2-80E A person trades in his Ford Taurus for a Ford Explorer. The extra amount of CO_2 emitted by the Explorer within 5 years is to be determined.

Assumptions The Explorer is assumed to use 850 gallons of gasoline a year compared to 650 gallons for Taurus.

Analysis The extra amount of gasoline the Explorer will use within 5 years is

$$\begin{aligned}\text{Extra Gasoline} &= (\text{Extra per year})(\text{No. of years})\\ &= (850 - 650\ \text{gal/yr})(5\ \text{yr})\\ &= 1000\ \text{gal}\\ \text{Extra } CO_2 \text{ produced} &= (\text{Extra gallons of gasoline used})(CO_2 \text{ emission per gallon})\\ &= (1000\ \text{gal})(19.7\ \text{lbm/gal})\\ &= \mathbf{19{,}700\ lbm\ CO_2}\end{aligned}$$

Discussion Note that the car we choose to drive has a significant effect on the amount of greenhouse gases produced.

2-81E A household uses fuel oil for heating, and electricity for other energy needs. Now the household reduces its energy use by 15%. The reduction in the CO_2 production this household is responsible for is to be determined.

Properties The amount of CO_2 produced is 1.54 lbm per kWh and 26.4 lbm per gallon of fuel oil (given).

Analysis Noting that this household consumes 14,000 kWh of electricity and 900 gallons of fuel oil per year, the amount of CO_2 production this household is responsible for is

$$\begin{aligned}\text{Amount of } CO_2 \text{ produced} &= (\text{Amount of electricit y consumed})(\text{Amount of } CO_2 \text{ per kWh})\\ &\quad + (\text{Amount of fuel oil consumed})(\text{Amount of } CO_2 \text{ per gallon})\\ &= (14{,}000\ \text{kWh/yr})(1.54\ \text{lbm/kWh}) + (900\ \text{gal/yr})(26.4\ \text{lbm/gal})\\ &= 45{,}320\ CO_2\ \text{lbm/year}\end{aligned}$$

Then reducing the electricity and fuel oil usage by 15% will reduce the annual amount of CO_2 production by this household by

$$\begin{aligned}\text{Reduction in } CO_2 \text{ produced} &= (0.15)(\text{Current amount of } CO_2 \text{ production})\\ &= (0.15)(45{,}320\ CO_2\ \text{kg/year})\\ &= \mathbf{6798\ CO_2\ lbm/year}\end{aligned}$$

Therefore, any measure that saves energy also reduces the amount of pollution emitted to the environment.

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