
Q531 - Motor Plants I

1. When calculating the indicated power developed in a diesel engine cylinder, 1 horsepower is equivalent to "33,000 foot-pounds per minute". What conversion factor would be used if the values are based on metric "kilogram-meters per minute"?

- **4500 kg-meters per minute = 1 HP**
- 5500 kg-meters per minute = 1 HP
- 11000 kg-meters per minute = 1 HP
- 16500 kg-meters per minute = 1 HP

Note:
Marine engineering practice utilizes a rounded conversion of 4500 kilogram-meters per minute to represent 1 horsepower when working with metric units.

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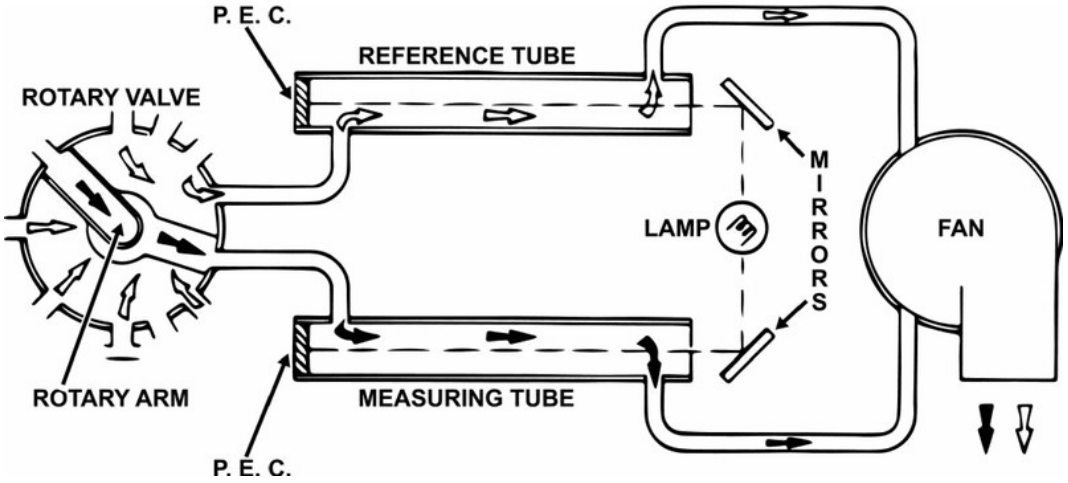
2. The device shown in the illustration is a _____

MO-0008



- photoelectric, explosive gas indicator, for use in high-speed, two-stroke, trunk type piston engines
- **comparator type mist detector for large low-speed, crosshead type engines**
- rotary type mist detector, designed for use in four-stroke, high-speed diesel engines
- level type explosimeter, for small medium-speed, trunk type piston engines

Note:
The illustration depicts a comparator type mist detector, characterized by its use of reference and measuring tubes to compare air streams, a design specific to large, low-speed, crosshead engines.

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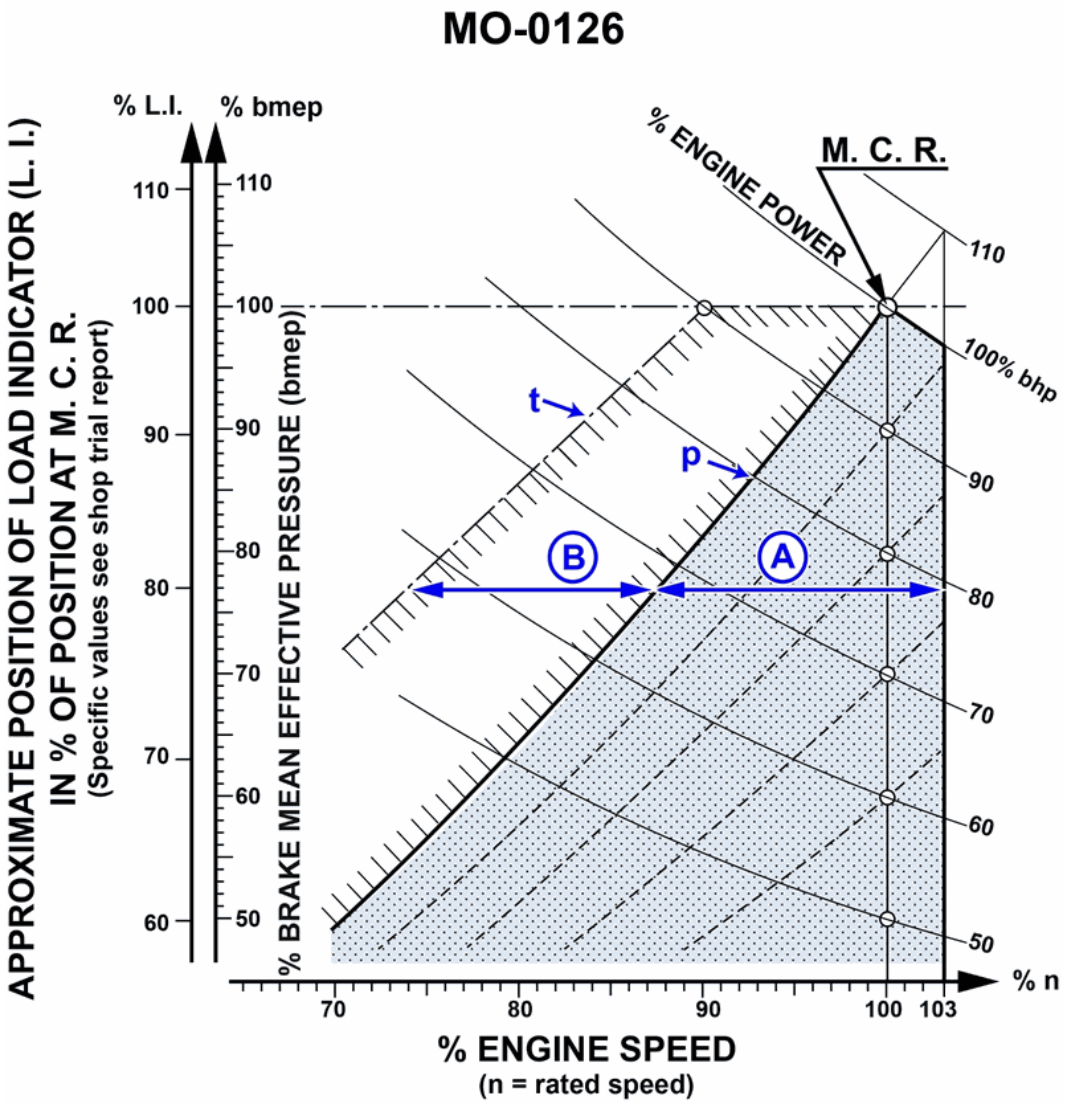
3. Line "P" in the illustration is the _____



- line of maximum horsepower
- **propeller curve**
- line of maximum efficiency
- exponential line

Note:
Line 'P' represents the propeller curve, which illustrates the relationship between engine speed and load for a fixed-pitch propeller. This curve reflects the propeller's power absorption as engine speed increases, following an approximately cubic relationship. The other options represent limits or unrelated concepts not depicted by this specific line on the engine load diagram.

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4. The bore of a diesel engine cylinder describes the _____.

- swept volume of the cylinder
- **inside diameter of the cylinder**
- piston displacement in the cylinder
- length of the piston stroke

Note:
The bore of a diesel engine cylinder is defined as its inside diameter. This measurement, representing the cylinder's internal diameter, distinguishes it from stroke, swept volume, and piston displacement, which are related but distinct concepts.

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5. The cubic inch (or liter) displacement of a cylinder is determined by the diameter of the piston and the _____.

- length of the crankshaft
- volume of the clearance space
- weight of the piston
- **length of the stroke**

Note:
Cylinder displacement is calculated using the piston's diameter and the length of the stroke; it represents the volume displaced as the piston moves from top dead center to bottom dead center.

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6. The compression ratio of a diesel engine refers to the ratio between the _____.

- piston area to connecting rod length
- **cylinder volumes at top dead center and at bottom dead center**
- engine cylinder size to piston size
- the number of compression strokes for a given horsepower

Note:
The compression ratio is the ratio of cylinder volume at bottom dead center to cylinder volume at top dead center. This represents a geometric property of the cylinder, comparing maximum volume (BDC) to minimum volume (TDC), and is not related to piston dimensions, stroke counts, or engine power.

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7. If the compression ratio is increased on any diesel engine, _____.

- the expansion ratio will decrease
- combustion will be slowed down
- thermal efficiency will decrease
- **thermal efficiency will increase**

Note:
Increasing the compression ratio in a diesel engine raises peak combustion temperature and pressure, which increases thermal efficiency by converting more of the fuel's energy into useful work.

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8. The theoretical minimum compression ratio necessary to ensure compression ignition in a direct injection diesel engine is _____.

- 10 to 1
- **12 to 1**
- 16 to 1
- 20 to 1

Note:
A compression ratio of 12 to 1 is the theoretical minimum required for compression ignition in a direct injection diesel engine, as it provides sufficient air temperature to ignite the fuel without external assistance.

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9. Which of the following relationships exist between the temperature developed in the combustion space, and the compression ratio of the engine?

- **Higher compression ratios create higher temperature.**
- Higher temperatures create higher compression ratios.
- Lower temperatures create higher compression ratios.
- Higher compression ratios create lower temperatures.

Note:
Increasing the compression ratio compresses the air-fuel mixture, which raises its temperature. Compression ratio is a fixed mechanical design characteristic; it dictates temperature, not the other way around.

10. The ratio of the brake horsepower to the indicated horsepower of a diesel engine is its _____.

- thermal efficiency
- **mechanical efficiency**
- brake thermal efficiency
- volumetric efficiency

Note:
Mechanical efficiency is defined as the ratio of brake horsepower to indicated horsepower.