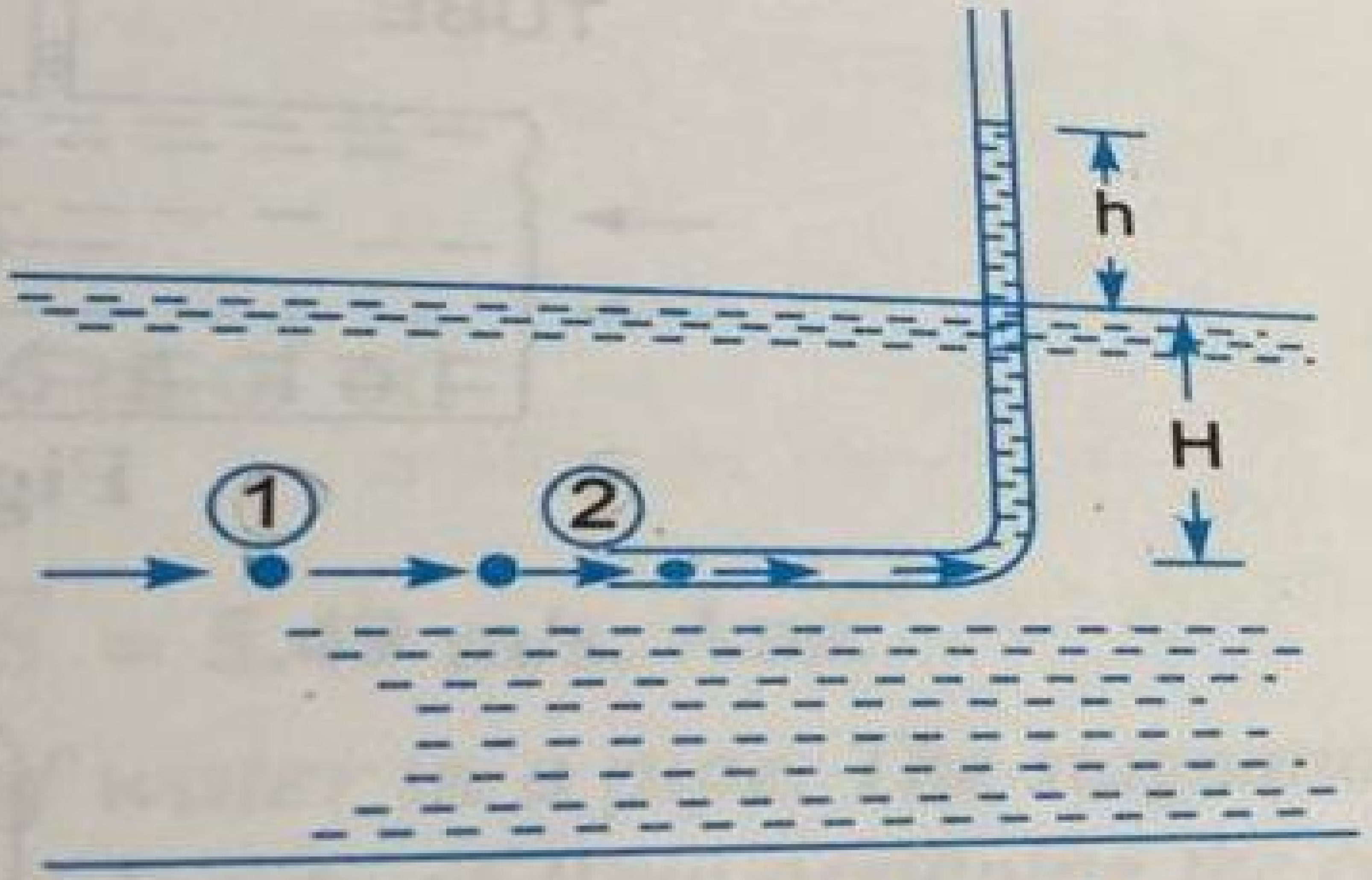

Fig. ***Pitot-tube.***

- Problem: An Orifice Meter with orifice diameter 0.15 m is inserted in a pipe of 30 cm diameter. The pressure difference measured by mercury oil differential manometer on the two sided of orifice meter gives a reading of 40 cm of Mercury. Find the rate of flow of oil of G = 0.8, when Cd = 0.62.
- D1 = 15 cm D2 = 30 cm
- a1= 176.7 sq.cm and a2= 706.85 sq.cm
- h= $x(S_2/S_1) – 1$
- h=40((13.6/0.8) -1) = 64 0 cm
- Cd=0.62
- $Q = (Cd\ a_1 a_2 (2gh)^{1/2})/ (a_1^2 – a_2^2)^{½}$

Problem: A 20x10 cm Venturimeter is provided by a vertical pipe line carrying oil of G=0.8. The difference in elevation of the throat section and entrance section of Venturimeter is 0.5 m. The differential U tube Venturimeter shown a gauge difference of 40 cm, Calculate the discharge of oil and pressure between entrance section and throat section. Take Cd = 0.92.

- D1 = 20 cm D2 = 10 cm
- a1= 314.16 sq.cm and a2= 78.5 sq.cm
- $h = x(S_2/S_1) - 1 = ((p_1/w) + Z_1) - ((p_2/w) + Z_2)$
- h=0.4((13.6/0.8) -1) = 6.4 m
- 6.4 = (p1/w+0) – (p2/w+0.5)
- p1/w-p2/w = 6.9 m
- $Q = (Cd\ a_1 a_2 (2gh)^{1/2}) / (a_1^2 - a_2^2)^{½}$


THANK YOU
VERY MUCH