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MODIFIED BERNOULLI'S APPARATUS

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ABSTRACT:
Bernoulli's apparatus is one of the simple but fundamental experimental devices of fluid mechanics. With this set up anyone could be able to verify physically verify the Bernoulli's equation which is the foundation of Fluid Mechanics and base of fluid flow problem. It will help the undergraduate students to understand the basic concepts of fluid friction, pressure head, velocity head and many others related terminology about the static and dynamic fluid flow. Designing, characterizing and constructing such a device is surely a challenging job which is definitely a result of combination of merits and hard work. In most of the cases this devices are imported from outside the country for experimental purpose and basic lab works. But by using our engineering knowledge and true effort we can construct such device rather than importing them. On the other hand by constructing such complex structure,students will be able to be oriented with many important aspects about construction of engineering apparatus. Subsequent further modification and improvement of this project is always welcome. The invention concerns apparatus for applying labels to articles. More particularly, the invention is related to use of the Bernoulli Effect in labelling apparatus and methods to provide quick, accurate placement of pressure-sensitive, adhesive-backed labels or precut pieces of adhesive tape.

Keywords- *Bernoulli's*

I. Introduction

1.1 Introduction of Project Work

The Bernoulli equation is an useful and important expression of wide application in many branches of science and engineering. General forms of Bernoulli's equation, also known as the extended Bernoulli's equation, valid for viscous fluids, have been discussed previously in this paper. Nonethe less, there are relatively few experiments, accessible to beginner that illustrate its use and applications. In this work we present a conceptually simple and inexpensive experiment to study the drainage of a cylindrical vessel that, we believe, clearly illustrates an application of Bernoulli's equation for real liquids. It is essentially a recreation of experimental, profiting from the advantages of new technologies. The experimental set up essentially consists of a rectangular duct kept at some inclination & it variable .In the first part of this study we present a model based on the Bernoulli equation for real flows. Then we present the basic characteristic of the experiment and the experimental results. The experiment allows us to thoroughly test the implications of the model and to extract the relevant parameter associated with the energy losses. Within this context, we veirfy the Bernoulli's throem in this case & satisfied the Bernoulli's equations. The experiment involves concepts that are relatively simple to discuss theoretically, the physics is easy to visualize and it is quite straight forward to quantitatively test the implication of the model. The invention concerns apparatus for applying labels to articles. More particularly, the invention is related to use of the Bernoulli Effect in inclined apparatus and methods to provide quick, accurate placement of pressure-sensitive, adhesive-backed precut pieces of adhesive tape. We start from the basic idea that real phenomena are governed by probabilistic models whose parameters can be approximated by using statistical procedures. In many applied fields such as environ metrics and econometrics it is often possible to obtain only vague data in studying a particular phenomenon. The vagueness of the data is the result of the non-random imprecision of the measurements or of the impossibility in finding an exact numerical description of the observed quantities.

1.2 Description Of Bernoulli's Apparatus

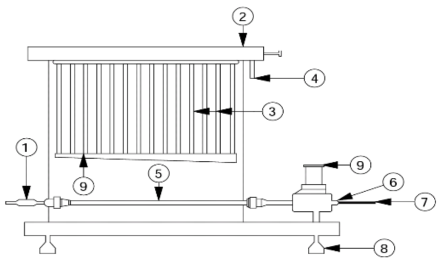

Fig 1. Different elements of Bernoulli's Apparatus

Fig.shows the location of each of the main elements of the apparatus. The testsection (5) is a machined tube of varying rectangular cross section provided with pressure tapping so that static pressures can be measured simultaneously at each of 14 locations. Fig. 3 provides the location and dimension of each cross section. A pitot probe (7) is provided which can be positioned to read the total head at any section of the tube. The probe can be moved after loosening the gland nut (6); this nut should be re-tightened by hand. (To prevent damage, the probe should be fully inserted during storage.) All eight pressure tapping are connected to a bank of pressurized manometer tubes (3). The pressure in the air chamber (2) can be increased by connecting a hand pump to the inlet valve (4). Pressure can be reduced by depressingthe valve (4). The inlet pipe (1) should be connected directly to the bench supply. A flexible hose attached to the outlet pipe should cause water flowing from the apparatus to empty directly into the volumetric measuring tank. The apparatus should be leveled with the adjustable feet (8). Flow rate and pressure in the apparatus can be varied by adjusting the flow control valve (9) and the bench supply control valve. Opening the flow control valve will increase flow rate through the tube and decrease fluid pressure throughout the tube. Whereas, opening the bench supply control valve will increase flow rate and fluid pressure throughout the tube. By use of the two valves, it is possible to vary flow rate and pressure independently.

Bernoulli's Principle

It states in a steady, ideal flow of an incompressible fluid, the total energy at any point of the fluid is constant. The total energy mainly consists of summation of pressure energy, kinetic energy and potential or datum energy. Mathematically, the Bernoulli's theorem is written as:

$$\frac{p1}{\rho g} + \frac{v_1^2}{2g} + z_1 = \frac{p2}{\rho g} + \frac{v_2^2}{2g} + z_2$$

II. METHODOLODGY

2.1 Modified Bernoulli's Apparatus

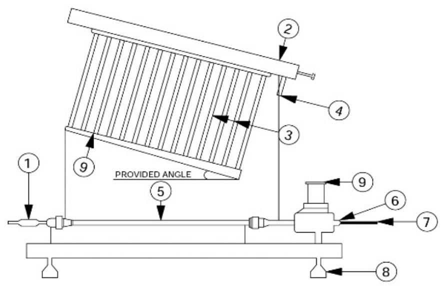

Fig. 2. Modified Bernoulli's Apparatus

1. Inlet pipe, 2.Air chamber, 3.Manometer tubes, 4.Inlet valve, 5.Test section, 6.Gland nut, 7.Pitot probe, 8.Adjustable feet, 9.Flow control valve, 9A. Tappered pipe

2.2 Followings are the sizes of Modified Bernoulli's Apparatus

Bernoulli's apparatus consist essentially of two dimensional rectangular section rectangular tappering duct design to fit between cussions constant head inlet & variable head outlet tank . An elevation tube static pressure manometric bank attached to the rectangular tappering duct . The rectangular tappering duct is symmetrical about the centre line with a flat horizontal surface in to which the Static pressure tappings are drilled . The lower surface is at an variable. The description of Modified apparat are as follows:

Sump tank size is 110x25x35 cm, Supply tank size is 18 x18x50 cm, Delivery tank size is 18 x 18 x 50 cm, Measuring tank 40 x 20 x 30 cm, Length of the channel 73 cm ,The width of channel 2.5 cm, The height of channel at entry is 6 cm ,The height of channel at Exit is 3 cm. ,The statics tapping are at pitch 5cm , The statics tapping are at edge is 4 cm, No. of Manometer is 14.

2.3 Review

1. In this is paper study is all about the experiment carried out in this simple and expensive. Also it is applicable to beginner student and it clearly illustrates the importance and usefulness of Bernoulli's equation for real fluids including energy losses, for a wide range of Reynolds number. The validity of type of energy losses proposed and the expanded Bernoulli's equation, span the beginning of turbulent regimes as well as the transitional and laminar regimes. All that is needed to further explore namely k, Δz and c_v are independent of R_e in the region studied here.
2. In this paper the study one of the most useful principles of fluid mechanics to solve practical problems in hydraulic engineering is the bernoullis theorem along a stream line. Which is deduced from the work energy from of the eulers equation along a stream line. A detailed analysis of the Bernoulli's theorem and its extension to flow in open channels has been developed. From the analytical resultof the extension of the Bernoulli's principle to open-channel flow, the generalized depth-averaged Bernoulli theorem is proposed.

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