Various devices are available to measure the fluid flow rate. Majority of these devices use Bernoulli's theorem which states that the sum of pressure head, velocity head and the potential head is constant along a streamline for a steady, inviscid and incompressible flow of fluid. Measurement of fluid flow rate is important to the students of mechanical, chemical, civil and several other branches of engineering.

The Tesca Flow Meter Demonstration Apparatus is a mobile bench top unit and has been designed to demonstrate the working of the venturi meter, orifice plate and the turbine flow meter. The apparatus consists of a piping net work with flow meters located suitably and instrumented with static pressure taps. Provision is made to calibrate and determine the coefficient of discharge of venturimeter and orifice plate. The turbine flow meter is used as a reference. The flow meters are calibrated by static pressure measurements using manometers and actual flow measurements using graduated measuring tanks of the hydraulic bench. Wall pressure tappings are provided along the converging and diverging portions of the venture-meter to measure the static pressure distribution. Multi-tube manometer having a manifold with an air bleed valve is supplied to make static pressure measurements. The manometer is pressurized by a hand pump.

Water is supplied by a hose connection to the inlet and flow rate is varied by a valve at the outlet. The complete unit is manufactured from corrosion resistant materials. The 32096 Hydraulic Bench or any other standard hydraulic bench models can be used to supply water.

OPTIONS:

1) Test Rig for Calibration of different flow meters:

   The Test Rig can be used for calibrating different flow meters like venture meter,

   orifice meter, rotameter etc. The flowmeter to be calibrated can be fitted to the apparatus. The apparatus will have a master flow sensor with accuracy of +/- 2% which can be used as a reference for calibration of flowmeter.

   Recommended options – 1st with differential pressure transmitter & other with conventional u tube manometer.

2) Computer based learning software is included to enable students to understand

Note: Specifications are subject to change.

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and conduct experiments, tabulate results and plot graphs. The Flow Meter Demonstration Apparatus is an important experimental setup for any Fluid Mechanics and Hydraulics Laboratory of an educational institution.The manual describing the theoretical and practical aspects of the apparatus, operation and maintenance, analysis of results and sample of results will be supplied with the equipment.

Experiments:

1. Familiarization with static pressure measurements.
2. Familiarization with flow measurement techniques.
3. Determination of coefficient of discharge of orifice plate.
4. Determination of coefficient of discharge of venturimeter.
5. Demonstration of continuity equation.
6. Demonstration of Bernoulli's theorem.
7. Study of static pressure variation along the venturi at different flow rates.
8. Study of working and calibration of turbine flow meter.

Measurements:

1. Static pressures along the venturimeter.
2. Static pressures across the orifice plate.
3. Flow rate using turbine flow meter.
4. Actual volume flow rate using Hydraulic Bench or graduated tank.

Important Features and Specifications:

1. Piping system, 25mm nominal bore, and stainless steel.
2. Venturimeter, transparent, made of clear Acrylic and having convergent and divergent portions, throat diameter:

   15mm, maximum diameter: 31.75mm, upstream taper: 210, downstream taper: 140. No. of static pressure taps: 7.
3. Orifice plate, 20mm nominal diameter.
4. Turbine flow meter, 2 - 20 liters/min, max. flow rate.
5. Multi-tube manometer, 0-440 mm water column, No. of tubes: 8 with hand pump.

Options:

1. Other types of water flow measuring devices such as (a) Sudden Enlargement, (b) Elbow (c) Variable Area Rotameter (d) Nozzle and (e) Pitot-tube with necessary pressure instrumentation can be included in the apparatus to suit the requirements of the user on request.

2. Vortex Flow Meter

The vortex flow meter is installed in the water circuit of the 'Flow Meter Demonstration 32019 trainer. It operates according to the principle of Von Karman vortex shedding. Downstream of a dam body in a flow, vortices alternately form which are separated off by the flow.

The frequency of the vortex separation to both sides of the dam body is proportional to the flow rate. The separated vortices alternately generate local vacuum which is measured using capacitive pressure sensors. The pressure signals are converted and indicated as the flow rate on a display. The necessary connections are provided so that the pressure loss can be determined with 32019.

Note: Specifications are subject to change.

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Specifications:

1. vortex flow meter as accessory for 32019 trainer
2. operation according to Von Karman vortex shedding display indicating flow rate
3. connections to facilitate pressure loss measurement with the 32019
4. connections to supply auxiliary power via the 32019
5. vertical and horizontal installation possible.

Technical Data:

1. Max. flow rate: 5200L/h
2. Auxiliary power: 24VDC
3. Pipe connections: DN 32

A self contained unit of Flow Meter Demonstration Apparatus mounted on a mobile platform with a flow controlled closed circuit water circulation unit consisting of a centrifugal pump, corrosion resistant sheet metal measuring tank and a sump tank will be supplied on request.

Services Required:

1. Water Supply.
2. Electrical Supply, 240 V, single-phase, 50 Hz.

Overall Dimensions:

Height: 0.75m, Width: 0.45m, Length: 0.95m.

The manual describing the theoretical and practical aspects of the apparatus, operation, analysis of results, and sample of results will be supplied with the equipment.

Note: Specifications are subject to change.

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