



Centrifugal pumps are widely used for pumping liquids in several applications including domestic, industrial, irrigation and drainage. Energy is supplied to the pump by an electric motor 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. The Tesca Centrifugal Pump Test Apparatus is an experimental set-up necessary for any Fluid Mechanics and Hydraulics Laboratory of an educational institution.

The Tesca Centrifugal Pump Test Apparatus has been designed to enable students to study the operation and performance characteristics of a typical centrifugal pump. The module consists of a variable speed centrifugal pump assembly having an independent discharge manifold interconnected by plastic tubing with quick release connectors. The pump is driven by a DC shunt wound motor of adjustable speed. The motor is suspended and the driving torque is determined with a torque wrench. The motor speed and power

consumption is digitally displayed on the control panel. The pump 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 pump to measure increase of head across the pump. The independent discharge manifold has a pressure gauge and a flow control valve upstream of the discharge pipe and the diffuser. The flow rate through the system is measured using the measuring tank of the hydraulic bench and can be checked independently by the water flow meter fixed in the discharge.

The Tesca Centrifugal 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 :**

1. Computer based learning software is included to enable students to understand and conduct experiments, tabulate results and plot graphs. The Tesca Centrifugal Pump Test Apparatus is an important experimental set-up for any Fluid Mechanics and Hydraulics Laboratory of an educational institution.
2. Computer Control Software
  - PID Computer Control + Data Acquisition + Data Management.
  - Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process on screen. Compatible with the industry standards.
  - Registration and visualization of all process variables in an automatic and simultaneous way.
  - Flexible, open and multi-control software, developed with actual windows graphic systems, acting simultaneously on all process parameters.
  - Analog and digital PID control.
  - Menu for PID and set point selection required in the whole work range.

Note: Specifications are subject to change.

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- Management, processing, comparison and storage of data.
- Sampling velocity up to 250 KS/s (Kilo samples per second).
- Calibration system for the sensors involved in the process.
- It allows the registration of the alarms state and the graphic representation in real time.
- Comparative analysis of the obtained data, after the process and modification of the conditions during the process.
- Open software, allowing the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.
- This unit allows the 30 students of the classroom to simultaneously visualize all results and manipulation of the unit, during the process, by using a projector or an electronic whiteboard.
- This module requires Control Interface Module and Data Acquisition.

### **Interface In-built Module:**

This control interface is common for the 'Tesca' trainers and can work with one or several trainers. The Control Interface is part of the SCADA system.

Control interface with process diagram on the front panel.

The unit control elements are permanently computer controlled.

- Simultaneous visualization in the computer of all parameters involved in the process.
- Calibration of all sensors involved in the process.
- Real time curves representation about system responses.
- All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.
- Shield and filtered signals to avoid external interferences.
- Real time PID control with flexibility of modifications from the computer keyboard of the PID parameters, at any moment during the process.
- Real time PID control for parameters involved in the process simultaneously.
- Proportional control, integral control and derivative control, based on the real PID mathematical formula, by changing the values, at any time, of the three control constants (proportional, integral and derivative constants).
- Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.
- Three safety levels, one mechanical in the unit, another electronic in the control interface and the third one in the control software.

### **Experiment :**

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

### **Important Specifications:**

1. Centrifugal pump size- 25.4 mm x 25.4 mm (Approx), Discharge: 15-30 lpm at 30 meter (Approx), Total head: 12 meter (Approx).
2. Driving Motor: ½ HP, DC electric motor
3. Power Measurement
4. RPM Indicator with sensor, Range - 0 to 9999

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5. Pressure Gauges: 5 Kg/ Sq. cm.
6. Vacuum Gauge: 760mm (approx)
7. Foot Valve: size: 1" (approx) Plastic
8. Energy meter
9. Stand: M.S. Structure with powder coating.
10. Measuring Tank: 40 Liter non Corrosive PVC/Acrylic tank
11. Mechanical level measurement facility with scale.
12. Sump Tank: 100 Liter non Corrosive PVC/FRP tank
13. Stop Watch.
14. Piping & fittings & valves.
15. Flow measurement facility.

**Measurements:**

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

**Option :**

1. A self contained unit of the Tesca Centrifugal 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.
2. Computer compatible Tesca Centrifugal Pump Test Apparatus having electronic transducers for pressure, flow rate and rotational speed measurements can be supplied on request.

**Services Required :**

1. Single phase electrical supply, 220-240 V, 50 Hz.
2. Water supply and drainage.

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