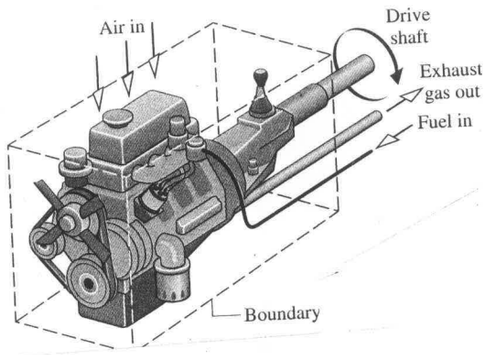
PROBLEM 2.39

KNOWN: Operating data are provided for a V-6 automobile engine.

FIND: Determine the percentage of the developed power that is transferred to the driveshaft and discuss.

SCHEMATIC & GIVEN DATA:



Driveshaft:
- Rotational speed = 4700 RPM
- Torque = 248 ft·lbf

Engine develops 226 hp

ANALYSIS: Using Eq. 2.20, the power delivered to the drive shaft is

$$\dot{W} = \tau\omega$$

$$= (248\ \text{ft}\cdot\text{lbf})\left(4700\ \frac{\text{rev}}{\text{min}}\right)\left|\frac{2\pi\ \text{rad}}{1\ \text{rev}}\right|\left|\frac{1\ \text{min}}{60\ \text{s}}\right|\left|\frac{1\ \text{hp}}{550\ \text{ft}\cdot\text{lbf/s}}\right|$$

$$= 221.9\ \text{hp} \quad (1)$$

The percentage of the power developed by the engine that is delivered to the driveshaft is

$$\% = \frac{221.9\ \text{hp}}{226\ \text{hp}} = 0.98 \quad (98\%)$$

Frictional and like effects account for the difference.

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1. This corresponds to the result of Problem 2.38. Applying it we get

$$\dot{W} = \frac{\tau\omega}{C} = \frac{(248\ \text{ft}\cdot\text{lbf})(4700\ \text{rev/min})}{\left[5252\ \frac{(\text{ft}\cdot\text{lbf})(\text{rev/min})}{\text{hp}}\right]} = 221.9\ \text{hp}$$