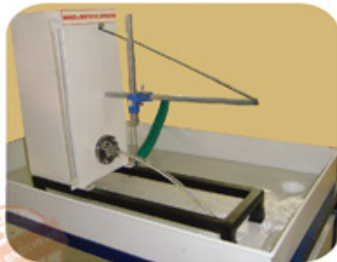




Free & Force Vortex Apparatus



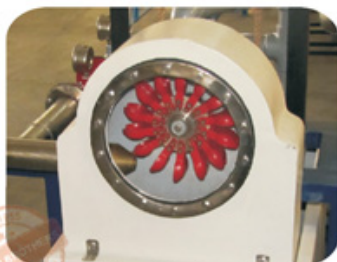
Metacentric Height Apparatus



Orifice & Mouthpiece Apparatus



Francis Turbine Model



Pelton Wheel Turbine Test Rig



FLUID MECHANICS LAB



(I) FLUID MECHANICS LAB

1300 Reynold's Apparatus

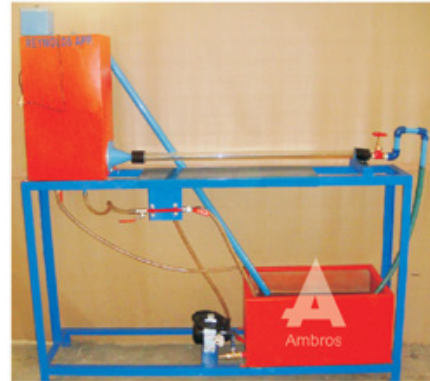
The Set-up is designed to verify Reynold's Apparatus experimentally. The Apparatus consists of a glass tube with one end having bell mouth entrance connected to a water tank. At the other end of the glass tube a cock is provided to vary the rate of flow. Flow rate of water can be measured with the help of Measuring Cylinder and Stop Watch, supplied with the set-up. A capillary tube is introduced centrally in the bell mouth. To this tube dye is fed from a small container, placed at the top of Constant head Tank, through polythene tubing.

EXPERIMENTS

- To study different types of flow.
- To determine the Reynold's Number and hence the type of flow either laminar or turbulent.

TECHNICAL SPECIFICATION

- Tube : Material Borosilicate Glass
- Dye Vessel : Material SS, Suitable Capacity
- Capillary Tube : Material Copper/Stainless Steel
- Constant Head Water Tank : Capacity 40 Ltrs.
- Water Circulation : FHP Pump
- Flow Measurement : Using Measuring Cylinder
- Sump Tank : Capacity 60 Ltrs.
- Stop Watch : Electronic
- Control Panel Comprises of : Standard make, On/Off Switch, Mains Indicator, etc.
- The Whole set-up is well designed and arranged in a good quality painted structure.



UTILITIES REQUIRED

- Water Supply.
- Drain
- Electricity Supply

1301 Bernoulli's Theorem Apparatus

The Set-up is designed to verify Bernoulli's Theorem experimentally. Set up consists of a one piece clear acrylic test section with convergent and divergent part section, supply tank, measuring tank, inlet water tank and pump for closed loop water circulation. The test section is connected to Piezometer tubes through pressure tapping at different locations on the section to demonstrate the Bernoulli's Theorem. The flow rate of water is measured using measuring tank and stop watch provided.

EXPERIMENTS

- To verify Bernoulli's Theorem experimentally.

FEATURES

- Clear test section
- Closed loop water circulation
- Compact & stand alone setup
- Stainless Steel tanks and wetted parts
- Superb Painted structure
- Simple to operate & maintain

TECHNICAL SPECIFICATION

- Test Section : Material Acrylic, Size
- Inlet Tank : Capacity 20 Liters., Stainless Steel
- Supply Tank : Capacity 70 Liters., Stainless Steel
- Measuring Tank : Capacity 20 Ltrs.
Fitted with Piezometer Tube & Scale
- Piezometer Tubes : Material P.U. Tubes (9 Nos.)
- Pump : FHP Capacity make Tullu / Crompton Graves
- Piping : GI / PVC Size BSP
- Stop Watch : Electronic
- The whole Set-up is well designed and arranged in a good quality painted Structure.



UTILITIES REQUIRED

- Electricity Supply : Provide 230 +/- 10 VAC, 50 Hz, Single Phase electric supply with proper earthing (Neutral - Earth voltage less than 5 VAC) 5 A, three pin socket with switch for pump
- Water Supply : Tap water connection ½ " BSP, Distilled water @ 60 Ltrs. (Optional).
- Drain

1302 Discharge Over Notches Apparatus

The Lab setup consists of a channel having sufficient length and width in which water is supplied from the bottom. Required Notch is fitted at one end of this channel. A hook gauge with Vernier scale is fitted to measure the height of fluid in flow channel. Arrangement for fixing interchangeable notches is made. Set of three brass notches, i.e. rectangular notch, 60V notch & 45V notch provided along with the set up. Present set up is self contained water re-circulating unit provided with a sump tank and a centrifugal pump etc. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rate. Flow rate of water is measured with the help of measuring tank and stopwatch.

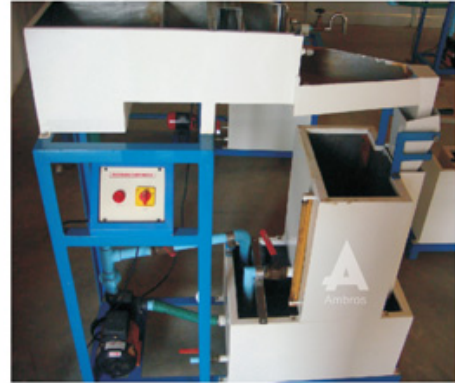
EXPERIMENTS

To Determine Co-efficient of discharge (Cd) through

- V notch (45 deg. and 60 deg.)
- Rectangular Notch.
- Trapezoidal Notch

TECHNICAL SPECIFICATION

- Channel Test Section : Size 600x250x180 mm
- Notches : Material Brass(3 Nos)
 1. Rectangular Notch
 2. 45 deg. V Notch
 3. 60 deg. V Notch
 4. Trapezoidal Notch
- Hook / Pointer : With Vernier Scale
- Water Circulation : FHP Pump, Crompton/Sharp make.
- Flow Measurement : Using Measuring Tank with Piezometer, Cap.25 Ltrs.
- Sump Tank : Capacity 70 Liters.
- Stop Watch : Electronic
- Control Panel : On/Off Switches, Main Indicator etc.
- The whole Set-up is well designed and arranged in a good quality painted Structure.
- Tanks will be made of Stainless Steel.



UTILITIES REQUIRED

- Water Supply & Drain
- Electricity 0.5kw, 220V AC, Single Phase

1303 Venturimeter & Orificemeter Calibration Set-up

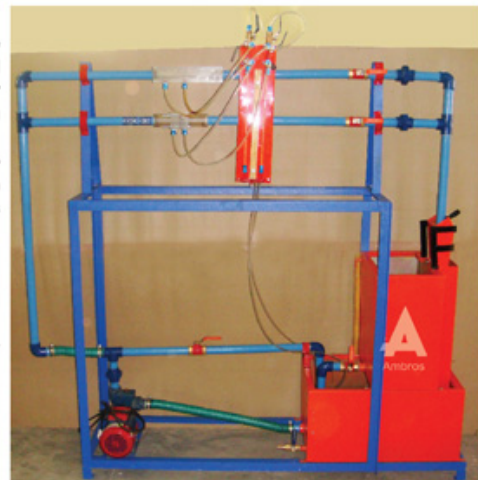
The apparatus consists of two pipelines emerging out from a common manifold. One pipeline contains a Venturimeter, second contains an Orifice. The pressure tapings from the Venturimeter and Orificemeter are taken to differential manometer to measure pressure difference. The Venturimeter and Orificemeter are connected in parallel and anyone of them can be put in operation by operating valves provided at the downstream. These valves can also regulate the flow. Present Set-up is self contained water re-circulating unit, provided with a sump tank and a centrifugal pump. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rate. Flow rate of water is measured with the help of measuring tank and stop watch.

EXPERIMENTS

- To determine the Co-efficient of discharged through Venturimeter and Orificemeter
- To measure discharge through Venturimeter and Orificemeter as flow meters.

TECHNICAL SPECIFICATIONS

- Venturimeter : Material Clear Acrylic, Compatible to 1" Dia pipe
- Orificemeter : Material Clear Acrylic, Compatible to 1" Dia. Pipe
- Water Circulation : FHP Pump, Crompton / Sharp make
- Flow Measurement : Using Measuring Tank, Capacity 25 Ltrs.
- Sump Tank : Capacity 50 Ltrs.
- Stop Watch : Electronic
- Control Panel : On / Off Switch, Mains Indicator etc.
- Tanks will be made of Stainless Steel.
- The whole Set-up is well designed and arranged in a good quality painted Structure.



UTILITIES REQUIRED

- Water Supply & Drain
- Electricity Supply : Single Phase, 220 VAC, 0.5 kW

1304 Study of Pipe Fitting

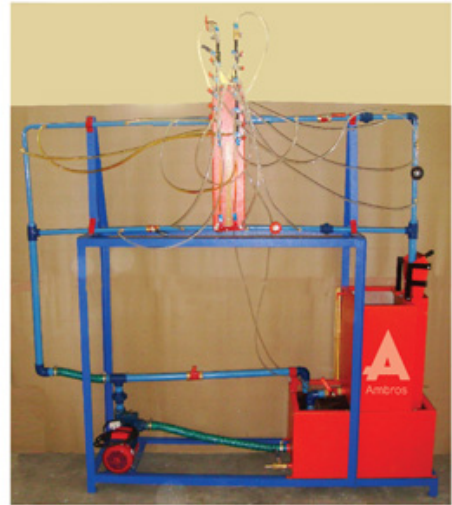
The Set-up consists of a $\frac{1}{2}$ bend and elbow, a sudden expansion & sudden contraction fitting from 15 mm to 25 mm, ball valve and gate valve. Pressure tapings are provided at inlet and outlet of these fittings under test. A differential manometer fitted in the line gives pressure loss of individual fitting. Present Set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rates. Flow rate of water is measured with the help of measuring tank and stop watch.

EXPERIMENTS

- To determine loss of head in the fitting at various water flow rates.
- To measure the loss co-efficient for the pipe fittings.

TECHNICAL SPECIFICATION

- | | | |
|---|---|---|
| • Sudden Enlargement | : | From 15 mm to 25 mm |
| • Sudden Contraction | : | From 25 mm to 15 mm |
| • Bend | : | $\frac{1}{2}$ |
| • Elbow | : | $\frac{1}{2}$ |
| • Ball Valve | : | $\frac{1}{2}$ |
| • Gate Valve | : | $\frac{1}{2}$ |
| • Water Circulation | : | FHP Pump, Crompton / Sharp make |
| • Flow Measurement | : | Using Measuring Tank with Piezometer, Capacity 25 Ltrs. |
| • Sump Tank | : | Capacity 50 Ltrs. |
| • Stop Watch | : | Electronic |
| • Control Panel | : | On / Off Switch, Mains Indicator etc. |
| • The whole Set-up is well designed and arranged in a good quality painted Structure. | | |



UTILITIES REQUIRED

- Water Supply and Drain
- Electricity Supply: Single Phase, 220 V AC, 0.5 KW.

1305 Friction In Pipe Lines Apparatus

The Set-up consists of 2 pipes of different diameters, which are connected in parallel. Pressure tapings are provided on each pipe to measure the pressure losses with the help of a Differential Manometer. Control valves are fitted on each pipe, which enables to use one pipe at a time for experiment. Present set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rates. Flow rate of water is measured with the help of measuring tank and stop watch.

EXPERIMENTS

- To determine the losses due to friction in pipes
- To determine the friction factor for Darcy Weis back equation

TECHNICAL SPECIFICATION

- | | | |
|---|---|---|
| • Pipes (2 Nos.) | : | Material GI of $\frac{1}{2}$ " & 1" Diameter |
| • Pipe Test Section | : | Length 1 m |
| • Water Circulation | : | FHP Pump, Crompton / Sharp make |
| • Flow Measurement | : | Using Measuring Tank with Piezometer, Capacity 25 Ltrs. |
| • Sump Tank | : | Stainless Steel, Capacity 50 Ltrs. |
| • Stop Watch | : | Mechanical / Electronic |
| • Control Panel | : | On / Off Switch, Mains Indicator etc. |
| • The whole Set-up is well designed and arranged in a good quality painted Structure. | | |



UTILITIES REQUIRED

- Water Supply & Drain
- Electricity Supply: Single Phase, 220 V AC, 0.5 KW

1306 Impact Of Jet On Vanes Apparatus

The Set-up consists of two sided clear fabrication. Water is fed through a nozzle and discharged vertically to strike a target carried on a stem, which extends through the cover. A weight carrier is mounted on the upper end of the stem. The dead weight of the moving parts is counter balanced by a compression spring. The vertical force exerted on the target plate is measured by adding the weights supplied to the weight pan until the mark on the weight pan corresponds with the level gauge. A total of two targets are provided a flat plate and a hemispherical cup.

EXPERIMENTS

- To measure the force developed by a jet of water impinging upon a different targets (Hemispherical & Flat Plate) and comparison with the forces predicted by the momentum theory.

TECHNICAL SPECIFICATION

- Test Plates : Material Brass (2 Nos.)
- 1. Flat Plate
- 2. Hemispherical Cup
- Nozzle : Material Brass
- Stainless Steel Chamber : Having of opposite sides made of glass
- Water Circulation : FHP Pump, Crompton / Sharp make
- Flow Measurement : Using Measuring Tank with Piezometer, Capacity 40 Ltrs.
- Sump Tank : Capacity 60 Ltrs.
- Stop Watch : Electronic
- Control Panel : On / Off Switch, Mains Indicator etc.

The whole Set-up is well designed and arranged in a good quality painted Structure



UTILITIES REQUIRED

- Water Supply & Drain
- Electricity Supply : Single Phase, 220 VAC, 0.5 KW

1307 Metacentric Height Apparatus

A pontoon is allowed to float in a small tank having a transparent side. Removable steel strips are placed in the model for the purpose of changing the weight of the model. Displacement of weight is measured with the help of a scale. By means of a pendulum (consisting of a weight suspended to a long pointer) the angle of tilt can be measured on a graduated arc.

For tilting the ship model, a cross bar with two movable hangers is fixed on the model. Pendulum and graduated arc are suitably fixed at the center of the cross bar. A set of weights is supplied with the apparatus.

EXPERIMENTS

- Determination of the Metacentric height and position of the Metacentric height with angle of heel of ship model.

TECHNICAL SPECIFICATION

- Pontoon : Size 300 x 150 mm (Approx.) with a Horizontal Guide Bar for aliding weight.
- Material : Stainless Steel Pontoon
- Water Tank : Size 600 x 400 x 400 mm (Approx.)
- Front Window of Tank : made of Glass/Perspex
- A set of weights is supplied with the apparatus.
- The whole Set-up is well designed and arranged in a good quality painted Structure.



1308 Pitot Static Tube Set-up

A Pitot tube is used to measure the local velocity at a given point in the flow stress. A Pitot tube of standard design made of copper / SS is supplied and is fixed below Vernier scale. The Vernier scale is capable to measure the position of Pitot tube in transparent pipe section. The pipe has a flow control valve to regulate the flow. A U-tube manometer is provided to determine the velocity head. Present Set-up is self-contained water re-circulating unit, provided with a sump tank and a centrifugal pump etc. Flow control valve and by-pass valve are fitted in water line to conduct the experiment on different flow rates. Flow rate of water is measured with the help of measuring tank and stop watch.

EXPERIMENTS

- To find the point velocity at the centre of a tube for different flow rates of water and calibrate the Pitot tube
- To plot velocity profile across the cross section of pipe

TECHNICAL SPECIFICATION

- Pitot Tube : Material Copper/SS of compatible size fitted with Vernier Scale
- Test Section : Material Clear Acrylic, Compatible to 1" Dia. Pipe
- Water Circulation : FHP Pump, Crompton / Sharp make
- Flow Measurement : Using Measuring Tank, Capacity 40 Ltrs.
- Sump Tank : Capacity 70 Ltrs.
- Stop Watch : Electronic
- Control Panel : On / Off Switch, Mains Indicator etc.
- The whole Set-up is well designed and arranged in a good quality painted Structure.

UTILITIES

- Water Supply & Drain
- Electricity Supply: Single Phase, 220 VAC, 0.5 KW

1309 Free And Force Vortex Apparatus

The experimental set up consist of a circular transparent cylindrical tank in which four circumferential jets have been placed along the circumference of the cylinder near its bottom which helps in the formation of free vortex. It is assumed that the torque exerted by these jets is negligible. The Orifice is reducing bush so that a reduced diameter can be investigated. The plate can also be rotated with the help of a variable speed motor so that the cylinder rotates about its vertical Axis with the help of a V belt and forced vortex is formed. Conditions wear allowed to steady state and the depth of flow at any particular point was observed not to change over a period of time. The experimental procedure involves measurement of resulting free surface that represents the variation of the sum of the pressure and datum head.

EXPERIMENTS

- To plot the surface profile of a free and forced vortex by measurement of the surface profile coordinates and to show that total energy is constant throughout vortex.

TECHNICAL SPECIFICATION

- Cylinder : Material Acrylic Dia. 200mm approx
- Height of Overflow point : 150mm
- Drive : FHP variable speed motor, speed way
- The whole Set-up is well designed and arranged in a good quality painted Structure.



1310 Orifice & Mouthpieces Apparatus

An orifice is an opening made in the side or bottom of tank, having a closed perimeter, through which the fluid may be discharged. A mouthpiece is short tube fitted to a same size circular opening provided in a tank so that fluid may be discharged through it. Orifice and mouthpiece are used to measure the rate of flow of liquid. The apparatus is designed to measure the co-efficient of discharge of orifice & mouthpiece.

The apparatus consists of a supply tank, at the side of which a universal fixture for mounting orifice or mouthpiece is attached. A centrifugal pump supplies the water to supply tank. Head over the orifice/mouthpiece is controlled by a by pass valve provided at pump discharge. A measuring tank is provided to measure the discharge. A gauge for measuring X and Y co-ordinates of jet from the orifice is provided, which is used to calculate CV of orifice.

SPECIFICATIONS

- Supply Tank - 0.4 X 0.3 X 0.5m height
- Orifice - 8mm and 10 mm.
- Mouthpiece
- LID = 4
- L/D = 1
- Bordas mouthpiece.
- Convergent mouthpiece.
- X-Y gauge for orifice jet co-ordinates.
- Measuring tank of suitable capacity OR a calibrated water flow meter.
- Sump tank of suitable capacity.
- 0.5 HP pump with valve.

A technical manual accompanies the unit.



SERVICES REQUIRED

- Flow surface 2 mtrs. X 1 mtr. X 1.5 mtrs. height.
- 230 Volts, 5 Amp. Stabilized AC. Power Supply.

1311 Study Of Flow Measurement Devices

Measurement of liquid flow is required at various places and for various purposes. Different types of flow measuring devices are used depending upon the system conditions, accuracy required, skill of operator and economy desired. The unit demonstrates some of the flow measurement devices.

SPECIFICATIONS

- [1] Intergratiry Type Turbine flow meter.
- [2] Glass Tube Rotameter.
- [3] Orificemeter differential manometer.
- [4] Venturimeter
- [5] Measuring Tan
- [6] Stop Watch (Digital)
- [7] 112 HP Monoblock Pump.
- [8] A differential manometer.
- [9] Sump tank of suitable capacity.

SERVICES REQUIRED

- Flow surface 2 mtrs. X 1 mtr. X 1.5 mtrs. height.
- 230 Volts, 5 Amp. Stabilized AC.Power Supply.

A technical manual accompanies the unit.

1312 Flow Over Weir or Open Channel Apparatus

A 'WEIR' is the name given to concrete or masonry structure built across a river (or stream) in order to raise the level of water on the upstream side and to allow the excess water to flow over its entire length to the downstream side. Weirs may also be used for measuring the rate of flow of water in river or streams.

Different shapes of "WEIRS" generally used are sharp-crested weir, broadcasted weir and ogee shaped weir. In the unit a centrifugal pump sucks the water from the sump tank, and discharges it to a small flow channel. The weir is fitted at the end of channel. All the weirs are interchangeable. The water-flowing over the weir falls in the collector. Water coming from the collector can be directed to the sump or can be directed in to the measuring tank for measurement of flow.

SPECIFICATIONS

- [1] The unit is provided with following weirs:
 - (a) Sharp-crested weir.
 - (b) Broad-crested weir.
 - (c) Ogee shaped weir.
- [2] Pump 1/2 H.P. monoblock.
- [3] Flow measurement - Measuring tank calibrated water flow meter is used.

A technical manual accompanies the unit.



(II) HYDRAULIC MACHINES LAB

1350 Pelton Wheel Turbine Test Setup

Pelton Wheel Turbine is only impulse water turbine now in common use, named in honor of Sir L.A. Pelton (1829-1908) of California, USA. It is a tangential flow impulse turbine. The water strikes the buckets along the tangent of the runner. The energy available at the Inlet of the Turbine is only kinetic energy. The Pressure at the Inlet and Outlet of the atmospheric. This turbine is used for high heads. The Present Set-up consists of a runner. The buckets are mounted on the runner. The water is fed to the turbine, through SS nozzle with a SS spear, by means of Centrifugal Pump, tangentially to the runner. Row of water into turbine is regulated by adjusting the spear position by the help of a given hand wheel. The runner is directly mounted on one end of a central SS shaft and other end is connected to a brake arrangement. The circular window of the turbine casing is provided with a transparent acrylic sheet for observation of flow on to the buckets. This runner assembly is supported by rigid MS structure. Load is applied to the turbine with the help of this brake dynamometer so that the efficiency of the turbine can be calculated. Pressure Gauge is fitted at the Inlet of the turbine to measure the total supply head of the turbine.

EXPERIMENT

- To study the operation of a Pelton Wheel Turbine
- To determine the Output Power of Pelton Wheel Turbine
- To determine the Turbine Efficiency

TECHNICAL SPECIFICATIONS

MODEL	1.33 HP	2 HP	5 HP
Output Power	1.33 HP / 1 KW	2 HP / 1.5 KW	5 HP / 3.75 KW
Discharge	300 LPM (Approx.)	400 LPM (Approx.)	630 LPM (Approx.)
Supply Head	25 m	40 m	45 m
Rope Brake Dynamometer	Dia 200 mm	Dia 200 mm	Dia 300 mm
Sump Tank	Capacity 150 Liters.	Capacity 200 Liters.	Capacity 300 Liters.
Water Circulation	Capacity 5 HP	Capacity 7.5 HP	Capacity 15 HP
Centrifugal Pump	Three Phase	Three Phase	Three Phase
Speed	1000 RPM (approx.)		
Impeller	Material Brass, Bucket type		
Nozzle	Material Stainless Steel/Mild Steel		
Spear	Material Stainless Steel/Mild Steel		
Discharge Measurement	Pitot Tube with Manometer		
Control Panel	Star/Delta Starter, Mains Indicator, MCB for overload protection		

The whole set-up is well designed and arranged in a good quality painted structure.



UTILITIES REQUIRED

- Water Supply and Drain.
- Electricity 15 KW, 440VAC, Three Phase.

1351 Francis Turbine Test Setup

Francis Turbine is a reaction Turbine, which was developed by English born American Engineer Sir J.B. Francis. The water enters the turbine through the outer periphery of the runner in the radial direction and leaves the runner in axial direction and hence it is called a mixed flow turbine. As the water flows to the runner, a part of pressure energy goes on changing into kinetic energy. Thus, the water through the runner is under pressure. The runner is completely enclosed in an air tight casing and runner is always full of water.

The present Set-up consists of a runner. The water is fed to the turbine by Means of centrifugal Pump, radially to the runner. The runner is directly mounted on one end of a central SS shaft and other end is connected to a brake arrangement. The circular window of the turbine casing is provided with a transparent acrylic sheet for observation of flow on to the runner. The runner assembly is supported by thick cast iron pedestal. Load is applied to the turbine with the help of brake arrangement so that the efficiency of the turbine can be calculated. A draught tube is fitted on the outlet of the turbine. The Set-up is complete with guide mechanism. Pressure and vacuum Gauge are fitted at the Inlet and Outlet of the turbine to measure the total supply head on the turbine.

EXPERIMENT

- To study the operation of a Francis Turbine
- To determine the Output Power of Francis Turbine
- To determine the Turbine Efficiency

TECHNICAL SPECIFICATIONS

MODEL	1.33 HP	2 HP	5 HP
Output Power	1.33 HP / 1 KW	2 HP / 1 KW	5 HP / 3.75 KW
Discharge	1000 LPM (App.)	1000 LPM (App.)	2000 LPM (App.)
Supply Head	10 m	10 m	15 m
Rope Brake	Dia 200 mm	Dia 200 mm	Dia 300 mm
Dynamometer Sump Tank	Cap. 300 Ltrs.	Cap. 300 Ltrs.	Cap. 600 Ltrs.
Water Circulation	Capacity 5 HP	Capacity 5 HP	Capacity 15 HP
Centrifugal Pump	Three Phase	Three Phase	Three Phase
Speed	1500 RPM (approx.)		
Runner	Having Curved Vanes		
Discharge Measurement	Pitot Tube with Manometer		
Control Panel	Star/Delta Starter, Mains Indicator, MCB for overload protection		

The whole set-up is well designed and arranged in a good quality painted structure.



SIDE VIEW

UTILITIES REQUIRED

- Water Supply and Drain.
- Electricity 15 KW, 440VAC, Three Phase

1352 Kaplan Turbine Test Setup

Kaplan Turbine is an axial flow reaction Turbine named in honor of Dr. B. Kaplan, a Gennan Engineer. This turbine is suitable for low head. The power produced by a turbine is proportional to QH . As the head (H) decreases the J discharge (Q) must increase to produce the same power. The present Set-up consists of a scroll casing housing a runner. Water enters the turbine through the stationary guide vanes and passes through the runner axially. The runner has a hub and airfoil vanes, which are mounted on it. The water is fed to the turbine by means of Centrifugal Pump. The runner is directly mounted on one end of a central SS shaft and other end is connected to a brake arrangement. A transparent hollow cylinder made of acrylic is fitted in between the draught tube and the casing for observation of flow on to the airfoil vanes. This runner assembly is supported by thick cast iron pedestal. Load is applied to the turbine with the help of this brake arrangement so that the efficiency of the turbine can be calculated. The Set-up is supplied with control panel. A draught tube is fitted on the Outlet of the turbine. The Set-up is complete with guide mechanism. Pressure and Vacuum Gauge are fitted at the Inlet & Outlet of the turbine to measure the total supply head on the turbine.

EXPERIMENT

- To study the operation of a Kaplan Turbine
- To determine the Output Power of Kaplan Turbine
- To determine the Turbine Efficiency

TECHNICAL SPECIFICATIONS

MODEL	1.33 HP	5 HP
Output Power	1.33 HP / 1 KW	5 HP / 3.75 Kw
Discharge	1500 LPM (Approx.)	5000 LPM (Approx.)
Supply Head	5 m	5 m
Rope Brake Dynamometer	Dia 200 mm	Dia 300 mm
Sump Tank	Capacity 300 Liters.	Capacity 600 Liters.
Water Circulation Centrifugal Pump	Cap. 7 HP, Three Phase	Cap. 20 HP, Three Phase
Speed	1500 RPM (approx.)	
Runner	With adjustable Curved Vanes	
Discharge Measurement	Pitot Tube with Manometer	
Control Panel	Star/Delta Starter, Mains Indicator, MCB for overload protection	

The whole set-up is well designed and arranged in a good quality painted structure.

UTILITIES REQUIRED

- Water Supply and Drain.
- Electricity 15 KW, 440V AC, Three Phase



FRONT VIEW



SIDE VIEW



BACK VIEW

1353 (A) Centrifugal Pump Test Rig

Closed Circuit Type With S.S. Tanks, ISI Mark Pumps & Motors, Powder coated. The closed circuit test rig consists of a "kirkloskar make" monoblock centrifugal pump. The pump is provided with a vacuum gauge on suction pipe and a pressure gauge on discharge pipe. The gate valve is used to adjust the head on the pump. The discharge is measured by measuring tank / water flow meter. The input power is measured by energy meter.

SPECIFICATIONS

1. Centrifugal monoblock-1 HP
2. Pressure gauge and vacuum gauge for measuring the head.
3. Measuring tank of 400x400 x400 mm
OR
Water flow energy meter for measuring the discharge.
4. Stop watch.
5. Sump tank of sufficient capacity.
6. Energy meter to measure input power.

A technical manual accompanies the equipment.

FEATURES

1. The equipment is coated with an attractive and anticorrosive powder coating.
2. The equipment consists of ISI standard
 - (i) Mono block ----- Kirloskar make
 - (ii) Energy meter ----- Maxwell Jaipur make
 - (iii) Water flow meter ----- Kranti/Anand make.



SERVICES REQUIRED

- 440 V, 15 A, stabilized three phase A.C. supply.
- Floor area : 2 m x 2m x 1.5m height
- Tachometer for speed measurement (can be supplied at extra cost)

1353 (B) Multi Stage Centrifugal Pump Test Setup

The Set-up is designed to study the performance of Multi Stage Centrifugal Pump. The Set-up consists of a Multi Stage Centrifugal Pump coupled with DC motor & drive, supply tank, measuring tank & pipe fittings for closed loop water circulation. There are 2 separate pumps connected to DC Motor and drive and can be connected in series and parallel to stimulate different combinations. Pressure and Vacuum Gauge are connected on delivery and suction side of each pump for the purpose of measurement. Swinging Field Dynamometer arrangement for direct torque measurement using dial type spring balance is made for individual pump. The flow rate of water is measured using measuring tank and stop watch provided.

EXPERIMENTS

- Speed Vs Discharge
- Head Vs Discharge at various speeds
- Efficiency curves at various speed and heads

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

TECHNICAL SPECIFICATIONS

- Pump (2 Nos.) : Kirloskar, Capacity 1 HP Speed 2800 RPM (max.) Head 12 m (max.)
- Drive : DC Drive along with non-contact type Digital RPM Indicator
- Supply Tank : Capacity 150 Ltrs.
- Measuring Tank : Capacity 100 Ltrs. fitted with Piezometer Tube & Scale
- Piping : GI / PVC
- Stop Watch : Electronic
- Control Panel : With required electrical instrumentation
- The whole Set-up is well designed and arranged in a good quality painted structure.



UTILITIES REQUIRED

- **Electric Supply** : Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC), 5 A, three pin socket with switch for pump.
- **Water Supply** : Tap water connection ½" BSP. Distilled water @ 80 Ltrs. (Optional extra cost)

1354 Reciprocating Pump Test Setup

The Set-up is designed to study the performance of Reciprocating Pump. The Set-up consists of a Reciprocating Pump coupled with electrical motor, supply tank, measuring tank & pipe fittings for closed loop water circulation. Pressure and Vacuum Gauge are connected on delivery and suction side of pump for the purpose of measurement. The flow rate of water is measured using measuring tank and stop watch provided.

EXPERIMENT

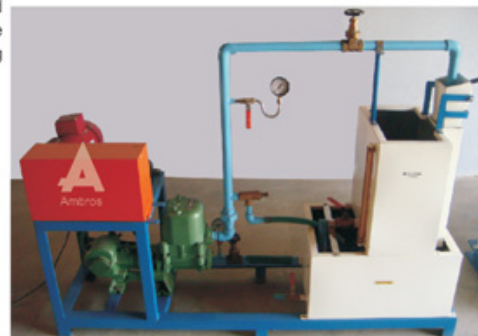
- To determine overall efficiency and pump efficiency of the Reciprocating Pump
- To plot Head Vs. Discharge, Pump efficiency Vs. Discharge

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

TECHNICAL SPECIFICATIONS

- Pump : Double acting, single Cylinder, Capacity 1HP Speed 250 RPM (max), Head 5 Kg/cm² max.)
- Drive : AC Motor with step cone pulley arrangement for 3 prefixed speed Or DC Motor with DC Drive along with non-contact type Digital RPM indicator.
- Supply Tank : Capacity 70 Ltrs.
- Measuring Tank : Capacity 50 Ltrs. fitted with Piezometer Tube & Scale
- Piping : GI / PVC
- Stop Watch : Electronic
- Control Panel : With required electrical instrumentation
- The whole Set-up is well designed and arranged in a good quality painted structure.



UTILITIES REQUIRED

- **Electric Supply** : Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC) 5 A, three pin socket with switch for pump.
- **Water Supply** : Tap water connection ½" BSP., Distilled water @ 80 Ltrs. (Optional extra cost)

1355 Gear Pump Test Setup

The Set-up is designed to study the performance of Gear Pump. The Set-up consists of a Gear Pump having a pair of meshed gears coupled with electrical motor, supply tank, measuring tank & pipe fittings for closed loop oil circulation. Pressure and Vacuum Gauges are connected on delivery and suction side of pump for the purpose of measurement. The flow rate of water is measured using measuring tank and stop watch provided.

EXPERIMENT

- To determine overall efficiency and pump efficiency of the Gear Pump
- To plot Head Vs. Discharge, Pump efficiency Vs. Discharge

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

TECHNICALS SPECIFICATIONS

- Pump : Gear Pump with pair of meshed gears Capacity 1 HP, Speed 1500 RPM (max.), Head 5 Kg/cm² (max.)
- Drive : AC Motor with step cone pulley arrangement for 3 prefixed speed DC Motor with DC Drive along with non-contact type Digital RPM Indicator
- Supply Tank : Capacity 30 Ltrs.
- Measuring Tank : Capacity 20 Ltrs. fitted with Piezometer Tube & Scale
- Piping : GI / PVC
- Stop Watch : Electronic
- Control Panel : With required electrical instrumentation
- The whole Set-up is well designed and arranged in a good quality painted structure.



UTILITIES REQUIRED

- **Electric Supply** : Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC) 5 A, three pin socket with switch for pump.
- **Oil Supply** : Oil @ 30 Ltrs. (Optional extra cost)

1356 Hydraulic Ram Test Setup

The Set-up is designed to study the Hydraulic Ram. Hydraulic RAM is used to pump little quantity of water to high head from a large quantity of water available at low head. It works on a principle of water hammer stating that "When flowing water is suddenly stopped in a long pipe a pressure wave travels along the pipe creating an effect of water hammer". The Set-up consists of a pipe section fitted with a pulse valve and non-return valve, a supply reservoir on a stand which is connected to an overhead tank, an air vessel above the valve chamber smoothes cyclic fluctuations from the Ram delivery. Different pressure may be applied to the pulse valve to change the closing pressure and hence the operating characteristic. The flow rate of useful and waste water is measured using measuring tank and stop watch provided. Pressure and Vacuum Gauge are connected on delivery and suction side for the purpose of measurement.

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

TECHNICAL SPECIFICATIONS

- Product : Hydraulic RAM
- RAM : Size 50 x 15 mm, Supply Head 2.5m, Delivery Head 10 m (max.)
- Air Vessel : Suitable Capacity MOC SS
- Delivery Line : For RAM, Dia 50 mm Length 6 m.
- Pump : Capacity 1 HP, Crompton / Sharp / Hero make
- Supply Tank : Capacity 150 Ltrs.
- Overhead Tank : Capacity 100 Ltrs.
- Measuring Tank : Suitable Capacity one each for useful and waste MOC SS fitted (2 Nos.) with Piezometer Tube & Scale
- Piping : GI / PVC
- Stop Watch : Electronic
- Pressure Gauge : Bourdon Type
- Control Panel : Comprises of Standard make On/Off Switch, Mains Indicator etc.
- Tanks will be made of Stainless Steel.
- The whole Set-up is well designed and arranged in a good quality painted structure.



EXPERIMENT

- To find out discharge of useful water and waste water.
- To find out the efficiency of the Hydraulic RAM

UTILITIES REQUIRED

- **Electric Supply**: Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC) 5A, three pin socket with switch for pump.
- **Water Supply**: Tap water connection ½ " BSP Distilled water @ 90 Ltrs. (Optional)

1357 Jet Pump Test Setup

The Set-up is designed to study the performance of Jet Pump. The Set-up consists of a Mono-Block Jet Pump coupled with electrical motor, supply tank, measuring tank & pipe fittings for closed loop oil circulation. Pressure and Vacuum Gauges are connected on delivery and suction side of pump for the purpose of measurement. The flow rate of water is measured using measuring tank and stop watch provided.

TECHNICAL SPECIFICATIONS

- Product : Mono - Block Jet Pump Test Rig
- Pump & Drive : Mono – Block Jet Pump, Size 32 mm x 25 mm x 25 mm (Suction x Pressure x Delivery), Capacity 1 HP
- Supply Tank : Capacity 70 Ltrs.
- Measuring Tank : Capacity 50 Ltrs fitted with Piezometer Tube & Scale
- Medium Flow : Clear Water
- Piping : GI / PVC
- Stop Watch : Electronic
- Pressure Gauge : Bourdon Type
- Control Panel : Comprises of
- Energy Measurement : Energy meter Electronics, L & T make
- MCB : For Overload Protection
Standard make On/Off Switch, Main Indicator etc.
- The whole Set-up is well designed and arranged in a good quality painted structure.

EXPERIMENT

- To determine overall efficiency and pump efficiency of the Jet Pump
- To plot Head vs. Discharge, Pump efficiency Vs. Discharge

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

UTILITIES REQUIRED

- **Electric Supply:** Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC) 5A, three pin socket with switch for pump.
- **Water Supply:** Tap water connection ½ "BSP, Distilled water @ 90 Ltrs. (Optional)

1358 Submersible Pump Test Rig

The Set-up is designed to study the performance of Submersible Pump. The Set-up consists of a Submersible Pump coupled with electrical motor, supply tank, measuring tank & pipe fittings for closed loop oil circulation. Pressure and Vacuum Gauges are connected on delivery and suction side of pump for the purpose of measurement. The flow rate of water is measured using measuring tank and stop watch provided.

TECHNICAL SPECIFICATIONS

- Product : Submersible Pump Test Rig
- Pump & Drive : Submersible Pump, Capacity 1 HP
- Supply Tank : Capacity 90 Ltrs. MOC SS
- Measuring Tank : Capacity 60 Ltrs. MOC SS fitted with Piezometer Tube & Scale
- Piping : GI / PVC
- Stop Watch : Electronic
- Control Panel : With required electrical instrumentation
- The whole Set-up is well designed and arranged in a good quality painted structure.

EXPERIMENT

- To determine overall efficiency and pump efficiency of the Submersible Pump
- To plot Head Vs. Discharge, Pump efficiency Vs. Discharge

FEATURES

- Closed loop water circulation
- Compact & stand alone set-up
- MS Excel sample calculation program on demand
- Stainless Steel tanks and wetted parts
- Superb painted structure
- Simple to Operate & Maintain

UTILITIES REQUIRED

- **Electric Supply:** Provide 230 +/- 10 VAC, 50 Hz, Single Phase Electric Supply with proper earthing. (Neutral – Earth voltage less than 5 VAC), 5 A, three pin socket with switch for pump.
- **Water Supply:** Tap water connection ½ " BSP, Distilled water @ 90 Ltrs. (Optional)

(III) HYDRAULIC BENCH WITH ACCESSORIES

1360 Hydraulic Bench Apparatus

OBJECTIVE : To conduct the experiment of hydraulic bench, with separate experiential set ups i.e. Hydrostatic Pressure, Flow over Weirs, Bernoulli's Theorem, Flow meter Demonstration, Impact of jet and Orifice Discharge etc. which are accessories of the Hydraulic Bench.

DESCRIPTION OF APPARATUS

The set up is a self-contained, water recirculation unit provided with a top tray, sump tank and a measuring tank. Drain valve and over-flow are provided on the sump tank. A centrifugal pump is fitted for water circulation. Flow control valve and bypass valve is fitted in water line to conduct the experiment at different flow rates.

Flow rate of water is measured with the help of measuring tank and stop watch. Measuring tank is provided to measure the discharge. Drain valve is provided in the measuring tank to empty water in sump tank after measuring discharge. Separate level indicator and scale is provided to read the level of water in the measuring tank.

SPECIFICATION

- Top Tray : 1060 mm x 650 mm.
- Pump : 1 HP
- Flow Measurement : Using measuring Tank (Material SS)
- Tank Capacity : 40 Ltr.
- Sump Tank : Capacity 120 Ltr. Material SS.

UTILITIES REQUIRED

- Water Supply (Fill approx 250 Ltrs Initially).
- Drain Required.
- 220 V AC, 50 Hz, single phase electric supply source.
- Floor area 1.75 m x 1.50 m.

The whole set-up is well designed and arranged in a good quality powder coating painted structure.

RANGE OF EXPERIMENTS

Following experiments can be carried out with common basic table with separate experimental setup (supplied at extra cost), which can be connected to Hydraulic Bench with flexible pipe.

- Bernoulli's Theorem Apparatus
- Orifice and Mouth Piece Apparatus
- Flow measurement by Venturimeter and Orificemeter
- Losses due to Friction in Pipe Lines
- Losses in Pipe fitting and Pipe Bends
- Reynold's Number study
- Flow over notches
- Impact of Jet on Vanes
- Pitot Static Tube



(IV) FLUID MECHANICS & HYDRAULIC MACHINES MODELS
Fluid Mechanics & Hydraulic Machines Models

1. Hook Gauges
2. Venturimeters & Orificemeters
3. Manometers
 - (A) Pitot Tube
 - (B) U Tube Double Column Manometer
 - (C) Differential Manometer
 - (D) Inclined Manometer
4. Valves Models
 - (A) Hydraulic Non Return Valve
 - (B) Gate Valve
 - (C) Globe Valve
5. Turbines & Pumps Models
 - (A) Different Impellers Of Pumps And Turbines (Set of 8) :
 - (i) Mixed Flow Runner Cast Aluminium
 - (ii) Axial Flow Runner Cast Aluminium
 - (iii) Radial or Centrifugal Runner Cast Aluminium
 - (iv) Kaplan Runner Cast Aluminium
 - (v) Francis Runner Cast Aluminium
 - (vi) Domestic Self Pumping Runner of Brass
 - (vii) Centrifugal Runner Actual Cast Iron
 - (viii) Pelton Wheel Runner Cast Aluminium
 - (B) Display Board For Pipes
 - (C) Hydraulic Elevator
 - (D) Hydraulic Ram Non Working Model
 - (E) Pelton Turbine Model
 - (F) De-Lavel Turbine Model
 - (G) Kaplan Turbine Model
 - (H) Francis Turbine Model
 - (I) Impulses Turbine Working Model
 - (J) Air or Steam Pressure Turbine Model
 - (K) Pure Reaction Turbine Model
 - (L) Radial Turbine Model
 - (M) Gear Pump Model
 - (N) Rotary Pump
 - (O) Centrifugal Pump : Actual Cut Section
 - (P) Reciprocating Pump : Actual Cut Section
 - (Q) Model Of Air Lift Pump Model
 - (R) Pendulum Pump Model
 - (S) Archemedian Screw Pump Model
 - (T) Tubewell Model
 - (U) Deep well Turbine Pump Model
 - (V) Submersible Pump Model
 - (W) Hydro-Electric Power Installation Model

