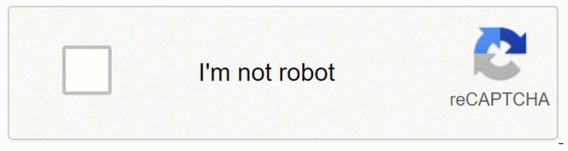

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Frictional losses in pipes lab report

Head Losses

- In the analysis of piping systems, pressure losses are commonly expressed in terms of the equivalent fluid column height called Head Losses (h_L).
- It also represents the additional height that the fluid needs to be raised by a pump inorder to overcome the frictional losses in the pipe

$$h_L = \frac{\Delta P_L}{\rho g} = \frac{fLV_{avg}^2}{2gd}$$

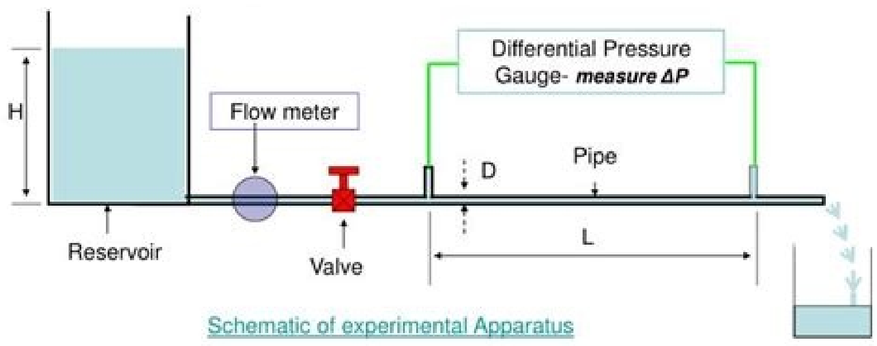
3

PDF

Friction Loss in Pipe Flow

Experiment 5
Pipe Flow-Major and Minor losses (review)

- **The goal is to study pressure losses due to viscous (frictional) effects in fluid flows through pipes**



Schematic of experimental Apparatus

- **Pipes with different Diameter, Length, and surface characteristics will be used for the experiments**

Chapter 3

Local Energy (Head) Losses

3.1. Introduction

Local head losses occur in the pipes when there is a change in the area of the cross-section of the pipe (enlargement, contraction), a change of the direction of the flow (bends), and application of some devices on the pipe (vanes). Local head losses are also named as **minor losses**. Minor losses can be neglected for long pipe systems.

Minor losses happen when the magnitude or the direction of the velocity of the flow changes. In some cases the magnitude and the direction of the velocity of the flow may change simultaneously. Minor losses are proportional with the velocity head of the flow and is defined by,

$$h_L = \xi \frac{V^2}{2g} \qquad (3.1)$$

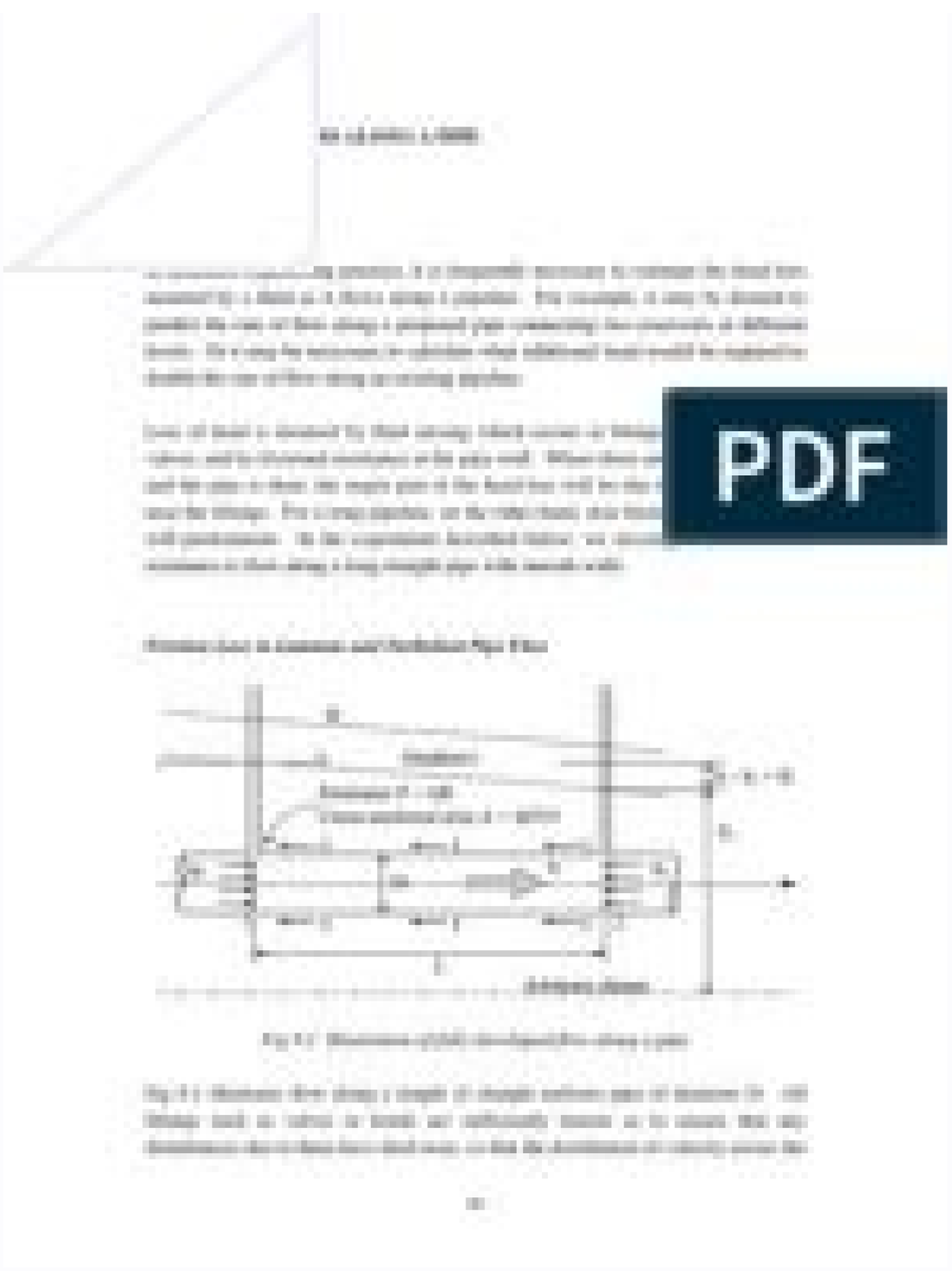
Where ξ is the **loss coefficient**.

3.2. Abrupt Enlargement

There is certain amount of head loss when the fluid moves through a **sudden enlargement** in a pipe system such as that shown in Fig. (3.1)

Impuls-momentum equation is applied to the 1221 control volume along the horizontal flow direction. The forces acting on to the control volume are,

a) Pressure force on the 1-1 cross-section, $\vec{F}_1 = p_1 A_1$
b) Pressure force on the 2-2 cross-section, $\vec{F}_2 = p_2 A_2$
c) Pressure force on the 3-3 cross-section, $\vec{F}_3 = p_3 (A_2 - A_1)$
Laboratory experiments have verified that $p_3 = p_1$, $\vec{F}_3 = p_1 (A_2 - A_1)$
d) Momentum on the 1-1 cross-section, $\vec{M}_1 = \rho Q V_1$
e) Momentum on the 2-2 cross-section, $\vec{M}_2 = \rho Q V_2$



Frictional losses in pipes formula. Friction losses in pipes pdf. Frictional losses in pipes. Friction loss in pipe experiment.

According to the equation of Darcy-Weisbach, by a given flow, the loss of the head, decreases with the fifth reverse power of the diameter of the pipe. Measure the water temperature, using a thermometer. When the output occurs from the overflow of the tank of the head, completely open the control vail. Then tighten the air purge screw. Therefore, for this experiment, the water-mercury manometers are replaced with a differential manometer to directly measure large pressure differentials. If necessary, a greater control of the levels can be achieved using a manual pump to raise the pressure of the air of the manometer. It becomes premium to read the entire document. 9.1. The results record all the handometers and readings of manometer, water temperature and volumer measurements, in the raw data tables. See our privacy policy and user agreement for more details. In the flows of laminar, it is only a function of the number of Reynolds and is independent of the roughness of the surface of the pipe. Get data for at least eight flow rates, the lowest to give HL = 30 mm. Results and Collles Use this link to access Excel Workbook for this experiment. For low flow-speed experiments, the input of the constant head tank is connected to the bank supply, and the output at the base of the head tank is connected to the top of the test tube [4]. Some of the steps are to make the flow of the water source consistent and remove the bubble from the tubes into the measurements. References) Rolf H.Sabersky, Allan J Acosta, Edward G.hauptmann and E.M.Gate, "Fluid Flow - The first course of fluid mechanics "(Fourth edition), Prentice Hall Inc., 1999.b) R.V Giles, fluid and hydraulic mechanics (third edition), McGrawhill Inc; 1994.c) University Laboratory Manual Malaysia.appendixsample Tube calculation 1 and 2 (i) (ii) (iii) (iii) Reynold number for pipe 1a (IV) Turbulent flow, (V) (VI) (VII) FEXP, itself All using to obtain data from the pipe 1 (B), 2 (A) and 2 (b) in the determination of the reynolds number: -1b: -1b: = 27.5 x 103 x v2a: re = 16.4 x 103 x v2b: re = 15.5 x 103 x vlasses in tube of sudden enlargement pipe (i) (ii) (h1 h1 = 582-570 mm = 12 mm = 0.012 m (iii) (iv) (v) (vi) (vii) paid in the pipenota of sudden contraction: the same mã © everything uses to find the value of q, (h as shown in the cages of the pages in the tube of the sudden enlargement pipe. (i) (ii) (iii) (iv) (v) pã © laids in the pipe for the pipe of 900 curves and the pipenote of the elbow: the same mã © Everything uses to find the value of Q, (H as shown in the cup February 2014 Pages of the application in Pipes36_1307450414.UNKNOWN_1307450395. Republic of Union of Philippines Batangas State University Batstateu Alangilan Alangilan, Batangas City College of Engineering, Architecture and Fine Arts Https U.Ph/, Tel. The following steps must be followed. Therefore, we measure the friction factor of the pipes using our measurements. Compare your results for F with the Moody diagram (Figure 4.2). This should face the volume tank, and a short flexible tube length must be joined, to avoid splashes. In addition, calculate the techric friction factor, F, using equation 4 for laminar flow and equation 5 for the turbulent flow for a rank of numbers of Reynolds. For the turbulent flow in a smooth pipe, a well -known curve for the bad mood diagram is given by: the number of Reynolds is given by: where v is the average speed, it is the diameter of the pipe, and they are dynamic and cinematic viscosities of the fluid, respectively. Closing the air voper before air bubbles are not observed in the connection tubes. Configure the equipment as follows: Mount the platform In the Hydraulic Bank and adjust the feet with a spy level to make sure that the base plate is horizontal and the manometers are vertical. Other factors, such as roughness space and form, can also affect the value of F; However, these effects do not understand well and Be insignificant in many cases. Duplicating the diameter of a pipe results that the loss of the head decreases in a factor of 32 (â € ° ë † 97% reduction), while the amount of material required by unit of length of the Pipe and its installation cost is almost duplicated. These chemulas are used in engineering applications when using computer programs or method of calculation sheet. When it is not in use, the manometers may be isolated, using Hoffman clamps. 118/2121 Department of Quismary Engineering and Food Experiment No. 1 Loss of Energy in Pipes A Laboratory Report in Che 411 â, ¬ - Laboratory of Chimic Engineering 1 Dimaculangan, Zyrene A. Practical Application in Engineering Applications, It is important to increase the productivity of the pipes, that is, maximize the flow capacity and minimization of head loss per unit length. Average flow rate, V (X axis) on a log-log log scale. The total energy of energy in a pipe system is the sum of the main and minor legs. Switch along the pipe since the pressure must work to overcome the friction resistance. 9. With these errors taken into consideration, the experimental results would be better. Theory in the equation of Bernoullis as shown below, HF represents the loss of the head due to the friction between the fluid and the internal surface of the constant diameter pipe, as well as the friction between the fluid layers AdjacentesP1 / (G + V1 / 2G + Z1 = P2 / (G + V2 / 2G + Z2 + HF (1) This will result in a continuous change of energy from a valuable mechanical form (as a cinctic o Potential energy) In a less valuable technical form that is hot. Connect the bank supply tube to the tank inlet of the head, run the pump and open the Bank Vail to the flow. The flow was changed to a range of different values and, therefore, the respective values of H1 and H2 were recorded. H2. Flow experiment High flow rate will be supplied to the test section by connecting the equipment input pipe to the hydraulic bank, with the pump off. Adjust the flow valve of flow control gradually to observe the pressure differences in increments of 0.05 bar. 2. Figure 4.2: Moody diagram Figure 4.3: Water Cinema Viscosity (V) to atmosphered pressure 8. Theory Energy loss in a pipe can be determined by applying energy equation to a section of a one Straight pipe with a uniform transverse section: If the pipe is horizontal: Ã Ã Ã Ã Ã Ã Ã Ã ¢ from Vin = Vout: The pressure difference (Pout-PIN) between two points in the pipe is due to the friction resistance, and the loss of The HL head is directly proportional to the pressure difference. The theoric values must be divided into two groups (laminar and turbulent) and also traced separately. Keep in mind that the pipe used in this experiment is a smooth pipe. Become a premium to read the 19 pages. Why is this page is out of focus? This is a premium document. Slideshare uses cookies to improve functionality and performance, and provide relevant advertising. Preview of load, the preview is currently not available. Experimental procedure The experiment will be carried out in two parts: high flow rates and low flow rates. Close the Bank Vail, open the valve of flow control of the appliance completely and start the pump. In this experiment, HL is measured directly by the water handometers and the differential pressure manometer that are connected by pressing thrusts to the test pipe. Different flow rates were introduced along with different diameters and roughness of the pipes. In engineering problems, it is determined by using the Moody diagram. Therefore, it must be determined experimentally. Equipment SE. The following equipment to perform the energy pã © redida in the pipe experiment: F1-10 Hydrose Bank, F1-18 pipe frictional apparatus, chronicleter to tame the flow flow flow Cylinder medicine to measure very low flows, spāritu level and themeter. The procedure was repeated for the different pipes that include, the rough, soft, sudden contraction and sudden enlarged pipes. The reinolds number was used to understand the flow variation between laminar and turbulent flows. For laminar flow, the coefficient of Darcy-Weisbach (or the Fricción Factor F) is only a function of the Number of Reynolds (Re) and is independent of the roughness of the surface of the pipe, that is: for the turbulent flow , is a function of both of both the number of Reynolds and the height of the roughness of the pipe ,. 4. Determine the flow by timed collection. Indicate any reason for lack of agreement. This change of energy is generally known as friction head of friction, which represents the amount of energy converted into heat per unit of fluid weight. Head (HF) pages in the pipe due to friction can be determined using the Darcy-Weisback equation; turbulent flow (2) Laminar flow (3) Where: f = friction factor = lengthV = average speed (q/a) g = gravityd = constant diameter Expressing by similar phramulas, although the original derivation of each one is different: (4) In laminar flow, the friction factor is only a friction of the Number of Reynolds, while for the turbulent flow it is a function of the number of Reynolds (Re) and the relative roughness of the pipe. (5) Where (: density, V: Average speed, D: pipeline tuber. The correlationalization f = 64/re (6) turbulentf flow = 0.316 x re -0.25 (7) The equation (7) is the equation of Blausius and And válido for soft pipes and 3000 Ksudden Contractionhence, the caution steps should be taken to obtain the best result to avoid all errors. Place Hoffman clamps to water manometers and pressure pressing manometer connection And close them. It becomes premium to read the entire document. This page is blurred because it is a premium document. For high-speed flow experiments, the input tube is directly connected to the bank's water supply. In totally turbulent flows, F depends so much on the number of Reynolds and the relative rugosity of the wall of the pipe. As the laminar flow (F) can be known by analysis, while the turbulent flow (F) is experimentally found. The friction factor increased the diminished Reynolds number, this shows the reverse proportion between the friction factor (F) and the number of Reynolds. With the fully open flow control vola, measure the loss of the head shown by the manometers. The experimental results must be divided into three groups (laminar, transitional and turbulent) and traced separately. Figure 4.1: Pipe friction test apparatus F1-18 7. Objective The objective of this experiment is to investigate the loss of the head due to the friction in a pipe and determine the associated friction factor under a rating range of rates Flow and flow regulations, that is, laminar, transitory and turbulent. In a graph, trace HL (Y axis) vs. Remove the clamps from the differential pressure manometer connection tubes, and purge any air of the air purge valve located on the side of the manometer. Jackie Meileen Yurong September 2021 Course Instructor This page is blurred because it is a premium document. Instead of using the diagram of a bad mood, F can be determined using empirical formula. Gross Data Tables: Test Test Experiment Test No. Loss of the Head (Bar) Volume (Liters) Time (s) 1 2 3 4 5 6 7 8 9 10 Gross Data Tables: Test Low Flow Speed Experiment No. H1 (M) H2 (M) Loss of the HL (M) Volume Head (liters) (S) 1 2 3 4 5 6 7 8 Water temperature: 9.2. The calculations calculate the values of the discharge; Average flow rate; and the experimental friction factor, f using equation 3, and the Number of Reynolds for each experiment. (Figure 4.3). The equation of Darcy-Weisbach is the Formula widely accepted to determine the energy of energy in the pipe flow. 3. Closing the flow control voper and turns off the pump. Che ã ¢ â,¬ "3103 Eng. yield, and provide relevant advertising. The Moody diagram is related to the relative roughness of the pipe wall (/ d) and the number of Reynolds (Figure 4.2). Assuming a relationship of the form, calculate the values K and N of the graphic of experimental data that has drawn and compete with the accepted values shown in the theoretical section (equations 4 and 5). For each step, determine the flow rate by timed collection. Obtain data for ten flows. When the exit from the head tank pressure exit occ on this website. He found that the head of the head increases with the increase in speed. Open the control valve completely and slowly open the air purge voye of air. With the completely open flow control voyance, measure the head of the head shown by the manmeter. Closing the voyance of flow control of devices and takes a zero flow reading of the pressure meter. The entire friction factor is determined by measuring the difference in the pressure head between two fixed points in a straight tube with a circular transverse section for constant flows. As during the sudden amplification, the minor pigid It increased. To conclude, we mainly study the heads of the head in the pipes along different diameters and roughness. 5. What is the importance of changes in temperature to the head of the head? The difference in pressure measured by differential pressure. differential. It can be converted into an equivalent head lite (HL) using the conversion ratio: 1 bar = 10.2 m of water The low flow experiment, the low flow rate will be supplied to the test section by connecting the output pipe of the Hydraulic bank to the tank of the head with the tank with the head with the pump turned off. DESCRIPTION OF THE EQUIPMENT The pipe friction apparatus consists of a test pipe (mounted vertically on the platform), a constant head tank, a flow control flow, an air valve and two sets of manometers To measure the head lids in the pipe (Figure 4.1). What is the cumulative effect of experimental errors in the values of K and N? Discuss the following: Identify the rolling and turbulent flow schedule in your experiment. Record your calculations on the following sample result tables. This means that energy consumption, to overcome the frictional strength in a pipe that transmits a certain flow, can be significantly reduced at a relatively small capital cost. The average speed, V, is calculated from the volumetric flow (Q) as: The following dimensions of the test pipe can be used in the appropriate catcles [4]: â €

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