



FRANCIS TURBINE TEST RIG

CONDUCTING EXPERIMENTS AND DRAWING THE CHARACTERISTICS CURVES OF FRANCIS TURBINE TEST RIG

AIM:

To conduct load test on Francis turbine and to study the characteristics of Francis turbine.

APPARATUS REQUIRED:

1. Stop watch
2. Tachometer

FORMULAE:

1. VENTURIMETER READING:

$$h = (p_1 - p_2) \times 10 \quad (\text{m})$$

Where

P1, P2- Venturimeter readings in kg /cm²

2. DISCHARGE:

$$Q = 0.011 \times \sqrt{h} \quad (\text{m}^3 / \text{s})$$

3. BRAKE HORSEPOWER:

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

Where

N = Speed of turbine in (rpm)

D = Effective diameter of brake drum = 0.315 m

T = torsion in [kg]

4. INDICATED HORSEPOWER:

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

Where

H = Total head in (m)

5. PERCENTAGE EFFICIENCY:

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

S.No	Pressure Gauge Reading [Hp] Kg/cm ²		Total Head [H] m of water	Venturimeter reading Kg/cm ²		H = $\frac{(P1-P2) \times 10}{\rho \times g}$ 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 x10 ⁻³ m ³ /sec	B.H.P hp	I.H.P hp	η %
	H1	H2		P1	P2										
Mean =															

DESCRIPTION:

Modern Francis turbine in an inward mixed flow reaction turbine it is a medium head turbine. Hence it required medium quantity of water. The water under pressure from the penstock enters the squirrel casing. The casing completely surrounds the series of fixed vanes. The guides' vanes direct the water on to the runner. The water enters the runner of the turbine in the dial direction at outlet and leaves in the axial direction at the inlet of the runner. Thus it is a mixed flow turbine.

PROCEDURE:

1. The Francis turbine is started
2. All the weights in the hanger are removed
3. The pressure gauge reading is noted down and this is to be
Maintained constant for different loads
4. Pressure gauge reading is ascended down
5. The Venturimeter reading and speed of turbine are noted down
6. The experiment is repeated for different loads and the readings are tabulated.

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 Francis wheel turbine is done and the maximum efficiency of the turbine is %