

EXPERIMENT No.1

FLOW MEASUREMENT BY ORIFICEMETER

1.1 AIM: To determine the co-efficient of discharge of the orifice meter

1.2 APPARATUS REQUIRED: Orifice meter test rig, Stopwatch

1.3 PREPARATION

1.3.1 THEORY

An orifice plate is a device used for measuring the volumetric flow rate. It uses the same principle as a Venturi nozzle, namely Bernoulli's principle which states that there is a relationship between the pressure of the fluid and the velocity of the fluid. When the velocity increases, the pressure decreases and vice versa. An orifice plate is a thin plate with a hole in the middle. It is usually placed in a pipe in which fluid flows. When the fluid reaches the orifice plate, with the hole in the middle, the fluid is forced to converge to go through the small hole; the point of maximum convergence actually occurs shortly downstream of the physical orifice, at the so-called *vena contracta* point. As it does so, the velocity and the pressure changes. Beyond the *vena contracta*, the fluid expands and the velocity and pressure change once again. By measuring the difference in fluid pressure between the normal pipe section and at the *vena contracta*, the volumetric and mass flow rates can be obtained from Bernoulli's equation. Orifice plates are most commonly used for continuous measurement of fluid flow in pipes.



Fig.1. Orifice Plate

1.3.2 PRE-LAB QUESTIONS

1. Write continuity equation for incompressible flow?

Mass flow rate = Density $\times$ Flow Area $\times$ Velocity of flow kg/s

2. What is meant by flow rate?

Volume flow rate, $Q = A \cdot V$ m^3/s

3. What is the use of orifice meter?

Fluid Dynamics Lab Manual

M Lipman



Fluid Dynamics Lab Manual:

Computational Fluid Dynamics Laboratory Manual M. Veeramanikandan, 2021-04-30 **Applied Fluid Mechanics Lab Manual** Habib Ahmari, Shah Md Imran Kabir, 2019 Basic knowledge about fluid mechanics is required in various areas of water resources engineering such as designing hydraulic structures and turbomachinery The applied fluid mechanics laboratory course is designed to enhance civil engineering students understanding and knowledge of experimental methods and the basic principle of fluid mechanics and apply those concepts in practice The lab manual provides students with an overview of ten different fluid mechanics laboratory experiments and their practical applications The objective practical applications methods theory and the equipment required to perform each experiment are presented The experimental procedure data collection and presenting the results are explained in detail LAB Fluid Mechanics Experiments Robabeh Jazaei, 2020-09-16 Fluid mechanics is one of the most challenging undergraduate courses for engineering students The fluid mechanics lab facilitates students learning in a hands on environment The primary objective of this book is to provide a graphical lab manual for the fluid mechanics laboratory The manual is divided into six chapters to cover the main topics of undergraduate level fluid mechanics Chapter 1 begins with an overview of laboratory objectives and the introduction of technical laboratory report content In Chapter 1 error analysis is discussed by providing examples In Chapter 2 fluid properties including viscosity density temperature specific weight and specific gravity are discussed Chapter 3 revolves around the fluid statics include pressure measurement using piezometers and manometers Additionally hydrostatic pressure on the submerged plane and curved surfaces as well as buoyancy and Archimedes Principle are examined in Chapter 3 In Chapter 4 several core concepts of fluid dynamics are discussed This chapter begins with defining a control system based on which momentum analysis of the flow system is explained The rest of the chapter is allotted to the force acting on a control system the linear momentum equation and the energy equation Chapter 4 also covers the hydraulic grade line and energy grade line experiment The effect of orifice and changing cross sectional area by using Bernoulli's equation is presented in Chapter 4 The application of the siphon is extended from Chapter 4 by applying Bernoulli's equation The last two chapters cover various topics in both internal and external flows which are of great importance in engineering design Chapter 5 deals with internal flow including Reynolds number flow classification flow rate measurement and velocity profile The last experiment in Chapter 5 is devoted to a deep understanding of internal flow concepts in a piping system In this experiment students learn how to measure minor and major head losses as well as the impact of piping materials on the hydrodynamics behavior of the flow Finally open channels weirs specific energy and flow classification hydraulic jump and sluice gate experiments are covered in Chapter 6 **Fluid Mechanics with Laboratory Manual** Bireswar Majumdar, 2010-10 Primarily intended for the undergraduate students of mechanical engineering civil engineering chemical engineering and other branches of applied science this book presents a comprehensive coverage of the basic laws of fluid mechanics The text

also discusses the solutions of fluid flow problems that are modelled by differential equations Emphasis is placed on formulating and solving typical problems of engineering practice The text introduces the principle of fluid mechanics in a well organized manner beginning with the simple and proceeding to the complex The aim of laboratory manual at the end of chapters is to teach the students how to conduct experiments in fluid mechanics It provides the step wise details of experiments which include objective theory of the experiment apparatus used in the experiment procedure observations and graphs to be plotted Chapter end exercises enable the students to recapture the topics discussed and drill them in the theory Finally the worked out examples with solutions are useful to readers in comprehending the problems discussed The book would also prove to be a useful ready reference for the first level postgraduate student **Lab. Manual of Fluid**

Mechanics & Machines Gupta,Chandra,2006-02-01 *Fluid Mechanics Experiments* Robabeh Jazaei,2022-05-31 Fluid mechanics is one of the most challenging undergraduate courses for engineering students The fluid mechanics lab facilitates students learning in a hands on environment The primary objective of this book is to provide a graphical lab manual for the fluid mechanics laboratory The manual is divided into six chapters to cover the main topics of undergraduate level fluid mechanics Chapter 1 begins with an overview of laboratory objectives and the introduction of technical laboratory report content In Chapter 1 error analysis is discussed by providing examples In Chapter 2 fluid properties including viscosity density temperature specific weight and specific gravity are discussed Chapter 3 revolves around the fluid statics include pressure measurement using piezometers and manometers Additionally hydrostatic pressure on the submerged plane and curved surfaces as well as buoyancy and Archimedes Principle are examined in Chapter 3 In Chapter 4 several core concepts of fluid dynamics are discussed This chapter begins with defining a control system based on which momentum analysis of the flow system is explained The rest of the chapter is allotted to the force acting on a control system the linear momentum equation and the energy equation Chapter 4 also covers the hydraulic grade line and energy grade line experiment The effect of orifice and changing cross sectional area by using Bernoulli s equation is presented in Chapter 4 The application of the siphon is extended from Chapter 4 by applying Bernoulli s equation The last two chapters cover various topics in both internal and external flows which are of great importance in engineering design Chapter 5 deals with internal flow including Reynolds number flow classification flow rate measurement and velocity profile The last experiment in Chapter 5 is devoted to a deep understanding of internal flow concepts in a piping system In this experiment students learn how to measure minor and major head losses as well as the impact of piping materials on the hydrodynamics behavior of the flow Finally open channels weirs specific energy and flow classification hydraulic jump and sluice gate experiments are covered in Chapter 6

Fluid Mechanics Laboratory Manual for Civil Engineering Students G. Padmanabhan,2007-12-28 **Catalog of Course of Instruction at the United States Naval Academy** United States Naval Academy,1953 FLUID MECHANICS RAJU, K. SRINIVASA,KUMAR, D. NAGESH,2020-07-01 Fluid Mechanics has transformed from fundamental subject to application

oriented subject Over the years numerous experts introduced number of books on the theme Majority of them are rather theoretical with numerical problems and derivations However due to increase in computational facilities and availability of MATLAB and equivalent software tools the subject is also transforming into computational perspective We firmly believe that this new dimension will greatly benefit present generation students The present book is an effort to tackle the subject in MATLAB environment and consists of 16 chapters The book can support undergraduate students in fluid mechanics and can also be referred to as a text reference book

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