



Gokaraju Rangaraju

Institute of Engineering and Technology

Fluid Mechanics and Hydraulic Machinery Laboratory

EXPERIMENT

FM and HMM Lab Experiment Applications & Uses

Venturimeter and orifice meter Both are used to measure the flow rate of gases and liquids.



Flow is measured using the differential pressure principle. Differential pressure integrated with time, so that it is used to any engineering parameters like flow rate, speed, etc

1. Venturimeter

Industrial applications:



Aviation , Automotive ,chemical , petro chemical industries,etc.

Aviation To measure the speed of the air around the plane.

Automotive To measure the fuel and air distribution in carburettor

Medical To measure the Volume flow of blood through vessels.

Chemical To measure the Flow rate of chemical through pipes



2. OrificeMeter

Orifice meter

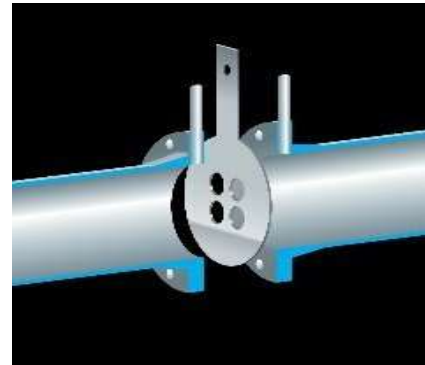
Either volumetric or mass flow rate determination

Often called as Restriction plate. Orifice is a circular plate used to measure the discharge through pipe.



Industrial applications :

Chemical, petro chemical, water treatment plants, power generation, gas generation and distribution, etc.



3. Triangular Notch

Notch is discharge measurement device used in the laboratory for the various discharge conditions. There are triangular notch , rectangular notch , trapezoidal notch used to calculate discharge

A triangular notch gives much more accurate results in low discharge conditions, as compared to the conventional rectangular notch. Also, only one reading (the head) is required to calculate the discharge rate, making calculations much easier. However, it cannot handle large volumes of flow rate accurately. And that's where rectangular notch comes into play. It is suitable where space is prime important





4. Rectangular Notch

A rectangular notch gives much more accurate results in high discharge conditions, as compared to the conventional triangular notch. Also, only one reading (the head) is required to calculate the discharge rate, making calculations much easier. However, it cannot handle large volumes of flow rate accurately. And that's where rectangular notch comes into play.

5. Reynolds Experiment Laminar Flow Through Pipes

And

6. Reynolds Experiment Laminar Flow Through Pipes

Reynolds Experiment is used to determine the laminar and turbulent flows. Its Applications plays an important part in the calculation of the friction factor in a few of the equations of fluid mechanics, including the Darcy-Weisbach equation. It is used when modelling the movement of organisms swimming through water. Atmospheric air is considered to be a fluid. Hence, the Reynolds number can be calculated for it. This makes it possible to apply it in wind tunnel testing to study the aerodynamic properties of various surfaces. It plays an important part in the testing of wind lift on aircraft, especially in cases of supersonic flights where the high speed causes a localized increase in the density of air surrounding the aircraft.



7. Verification of Bernoulli's theorem

Bernoulli's equation is called energy equation. In the laboratory it is verified that energy at different sections are constant. Bernoulli's energy used in sizing of pumps, flow sensors, ejectors, carburetor, siphon, pitot tube etc. Applications are In Pumps Volute in the casing of centrifugal pumps converts velocity of fluid into pressure energy by increasing area of flow. The conversion of kinetic energy into pressure is according to the Bernoulli's theorem states that for steady, uniform and laminar flow of an incompressible fluid, the total energy per unit weight or total head of each particle remains same along a stream line provided no energy is gained or lost. Most, Bernoulli's theorem can be expressed as Total head (or) total energy per unit weight





8. Impact Of Jet On Vanes



Impact of jet Principles are applied for the hydraulic turbines .Impact coefficient is calculated to design the vane thickness in hydraulic turbine. To measure the volumetric flow rate. They are of particular use in large scale situations such as irrigation schemes, canals and rivers. To verify the integral and momentum equation of fluid flow. This impact of jets are used in pelton wheel , kaplane and Francis turbine in the form of velocity triangles

9. Centrifugal Pump



Common uses include water, sewage, petroleum and petrochemical . pumping a centrifugal fan is commonly used to implement a vacuum cleaner. They are used often in oil refineries and power plants. Used in municipal water supply from the pressure main in cases where a little or no suction lift is required. They can also be used for boiler feed applications, wastewater management, flood protection, drainage and irrigation. Centrifugal pumps also have numerous building applications. They are used to provide booster service into homes. They are also used in fire protection sprinkler systems or to circulate hot water.



10. Multistage Centrifugal Pump



In given centrifugal pump, more than one impeller is provided then they are called multi stage centrifugal pumps. This type pump are Design the high discharge and higher elevation in the irrigation field . Pressure boosting in buildings, hotels, residential complexes, pressure booster stations, supply of water networks, pressure boosting for industrial water supply. Washing and cleaning systems, car washing facilities fire fighting systems, process water systems, machine tools (cooling lubricants). Irrigation and agriculture: greenhouses, sprinkler irrigation, flood irrigation.

11. Major Losses In pipe flow



It is major loss in the pipe net working is also called pipe friction loss. This loss has various problems created in the pipe net working To Design municipal Water distribution system (friction loss are essential) Loss of head is calculated to deliver the Sufficient discharge of water at destination. Design the penstock for the Hydropower plants. Minor losses are also called pipe fitting and fixture losses or plumbing losses This losses are included about the valve fitting ,loss due to enlargement and contractions and pipe bends in the pipe networking. Various applications To Design municipal Water distribution system (friction loss are essential Used in Designing of penstock for the Hydropower plants.

12. Minor Losses In Pipe Flow

13 Pelton Wheel

Pelton wheel is impulsive turbine used to Generate hydro power. Pelton



Turbine

wheels are the preferred turbine for hydro-power, when the high hydraulic head at low flow rates. There exist multi-ton Pelton wheels mounted on vertical oil pad bearings in hydroelectric plants. The largest units power can be generated up to 200 megawatts. The smallest Pelton wheels are only a few inches across, and can be used to tap power from mountain streams having flows of a few gallons per minute.



14. Hydraulic Jump

Hydraulic jump is useful to get the energy created due to hydraulic jump and require to design the dam downstream side apron. To design open channels it requires to calculate the specific energy for various alternative depths in the hydraulic jump. Stilling basin is designed at the downstream side of dam by considering the Hydraulic jump energy dissipation.

