

**EXPERIMENT:** Brake Mean Effective Pressure (BMEP)

**OBJECTIVES:**

After operate this, students will be able to determine BMEP at wide-open throttle and varying RPM.

**EQUIPMENT:**

1. EFI Petrol Engine Test Bed
2. 150 kW Hydraulic Dynamometer Trainer
3. Heat Exchanger System

**THEORY:**

- $B$  - Brake power in kW  
 $r$  - Number of revolutions required for each power stroke (1 for 2 stroke engines; 2 for 4 stroke engines)  
 $n$  - Number of piston  
 $A$  - Cylinder Area (m<sup>2</sup>)  
 $L$  - Stroke Length (m)  
 $N$  - Engine Speed in rev/sec.

$$\text{Brake Mean Effective Pressure (BMEP)} = \frac{\text{Work done per cycle}}{\text{Stroke volume}}$$

$$BMEP = \frac{\text{Work done per cycle} \times \text{number of cycles per second}}{\text{stroke volume} \times \text{number of cycles per second}}$$

$$BMEP = \frac{\text{Brake power}}{A L n \times N / r}$$

$$BMEP = \frac{B \times r}{A \times L \times n \times N}$$

**PROCEDURE:**

1. Prepare the required equipment for this experiment.
2. Observe Heat-Exchanger system; make sure all connection is tightened properly.
3. Switch On Pump and Fan of Heat Exchanger system.
4. Observe the Hydraulic Dynamometer tank, find the load control and set the load to minimum load (fully counter-clockwise)
5. Start the engine and adjust the throttle to 1000 rpm, allow time to warm-up to normal operating temperature.
6. Slowly increase the throttle setting while at the same time loading the engine by means of the load control valve until 3000 rpm and 100 Nm.

7. Adjust load control to get variation of engine speed, at this stage hold-down the throttle control. Gradually adjust the load control to get engine speed of 2800, 2600, 2400, 2200 and 2000 rpm respectively. Record the rpm and torque reading on each step.

**Note:** *This step must be done without interruption and the torque readings are taken from high speed to the next lower speed. It is recommended to do this step within 2 minutes (about 15 seconds per reading)*

8. Reduce the load and the speed simultaneously until the engine is idling smoothly.
9. After finishing the experiment, allow the engine to run at idle speed under no load conditions for a few minutes to cool down the temperature.
10. Turn off the engine and all electrical systems o control panel.

### **CALCULATIONS:**

1. Calculate the power of the engine at speed and torque states ( $P = T\omega$ )
2. Calculate the BMEP at each stage.

$$BMEP = \frac{B \times r}{A \times L \times n \times N}$$

### **DISCUSSION:**

1. Discuss the importance of BMEP.
2. What are the methods used to increase the performance of newly manufactured engines.

## OBSERVATION SHEET

**EXPERIMENT:** Brake Mean Effective Pressure (BMEP)

**EXPERIMENT NO:**

**ADMISSION NO:**

No	Engine Speed (rpm)	Torque (Nm)
1		
2		
3		
4		
5		
6		

Cylinder area  $A = 0.0177 \text{ m}^2$

Stroke length  $L = 0.0847 \text{ m}$

Number of Cylinders  $n = 4$

Number of strokes = 4