BME 332
Biomaterials and Biomechanics Lab

Lab 6
Hydraulics Bench Experiment-II

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Experiment -3.1

Examination of Pressure Losses in Different Diameter Straight Length Pipes

Aim of This Experiment

This experiment aimed to determine boundry layer thickness and energy loses causes friction on the pipes.

Procedure

1. Configure the pumps for parallelflow.
2. Switch on the pump(s).
3. Adjust the Flow to 50l/m using the flow control valve on the HB100.
4. Attach the positive end of the Manometer Coupling to the left hand side PressureTappingof the Smooth Pipe and the negative end to the right hand side. The flowof water in the Smooth Pipe is from left to right so the Manometer Coupling's arereversed for this pipe.
5. The pressure drop will be very small for the Smooth Pipe. In order to obtain a steadyreading place the Digital Manometer on a flat surface (such as a chair) in front of theHB100D and wait until the manometer tubes have stopped swinging.
6. Record the pressure drop.

7. Adjust the Flow rate to 40l/m and record the new pressure drop.
8. If only 1 pump is fitted the same procedure applies starting at a lower flow rate.
9. Reduce the flow rate until the lowest feasible flow rate is archived. It will be found that dueto the very small pressure drop in these pipes, operation at the lower end of the flow rangeis not practically feasible.
10. Once the Smooth Pipe is completed, switch the Manometer Coupling to theRough pipepressure tappings. The Rough Pipe operates from right to left. Ensurethe positive hose is connected to the right hand side tapping.
11. Repeat Steps 5 to 9.
12. Repeat the procedure again for the 20mm and ½” pipes.

Experiment -3.2

Demonstration of the Pressure Drop across a Sudden Constriction

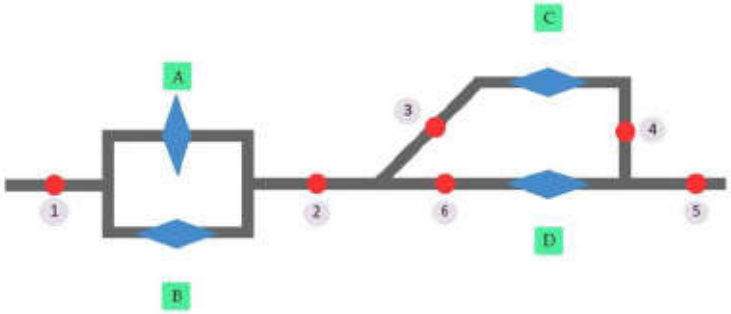
Aim of This Experiment

This experiment aimed to determine velocity changes and pressure drops on sudden constriction connection.

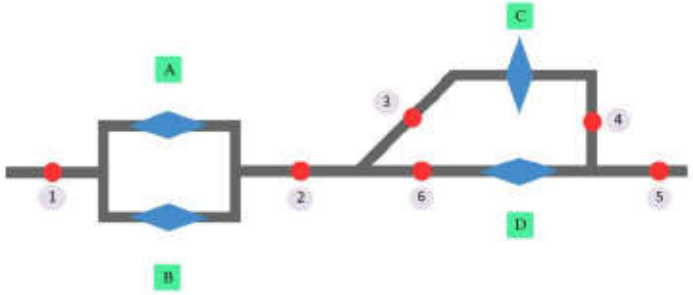
Procedure

1. Configure the pumps for parallel flow.
2. Switch on the pump(s).
3. Adjust the Flow to 50l/m using the flow control valve on the HB100.
4. Attach the positive end of the Manometer Coupling to the right hand side Pressure Tapping of the Sudden Constriction and the negative end to the left hand side. The flow of water in this section is from right to left.

5. Record the flow rate and pressure drop.
6. Reduce the flow rate to 40l/m and repeat the observations.
7. Repeat this procedure until the lowest sensible results are achieved.
8. Close Valve A as shown below and repeat the test again.



9. Open Valve A and close Valve C as shown below and repeat the test again.



10. Open Valve C and close Valve D as shown below and repeat the test again.

Kinematic viscosity, ν, of water at varying temperatures:

Temperature (°C)	Kinematic Viscosity (m^2/s) x 10^{-6}
0	1.787
5	1.519
10	1.307
20	1.004
30	0.801
40	0.658
50	0.553
60	0.475
70	0.413
80	0.365
90	0.326
100	0.29