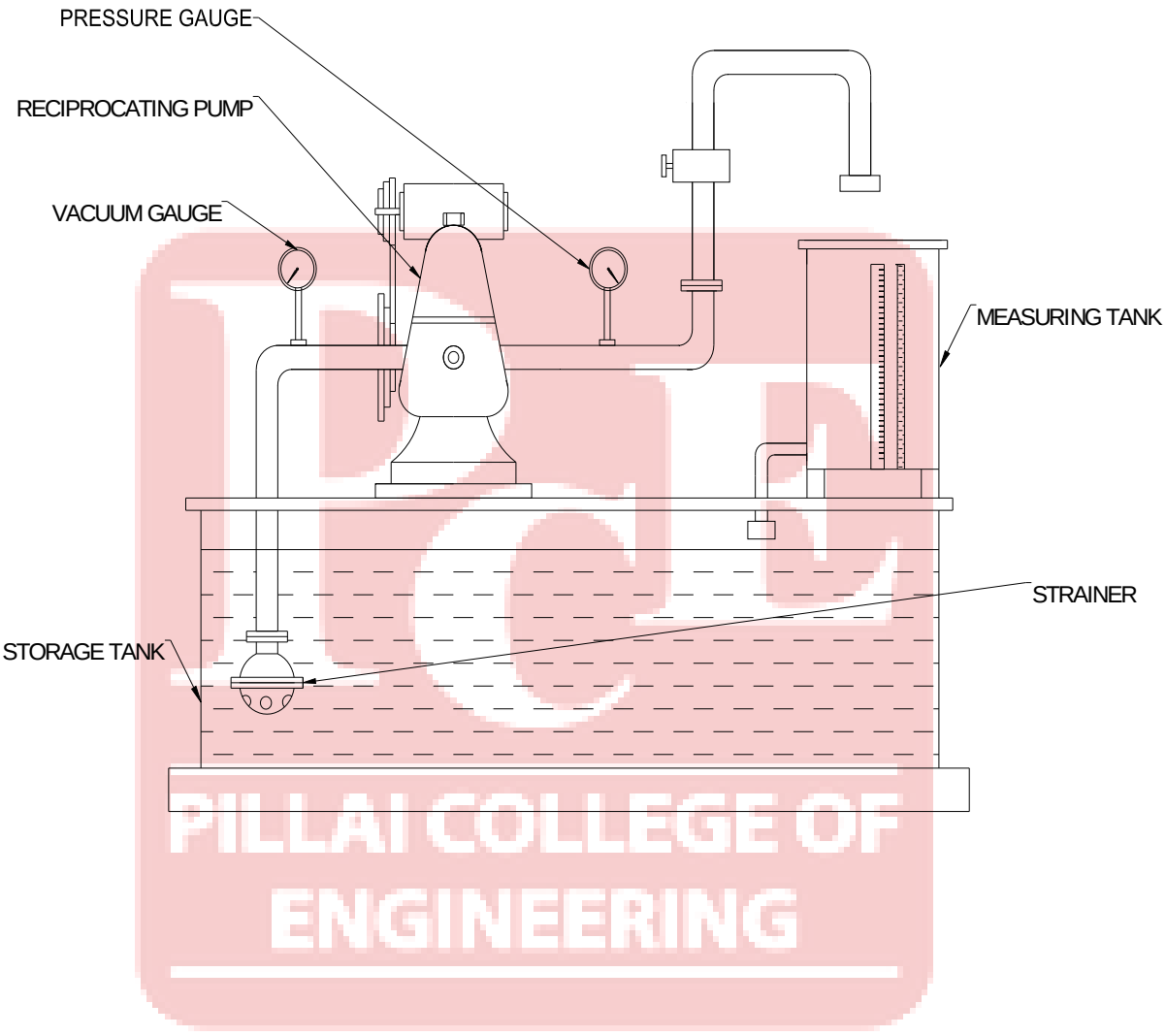
RECIPROCATING PUMP



AIM :- To study the performance of reciprocating pump and plot characteristic curve.

APPARATUS :-1) Reciprocating Pump Test rig.
2) Stop Watch.
3) Pressure Gauge.
4) Vacuum Gauge.

SECIFICATION :-

1) Piston stroke length	(L)	= 44.5	mm
2) Piston diameter	(D)	= 38	mm
3) Area of measuring tank	(A)	= 300 × 300	mm^2
4) Energy meter constant	(N)	= 500	Rev / kw.hr
5) Level difference between vacuum gauge & pressure gauge	(X)	= 160	mm

THEORY :- A reciprocating pump essentially consist a piston or plunger which moves to and fro in a close fitted cylinder. The cylinder is connected to the suction and delivery valves. The plunger is connected to a crank by means of connecting rod. As the crank rotates uniformly by motor, the piston or plunger moves to and fro in the cylinder.

When the crank rotates at 0 to 180° the piston which is initially at the extreme position since during suction operation to the pump. The liquid is sucked from below, it is known as the suction stroke.

When the crank rotates from 180° to 360° the plunger inwards from extreme right to left position. Because of this inward motion pressure in cylinder rise above atmospheric pressure due to which suction valve is closed and delivery valve is opened. The liquid then forced up the delivery pipe and raise to the required level since during this operation liquid is delivered to required height this operation is called delivery stroke.

EXPERIMENTAL SETUP :-

Reciprocating pump test rig consist of a reciprocating pump coupled to an electric motor. The suction pipe of the pump is dipped in tank (sump). The delivery pipe is fitted with the gate valve to control delivery head. A pressure gauge and vacuum gauge are fitted in the delivery and suction pipe respectively to the measure the pressure. Discharge is measured by collecting water into measuring tank. The power input to the pump is measured by an energy meter.

PROCEDURE :-

1) Fill up sufficient water in sump tank.

2) Keep the gate valve partially open on the discharge line.

3) Start the motor.

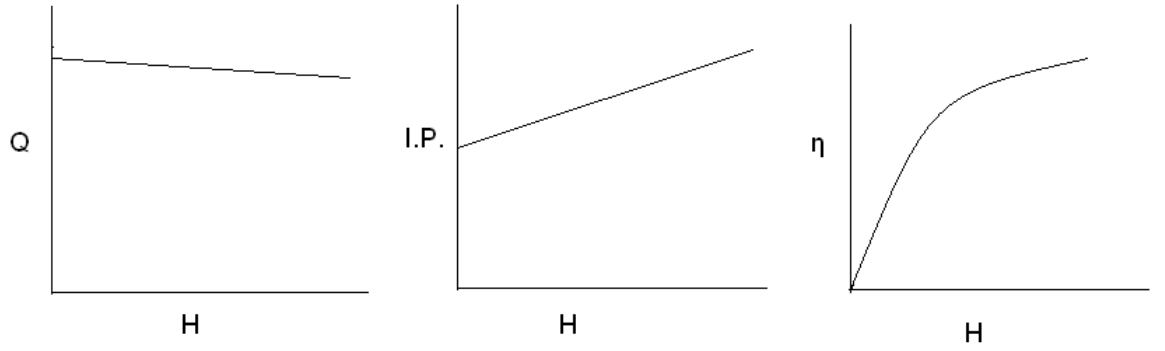
4) Record the following observation in the observation table:-
   a) The pressure gauge reading 'G'
   b) The vacuum gauge reading 'V'
   c) Time for 5 of energy meter by means of stop watch.
   d) Time for 10 cm rise in the collecting tank level by means of stop watch.

5) Take at least 6 sets of reading by varying the head from maximum at shut off to minimum where gate valve is fully open.

CHARACTERISTICS :

Draw the following characteristics of gear pump.

1) Head vs. Discharge.
2) Head vs. Input power
3) Head vs. Efficiency



OBSERVATION TABLE :-

Sr. No	Pr gauge reading (G) kg / cm²	Vacuum gauge reading (V) mm of hg	Time required for 5 rev of energy meter (T) sec	Time required for 10 cm rise of oil level (t) sec
1				
2				
3				
4				
5				
6				

CALCULATION

- Actual discharge (Q_A) = $\frac{A \times h}{t}$

- Total head (H) = G +V + X
  Where
  G = Pressure gauge reading = G X 10 = ---------- m
  V = Vacuum gauge reading = (V /1000) X 12.6 = ---------- m
  X = Level difference between vacuum and pressure gauge = 160/1000 = 0.16 m

- Output power (I.P.) = ρ. g .Q_A. H
  Where
  ρ = Density of water = 1000 Kg /m^3

- Input power (I.P) = $\frac{3600}{N} \times \frac{5}{T}$
  Where
  N = Energy meter constant = 500 rev/kw.hr
  T = Time required for 5 revolution = sec

- Efficiency (η) = O.P/I.P

RESULT TABLE :-

Sr. No.	Q (m^3/s)	H (m)	Output Power (W)	Input Power (W)	η (%)
1					
2					
3					
4					
5					
6					

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