



Pumps are connected in series and parallel to obtain the required flow rate and head in several applications including domestic, industrial, irrigation and drainage. Energy is supplied to the pumps by electric motors and the potential energy of the liquid is increased by the action of the impeller rotating inside a volute casing. It is essential for students to understand the operation and performance characteristics of centrifugal pumps operating in both series and parallel connection. The Tesca Series & Parallel Pump Test Apparatus is an experimental set-up necessary for any Fluid Mechanics and Hydraulics Laboratory of an educational institution.

The Tesca Series & Parallel Pump Test Apparatus has been designed to enable students to study the operation and performance characteristics of typical centrifugal pumps connected by flexible tubing and valves to operate in both series and parallel mode. The apparatus can also be used to conduct experiments on a single centrifugal pump independently. The apparatus consists of two similar variable speed centrifugal pumps having independent

discharge manifolds connected by plastic tubing with connectors to enable quick change of operation to series or parallel modes. Shut-off valves in the pipe system enable the pumps to be connected in series or in parallel. Pumps are driven by DC shunt wound motors of adjustable speed.

Motors are suspended and the driving torque is measured using torque wrench. Motor speeds and power consumption is digitally displayed on the control panel. The apparatus can be connected to the 32096 Hydraulic Bench or any other hydraulic bench models to supply and re-circulate water. Bourdon tube pressure gauges are mounted at the inlet and exit of the pumps to measure increase of head across the pumps. The independent discharge manifolds have pressure gauges and flow control valves upstream of the discharge pipe and the diffuser. The flow rate through the pump system is measured using the measuring tank of the hydraulic bench and can be checked independently by water flow meters fixed at the delivery side of both pumps.

The Tesca Series & Parallel Pump Test Apparatus is a compact unit and all components and instrumentation are placed in a robust and mobile frame. The complete unit is manufactured from corrosion resistant material.

### Option :

Computer based learning software is included to enable students to understand and conduct experiments, tabulate results and plot graphs. The Tesca Series & Parallel Pump Test Apparatus is an important experimental set-up 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.

### Experiment :

1. Study of operation and working of centrifugal pumps connected in series and parallel.
2. Study of matching of pumps, starting and stopping of pumps in series and parallel connection.
3. Determination of power requirement for series and parallel operation.
4. Determination of hydraulic power output in series and parallel operation.

Note: Specifications are subject to change.

### **Tesca Technologies Pvt. Ltd.**

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- Investigation of performance and characteristics in series and parallel operation.
  - Effect of Pump speeds - Pumps to operated at same and different speeds.
  - Head, discharge, speed, power and efficiency curves.

### Single Centrifugal Pump Operation:

- Study of the operation and working of a centrifugal pump.
- Determination of power requirement of the pump.
- Determination of the hydraulic power output of the pump.
- Investigation of the performance and characteristics of centrifugal pump:- dimensional performance curves
  - The effect of pump speed.
  - Head, discharge, speed, power and efficiency cures.
  - Non
  - Determination of specific speed.
  - Determination of net positive suction head.

### Important Specifications:

- Pump : 2 Nos, centrifugal type, max. head: 21 m water, max. Flow rate: 90 Lpm.
- Motor : 2 Nos, dc motor variable speed drive or ac motor, variable speed, 0.37 kW.
- Sump tank: Capacity 50 Litres.
- Speed range : 0-1500 rpm.
- Rotameter: Size 1"; 0-240 Lpm.
- Pressure gauge, 2 Nos, delivery side, Bourdon type, 0-10 bar.
- Pressure gauge, 2 Nos, suction side, Bourdon type, -1-5 bar.
- Pipes and pipe connections made of PVC.
- Shut-off valves.
- Optional: Computer & Computer based learning software to include data logging, data acquisition, Process Control, Real Time Display, Tabulated Results, Experiment Graphs.
- Optional: Data Acquisition System with electronic signaling system & data acquisition module. .
- Control panel.
- Digital Meters: Tachometer; 4 nos Digital indicators; Electronic Flow Meter; Power Transducer; 2 nos Speed sensors; 4 nos pressure sensors.

### Measurements:

- Power input to motors.
- Torque and power input to pumps
- Pump rotational speeds.
- Pump suction and delivery pressures.
- Flow rates

### Option :

- A self contained unit of the Series & Parallel Pump Test Apparatus consisting of a flow discharge measurement tank and a sump tank made of FRP or corrosion resistant sheet metal for use in case the hydraulic bench is not available with the user can be supplied on request.
- Computer compatible Series & Parallel Pump Test Apparatus having electronic transducers for all measurements including pressures, flow rates and rotational speeds can be supplied on request.

Note: Specifications are subject to change.

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