

Fluid Mechanics Problems and Solutions

Problem 1: Venturi Meter Flow Measurement

Given:

- Diameter at section 1 (D_1) = 0.15 m
- Diameter at section 2 (D_2) = 0.10 m
- Pressure at section 1 (P_1) = 200 kPa
- Pressure at section 2 (P_2) = 150 kPa
- Density of water (ρ) = 1000 kg/m³
- Discharge coefficient (C_d) = 0.98

Find: The flow rate through the Venturi meter.

Solution:

Step 1: Use Bernoulli's equation between sections 1 and 2:

$$P_1 + (1/2) \cdot \rho \cdot v_1^2 = P_2 + (1/2) \cdot \rho \cdot v_2^2$$

Rearrange to get: $v_1^2 - v_2^2 = (2 \cdot (P_1 - P_2)) / \rho$

Since velocity at section 1 is smaller, we approximate $v_1 = 0$.

$$\text{Thus: } v_2 = \sqrt{(2 \cdot (P_1 - P_2)) / \rho}$$

Step 2: Use the Continuity Equation to relate the velocities:

$$A_1 \cdot v_1 = A_2 \cdot v_2 \rightarrow v_2 = (A_1 / A_2) \cdot v_1$$

Step 3: Substitute and solve for v_1 and v_2 .

Finally, use $Q = A_1 \cdot v_1$ to calculate the flow rate Q .

Problem 2: Orifice Plate Flow Measurement

Given:

- Diameter of the orifice (D_o) = 0.05 m
- Pressure difference across the orifice (ΔP) = 20 kPa
- Discharge coefficient (C_d) = 0.62
- Fluid density (ρ) = 1000 kg/m³

Find: The flow rate Q through the orifice.

Solution:

Step 1: Use the orifice flow rate formula:

$$Q = C_d \cdot A_o \cdot \sqrt{(2 \cdot \Delta P) / \rho}$$

Where A_o is the area of the orifice, $A_o = \pi \cdot (D_o)^2 / 4$

Step 2: Calculate the area of the orifice:

Fluid Mechanics Problems And Solutions Download

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This book delves into Fluid Mechanics Problems And Solutions Download. Fluid Mechanics Problems And Solutions Download is an essential topic that must be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Fluid Mechanics Problems And Solutions Download, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:

- Chapter 1: Introduction to Fluid Mechanics Problems And Solutions Download
- Chapter 2: Essential Elements of Fluid Mechanics Problems And Solutions Download
- Chapter 3: Fluid Mechanics Problems And Solutions Download in Everyday Life
- Chapter 4: Fluid Mechanics Problems And Solutions Download in Specific Contexts
- Chapter 5: Conclusion

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This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. It is highly recommended for anyone seeking to gain a comprehensive understanding of Fluid Mechanics Problems And Solutions Download.

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