

# MORSE TEST ON MULTI CYLINDER PETROL ENGINE

**Ex.No. :**

**Date:**

## **Aim :**

To conduct morse test on given multi cylinder petrol engine in order to determine the indicated power developed in the each cylinder of the engine and to determine the mechanical efficiency.

## **Apparatus Required :**

1. Multi cylinder petrol engine with ignition cut off arrangement
2. Loading arrangements
3. Tachometer

## **Theory and Description :**

For slow speed engine the indicated power is directly calculated from the indicator diagram. But in modern high speed engines , it is difficult to obtain accurate indicator diagram due to inertia forces , and therefore , this method cannot be applied . In such cases the morse test can be used to measure the indicated power and mechanical efficiency of multi cylinder engines . The engines test is carried out as follows . The engine is run at maximum load at certain speed . The B.P is then measured when all cylinders are working . Then one cylinder is made in operative by cutting off the ignition to that cylinder . As a result of this the speed of the engine will decrease . Therefore , the load on the engine is reduced so that the engine speed is restored to its initial value . The assumption made on the test is that frictional power is depends on the speed and not upon the load on the engine .

## **Definitions :**

### **Break power : (BP)**

The useful power available at the crank shaft of the engine is called brake power of the engine . The brake power of the engine are determined by

1. Rope brake dynamometer.

$$T = WRe$$

W = net load

Re = effective radius of the brake drum

2. Prony brake dynamometer

$$T = WL$$

W = Load

L = Distance at which the load is applied

### Observation and Tabulation :

- (1) Brake power B.P =..... KW
- (2) Rated Speed N =.....Rpm
- (3) Type of loading : =.....
- (4) Radius of brake drum : R =..... ‘m’
- (5) Radius of Rope r =..... ‘m’
- (6) Number of cylinders = 4

S No	Conditions	Loading				Speed Rpm	BP ‘KW’
		W1 kg	W2 kg	W1 - W2 kg	Net load W in ‘N’		
1	All cylinders are working						
2	First cylinder was cut off and remaining are in working						
3	Second cylinder was cut off and remaining are in working						
4	Third cylinder was cut off and remaining are in working						
5	Fourth cylinder was cut off and remaining are in working						

Note : The speed should be same for all readings



3. Hydraulic dynamometer

$$B.P = \frac{WN}{C}$$

W = Load

N = Speed in RPM

C = Dynamometer constant

4. Electrical dynamometer

### Indicated power : ( I P )

The power actually developed inside the engine cylinder due to the combustion of the fuel are called indicated power .

$$IP = FP + BP ; \quad FP = \text{Frictional power}$$

### Frictional power (FP) :

The power loss due to friction between the moving parts are called as frictional power .

### Mechanical efficiency : ( $\eta_{\text{mech}}$ )

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

$$\eta_{\text{mech}} = \frac{B.P}{I.P} \times 100$$

### Procedure :

From the name plate details , determine the maximum load that can be given to the engine

For example : B.P = 12.5 kw , N = 2000 rpm

$$B.P = \frac{2\pi NT}{60 \times 1000}$$

$$T = \frac{60 \times 1000 \times 12.5}{2 \pi \times 2000} = 59.68 \text{ N-m}$$

$$T = W.Re \quad \text{Say } Re = 0.4\text{m}$$

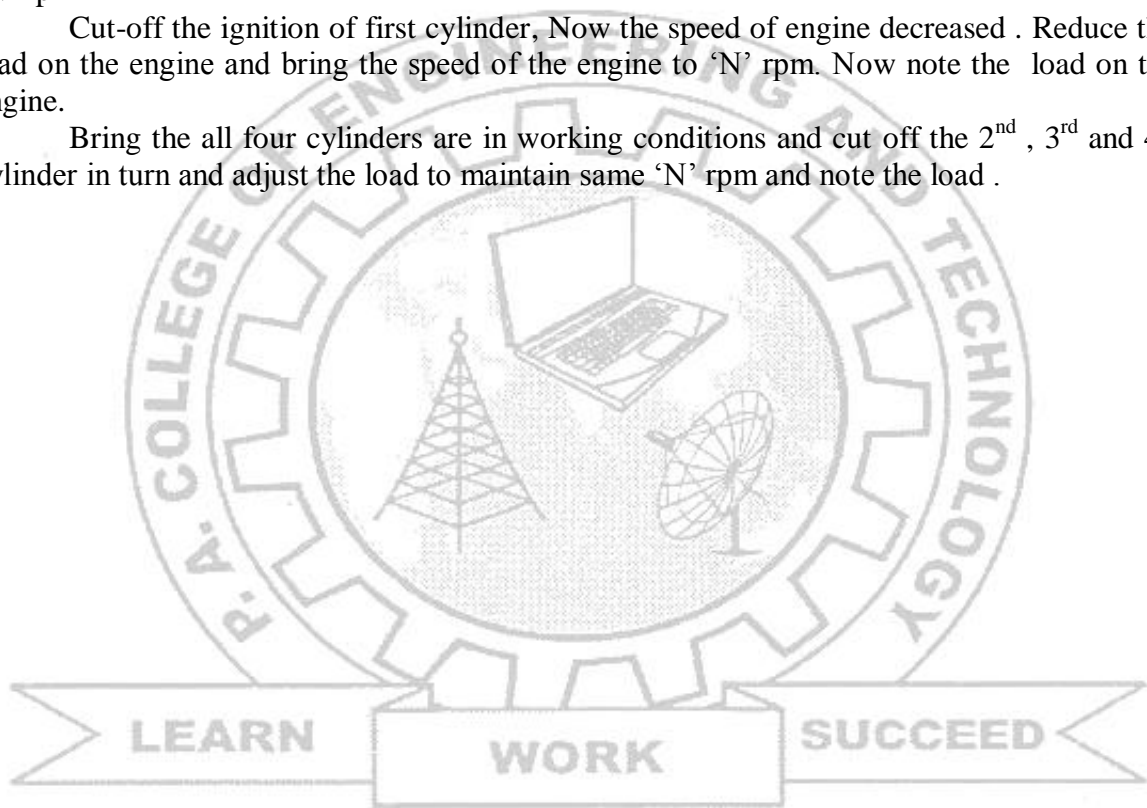
$$\therefore W = \frac{T}{Re} = \frac{59.68}{0.4} = 149.2\text{N} \\ \approx 150 \text{ N}$$

max : load that can be given to the engine was

$$75\% \quad w = \frac{75}{100} \times 150 = 112.5\text{N}$$

$$\text{max} = \text{net load} = \frac{112.5}{10} = 11.25\text{kg}$$

2. Check the engine for fuel availability, lubricant and cooling water connections .
3. Release the load completely on the engine and start the engine in no load conditions and allow the engine to run for few minutes to attain the rated speed.
4. Apply the load and increase the load upto maximum load. (All four cylinders should be in working ) . Now note the load on the engine and speed of the engine say the speed is 'N' rpm
5. Cut-off the ignition of first cylinder, Now the speed of engine decreased . Reduce the load on the engine and bring the speed of the engine to 'N' rpm. Now note the load on the engine.
6. Bring the all four cylinders are in working conditions and cut off the 2<sup>nd</sup> , 3<sup>rd</sup> and 4<sup>th</sup> cylinder in turn and adjust the load to maintain same 'N' rpm and note the load .



### **Result:**

Morse test was conducted on given petrol engine and indicated power developed in each cylinder are determined and mechanical efficiency are also determined .