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Fluid Mechanics First Quiz

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Problem 1 (10 points) :

The brake horsepower bhp of a pump is a function of the pump diameter, the density of the fluid, and the rotational speed of the impellers.

Express this relation as a dimensionless group and name the coefficient.

$$bhp = fnc(D, \rho, n)$$

$$h=4, \quad j=3, \quad k=1 \text{ pi group}$$

$$\begin{aligned} \pi &= \rho^a D^b n^c P^d = M^0 L^0 T^0 \\ &= \left(\frac{M}{L^3}\right)^a (L)^b \left(\frac{1}{T}\right)^c \left(\frac{ML^2}{T^3}\right)^d = M^0 L^0 T^0 \end{aligned}$$

$$M: 0 = a + 1 \rightarrow a = -1$$

$$L: 0 = -3a + b + 2 \rightarrow b = -5$$

$$T: 0 = -c - 3 \rightarrow c = -3$$

$$\pi = \frac{P}{\rho D^5 n^3}$$

Coefficient
of Power

GOOD LUCK!!!!!!!!!!!!!!

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