37.75 A four stroke 12-cylinder backup diesel generator rotates at $1800rpm$. Each cylinder has a stroke of $6.5in$ and a bore of $5.5in$. The indicated mean effective pressure is $300psi$. How much power does the generator produce?

A. $160KW$

B. $210KW$

C. $940KW$

D. $1890KW$

Use the formula for Internal Combustion Engines to calculate the horsepower produced by the engine.

$$hp = (MEP)\frac{Lan}{K}$$

Start by calculating n which is a function of the rotational speed in rpm, the number of cylinders, and the number of strokes per cycle.

$$n = \frac{2N \times Number\,of\,cylinders}{Number\,of\,strokes\,per\,cycle}$$

$$n = \frac{2\,(1800)\,(12)}{4} = 10,800$$

The mean effective presure is given in the required units, psi.

$$MEP_{[psi]} = 300$$

Convert the stroke length to ft.

$$L_{[ft]} = 6.5in\left(\frac{1ft}{12in}\right) = 0.542$$

Determine the area of the cylinder by caclulating the area of a circle with the given bore (diameter).

$$a_{[in^2]} = \frac{\pi}{4}(5.5in)^2 = 23.758$$

For imperial units, select the appropriate value for K.

$$K = 33,000$$

Substitute values into the equation and solve for the horsepower of the engine.

$$hp = \frac{(300)\,(0.542)\,(23.758)\,(10,800)}{33,000} = 1264.3hp$$

Convert units to KW.

$$P_{[KW]} = (1264.3hp)\left(0.7457\frac{KW}{hp}\right) = 942.8KW$$

Answer C