LOAD TEST ON DIESEL ENGINE

Ex. No :   **Date :**

Aim :

To conduct load test on given diesel engine in order to determine:
1. Brake power of the engine
2. Indicated power of the engine
3. Total fuel consumption
4. Specific fuel consumption
5. Mechanical efficiency
6. Break thermal efficiency or overall efficiency
7. Indicated thermal efficiency

Apparatus Required :

1. Diesel engine with loading arrangement
2. Thread and scale (or) measuring tape
3. Stop watch
4. Tachometer

Theory and Description :

In diesel engine the diesel is used as the fuel . The diesel engine may be either two stroke engine or four stroke engine . In two stroke engine there is a one power stroke for each revolution of the crank shaft . In four stroke engine there is a one power stroke for every two revolution of the crank shaft , Most of the heavy duty engines are four stroke engines . The engine is provided with suitable loading arrangement to apple and measure the load . The provisions are also available to measure the fuel consumption and speed .

Definitions :

Break power :

The useful power available at the crank shaft of the engine is called brake power (BP) . The brake power of the engine are determined by
1. Rope brake dynamometer (T = WRe) and
2. Prony brake dynamometer (T = WL) and
3. Hydraulic dynamometer BP = WN / C Kw
4. Electrical dynamometer

$$BP = \frac{2\pi N T}{60 \times 1000} \quad KW$$

Indicated power :

The power actually developed inside the cylinder due to the combustion of fuel are called indicated power (IP) (or)

IP = F.P + B.P

where F.P = Frictional Power

Observation and Tabulation:

1. Brake power BP = _____ kW.
2. Speed N = _____ Rpm.
3. Type of loading = _____
4. Fuel used: petrol

5. Calorific value fuel: 42000 KJ/kg.
6. Radius of the brake drum: R
7. Radius of the Rope r =
8. Effective Radius Re = R+r 'm'
9. Specific gravity of fuel = 0.83 for petrol.

S.No.	Load			Speed in 'Rpm'	Time taken for 10CC fuel consumotion 'Sec'	TFC Kg/hr	BP 'KW'	FP 'KW'	IP 'KW'	$SFC = \frac{TFC}{BP}$ kg/kw-hr	η_{mech} %	$\eta_{overall}$ (or)$\eta_{B.T.}$ %	I.T.η (or) η_i%
	W_1 kg	W_2 kg	W_1-W_2 Net load =W kɡ 'N'										

Specific Fuel Consumption :

It is defined as the mass of the fuel consumed per hour per brake power of the engine . Its unit is Kg / KW – hr

$$SFC = \frac{TFC}{B.P}$$

Where TFC = Total Fuel consumption in kg / hr

Total Fuel Consumption :

It is the mass of fuel consumed at particular load consumed at particular load per hour .It is expressed in kg / hr

Mechanical Efficiency :

It is defined as the ratio of Brake power to indicated power

$$\eta_{mech} = \frac{B.P}{Heat\ Supplied} \times 100$$

Brake thermal efficiency or overall efficiency :

It is defined as the ratio of brake power to heat supplied by the combustion of fuel .

$$\eta_{B.T} \ or \ \eta_{overall} = \frac{B.P}{Heat\ Supplied}$$

Heat supplied = mass of the fuel consumed per sec x calorific value of fuel
= m_f x C.V.

$$m_f = \frac{TFC}{3600} \ \frac{Kg}{sec}$$

The calorific value of the diesel ranges from 42,000 KJ / Kg to 45,000 KJ/Kg depends on the quality of the fuel .

The calorific value of petrol ranges from 41000 KJ/Kg to 44000 KJ/Kg

Indicated thermal efficiency or Thermal efficiency

It is defined as the ratio of indicated power to heat supplied by the combustion of fuel

$$\eta_{I.T} = \frac{I.P}{Heat\ supplied} \times 100$$

$$= \frac{I.P}{m_f \ x \ C.V} \times 100 \ ; \quad mf = \frac{TFC}{3600} \ kg/sec$$

Procedure :

1. From the name plate details calculate the maximum load that can be applied on the given engine.
2. Check the engine for fuel availability , lubricant and cooling water connection.
3. Release the load on the engine and start the engine with no load condition . Allow the engine to run for few minute to attain rated speed
4. Note the speed of the engine and time taken for consumption of 10 cc of fuel
5. Increase the load on the engine and note the speed of the engine and time taken for 10cc of fuel consumption
6. Repeat the procedure '5' up to 75% of the maximum load and tabulate the readings.

Graph :

The following graphs has to be drawn

1. B.P Vs TFC
2. B.P Vs SFC
3. B.P Vs η_{mech}
4. B.P Vs $\eta_{B.T}$
5. B.P Vs $\eta_{I.T}$

Results :

Load test on given diesel engine were conducted and the TFC ,BP , IP , SFC , $\eta_{mech,}$ $\eta_{B.T}$ and $\eta_{I.T}$ were determined at different loads .