University of Technology / Petroleum Technology

Laboratory section / Fluid flow of oil laboratory

Guide of fluid flow of oil laboratory

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Introduction

The fluid flow of oil laboratory is considered one of the important and complementary laboratories for the theoretical material (fluid flow) through the practical applications it offers specialized in studying the flow of fluids inside the tubes, which allows the student to be familiar with all the requirements of the applied work of this specialization.

The laboratory includes 18 modern devices used in many experiments to measure flow rates and the extent of the losses that occur while running through the pipes**.**

The purpose of the laboratory

Presenting a practical and practical study specialized in studying the flow of fluids inside the tubes, their rates, the difference in pressures, and the extent of energy loss that occurs due to the passage of the fluid through the tubes. This study is presented to students of primary studies / second stage.

The experiments and the devices of the laboratory

1- Name of the experiment: hydraulic bench.

Device name: hydraulic bench. (fig1)

Objective: determining the volumetric flow rate of the fluid.

Fig-1-

2-A. **Name of the experiment:** Osborne-Reynolds and laminar flow Demonstration

Device name: Osborne-Reynolds demonstration. (fig2-A)

Objective: The purpose of this experiment is:-

a. Observation of the laminar, transition and turbulent regime.

b. Study of the velocity profile, reproducing the Osborne-Reynolds's experiment.

c. Reynolds's number calculation.

Fig-2-A

B. Name of the experiment: Osborne-Reynolds Demonstration & Laminar Flow Demonstration.

Device name: Laminar Flow Demonstration. (Fig2-b)

Objective: Observation of the laminar, transition and turbulent regime.

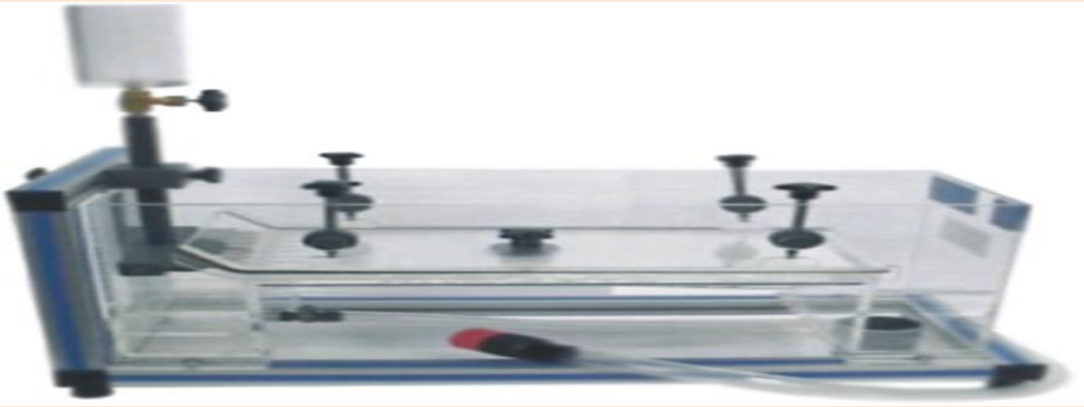

Fig 2-b

3- Name of the experiment: flow through a Venturi meter.

Device name: Venturi, Bernolli and Gravitation unit. (fig3)

Objective:

A. To calibrate venture meter by establishing the relationship between flow rate (A_{ct}) and pressure difference, thus establishing the value of the coefficient of discharge (Cd).

b. To measure the pressure distribution along with the meter and compare it with the ideal pressure distribution.

Fig-3-

4- Name of the experiment: Head losses in bends.

Device name: Energy Losses in Bends. (fig4)

Objective: To investigate the energy losses and the effect of velocity on the head losses in the following systems:

1. Two elbows of 90º, a short one and a middle one.
2. A curve of 90º or long elbow
3. A widening
4. A sudden section narrowing
5. Membrane valve
6. A sudden direction change, miter type.

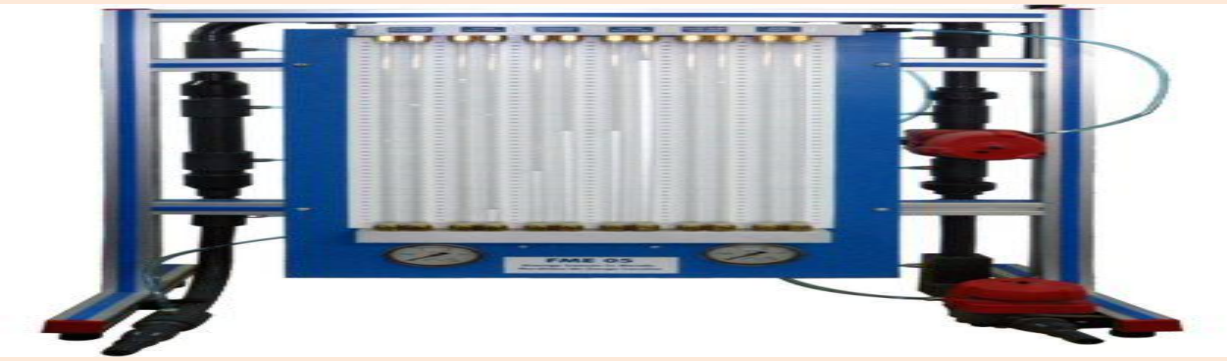

Fig-4-

5-A. Name of the experiment: Energy losses in piping system.

Device name: Fluids friction measurement. (fig5)

Objective: a. It is used to determine the relationship between the head losses due to fluid friction and velocity of flow of water through smooth and bore pipes.

b. To compare the head losses predicted by a pipe friction equation with direct measure head loss.

c. To determine the fluid friction in different bore pipes.

B. Name of the experiment: Fluid friction in a smooth & roughened pipe + flow measuring and valves.

Device name: Fluid Friction Measurement. (fig5)

Objective: Determine the fluid friction in different pipes.

Compare the methods of flow measuring using venture, orifice and pitot tube.

Determine the fluid friction in gate and globe valve.

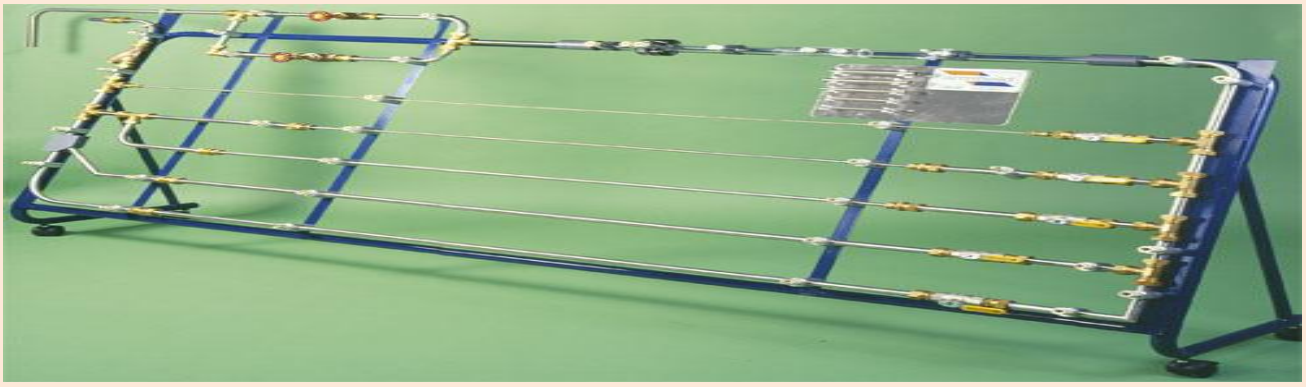

Fig-5-

6- Name of the experiment: Bourdon manometer calibration (dead weight).

Device name: Bourdon Manometer Calibrator. (Fig 6)

Objective: To carry out the confirmation of the readings of a Bourdon manometer using patron equipment of calibrated weights.

Fig-6-

Other experiments and devices

The laboratory contains a number of other devices that are used in conducting experiments and other calculations, including:

1- **Name of the experiment:** centrifugal pump characteristics.

Device name: centrifugal pump characteristics. (fig7)

Objective: to determine the pump efficiency and pump characteristic curves.

Fig-7-

2- **Name of the experiment:** impact of a jet.

Device name: impact of a jet. (fig8)

Objective:

1. The purpose of this experiment is to produce and measure forces due to the impact of water jet on target (flat plate, cone and hemi sphere).
2. Comparing results with theoretical force developed by change of momentum jet.

Fig-8-

3- Name of the experiment: Pitot tube.

Device name: Pitot static tube. (Fig 9)

Objective:

a. Demonstrate Pitot tube device.

b. Indication fluid flow velocity.

c. Determination of tube flow speed profile**.**

Fig-9-

4- Name of the experiment: energy losses in pipes.

Device name: friction loss along a pipe. (fig10)

Objective: determination of the energy losses of a pipe in the laminar and turbulent regimen.

Fig-10-

5- Name of the experiment: cavitations phenomena

Device name: Venturi and cavitations apparatus. Fig (11)

Objective:

a. Notice the cavitations phenomena with forced piping.

b. Calculate the cavitations number.

Fig-11-

6- Name of the experiment: Unit for studying of porous beds in Venture Tube.

Device name: Unit for studying of porous beds in Venture Tube. (fig12)

Objective: To determine of the exact section in a venture tube by which the pressure is measured allows obtaining the exact hydrostatic pressure of the system and checking Bernoulli's equation.

Fig-12-

7- Name of the experiment: flow measurement by orifice meter

Device name: orifice discharge. Fig (13)

Objective: To determine the co-efficient of discharge of the orifice meter using the same principle as a Venturi meter, namely Bernoulli's principle which states that 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, 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 is called vena contract point.

Fig -13-