Title :Steam Engine

Objective

To find the various efficiency and Performance Curves for Reciprocating Steam Engine

- RPM vs. various efficiency

Relevant theory

If indicated power (IP) is directly obtained from the enthalpy loss of steam inside the cylinder then, IP can be written as:

$IP = m(h_1 - hf_2) - m_c*C*(T_{out} - T_{in})$ kw,

Where

C = specific heat of water.

m = mass flow rate of steam (Condensed water)

h_1 = enthalpy of inlet steam

h_{f2} = enthalpy of condensed seam (water)

m_c = mass flow rate of cooling water

T_{in} = temperature of inlet cooling water

T_{out} = Temperature of outlet cooling water

E can be read as the energy input to the overall system it may be fuel oil in boiler or may be of amount of electric energy input through the heaters in the boiler.

Heat input, E = total unit consumed/ time = Watts,

Where all units are in SI system

The Brake Power (BP) can be calculated as: BP = 2 * 3.14 * (N / 60) * Dm * (B2-B1), in Watts

Thermal Efficiency:

IP basis: E(i) = IP / m * (h1 - hf2), %

BP basis: E(b) = BP / m * (h1 - hf2), %

Overall Efficiency: E(o) = BP / (E/t), %

Mechanical Efficiency: E(m) = BP / IP, %

Apparatus Required

Extra thermometer (0-100 ^{o}C), Stop watch, Measuring cylinder for condensed water and cooling water

Procedure

1. Supply water into the Boiler by operating feed pump about 80% of boiler with the help of level .
2. Operate both heater until sufficient steam produced, close outlet of boiler until boiler pressure reaches 200 -300 kPa.
3. Open the steam outlet valve from boiler i.e. inlet side of engine
4. Supply cooling water into the condenser
5. Adjust brake pulley tension
6. Rune the steam engine with fix RPM take the data according to data sheet.

Pressure safety valve will open at 400kpa, check if pressure valve does not open beyond that limit

Observation Table

Mean diameter of break pulley: Dm=

Engine	Input parameters		Output readout			Cylinder inlet steam			Condenser outlet water			Condenser Cooling Water		
Speed reading N	Time of read-ing t	Ene-rgy meter read-ing e	Dynamometer Braking Force F, Newtons			Temp Ti	Press-ure P_i	Enth h_1	Enth h_{f2}	Mass m	Temp T_c	Temp T_{in}	Temp T_{out}	flow rate mc
Rpm	Minute	kwh	B_1	B_2	B_2-B_1	°C	kPa	kJ/kg	kJ/kg	kg	°C	°C	°C	kg/s
500														
1000														
1500														
2000														
2500														