



- 1. Kaplan Turbine
- 2. Flow control valve
- 3. Venturimeter
- 4. Brake drum
- 5. Spring balance
- 6. Weight hanger
- 7. Supply pump
- 8. Draft tube
- 9. Transparent duct
- 10. Sump tank
- 11. Pressure gauges
- 12. Inlet Pressure & Outlet Vacuum Gauges

MGNOBLOCK

Runner Vanes  
 Runner Coupled with shaft  
 Guide Vanes  
 Kaplan Turbine

**KAPLAN TURBINE TEST RIG**

# CONDUCTING EXPERIMENTS AND DRAWING THE CHARACTERISTICS CURVES OF KAPLAN TURBINE TEST RIG

## AIM:

To study the characteristics of a Kaplan turbine

## APPARATUS REQUIRED:

1. Venturimeter
2. Stopwatch
3. Tachometer
4. Dead weight

## FORMULAE:

### 1. VENTURIMETER READING:

$$h = (P1 - P2) \times 10 \quad (\text{m of water})$$

Where,  
P1, P2 - Venturimeter reading in Kg /cm<sup>2</sup>

### 2. DISCHARGE:

$$Q = 0.0055 \times \sqrt{h} \quad (\text{m}^3 / \text{s})$$

### 3. BRAKE HORSE POWER:

$$\text{BHP} = (\pi \times D \times N \times T) / (60 \times 75) \quad (\text{hp})$$

Where,  
N = Speed of the turbine in (rpm)  
D = Effective diameter of brake drum = 0.315 m  
T = Torsion in To + T1 - T2 (Kg)

### 4. INDICATED HORSE POWER:

$$\text{IHP} = (1000 \times Q \times H) / 75 \quad (\text{hp})$$

Where,  
H = Total head (m)

### 5. PERCENTAGE EFFICIENCY:

$$\% \eta = (\text{B.H.P} / \text{I.H.P} \times 100) (\%)$$

S.No	Pressure Gauge Reading [Hp] Kg/cm <sup>2</sup>	Total Head [H] m of water	Venturimeter reading Kg/cm <sup>2</sup>		H = (P1-P2) x 10 m of water	Weight of hanger To Kg	Speed of turbine N Rpm	Weigh of hanger [T1] kg	Spring Balance T2 Kg	Tension [T] Kg	Discharge Q x 10 <sup>-3</sup> m <sup>3</sup> /sec	B.H.P hp	I.H.P hp	$\eta$ %	
			P1	P2											
Mean =															

**DESCRIPTION:**

Kaplan turbine is an axial flow reaction turbine used in dams and reservoirs of low height to convert hydraulic energy into mechanical and electrical energy. They are best suited for low heads say from 10m to 5 m. the specific speed ranges from 200 to 1000

The flow through the pipelines into the turbine is measured with the orifice meter fitted in the pipeline. A mercury manometer is used to measure the pressure difference across the orifice meter. The net pressure difference across the turbine output torque is measured with a pressure gauge and vacuum gauge. The turbine output torque is determined with the rope brake drum. A tachometer is used to measure the rpm.

**EXPERIMENTAL PROCEDURE:**

1. Keep the runner vane at required opening
2. Keep the guide vanes at required opening
3. Prime the pump if necessary
4. Close the main sluice valve and then start the pump.
5. Open the sluice valve for the required discharge when the pump motor switches from star to delta mode.
6. Load the turbine by adding weights in the weight hanger. Open the brake drum cooling water gate valve for cooling the brake drum.
7. Measure the turbine rpm with tachometer
8. Note the pressure gauge and vacuum gauge readings
9. Note the orifice meter pressure readings.

Repeat the experiments for other loads

**GRAPHS:**

The following graphs are drawn.

1. BHP Vs IHP
2. BHP Vs speed
3. BHP Vs Efficiency

**MODEL CALCULATION:**

**RESULT:**

Thus the performance characteristic of the Kaplan Turbine is done and the maximum efficiency of the turbine is ..... %