RADHIKA PATWARI
18CS10062

PAGE NO.
DATE

[EVS] Assignment 1: Understanding Air Pollution

1: A burning power plant consumes 10,000 tons coal/day

→ A burning power plant consumes 10^7 kg coal/day

[1 ton = 10^3 kg]

Given, coal contains 2% sulfur by weight

∴ 10^7 kg coal produces (0.02×10^7) kg sulfur per day

The relevant chemical reaction:

$$S + O_2 \rightarrow SO_2$$

∴ 32 g of sulfur produces 64 g of sulphur dioxide

Assuming 100% of sulphur is converted to SO_2,

∴ Amount of SO_2 produced per day $= \left(\frac{64\,g}{32\,g}\right) \times (0.02 \times 10^7)\ \frac{kg}{day}$

$= 0.04 \times 10^7$ kg/day

$= 4 \times 10^5$ kg/day

$= 4 \times 10^8$ g/day

RADHIKA PATWARI

18CS10062

PAGE NO.
DATE / /

Given, sulfur oxides produced per day are confined in a volume of $10^{11} m^3/day$

$\therefore$ Concentration of SO_2 in the air surrounding the power plant $= \dfrac{4 \times 10^8 \ g/day}{10^{11} \ m^3/day}$

$= 4 \times 10^{-3} \ g/m^3$

$= \underline{4000 \ \mu g/m^3}$

If all conditions are same, to keep concentration of SO_2 as $365 \ \mu g/m^3$

Amount of sulfur dioxide released per day $= 365 \times 10^{11} \dfrac{\mu g}{\cancel{m^3}} \times \dfrac{\cancel{m^3}}{day}$

$= 365 \times 10^5 \ g/day$

Let sulfur content in coal be $x\%$, then

$$365 \times 10^5 \ g/day = \left(\frac{\overset{2}{\cancel{64}} \ g}{\cancel{32} \ g}\right) \times \frac{x}{100} \times 10^7 \frac{kg}{day}$$

$$\Rightarrow 365 = (2x)(1000)$$

$$\Rightarrow x = \frac{365}{2 \times 1000} = 182.5 \times 10^{-3}$$
$$= \underline{0.1825 \ \%}$$

$\therefore$ Sulfur content in coal should be $\underline{0.1825\%}$

RADHIKA ~~PATWARI~~
18CS10062

2. No. of gasoline powered cars $= 10^9$

Average distance travelled by a car $= 16000$ km/year

Since, Gasoline is consumed at the rate of 7.8 l per 100km.

∴ ~~Amount of gasoline consumed by a car~~ =

∴ Total gasoline consumed = No. of cars × $\frac{\text{~~service provided~~}}{\text{car}}$ × $\frac{\text{gasoline}}{\text{distance}}$

$\Rightarrow \quad I = P \times A \times T$

$\Rightarrow$ Gasoline $= 10^9 \times \frac{16\cancel{000}\text{ km}}{1\text{ year}} \times \frac{7.8\text{ l}}{\cancel{100}\text{ km}}$

$= 1248 \times 10^9$ l/year

∴ Annual Consumption of gasoline $= 1248 \times 10^9$ l

Given, 1 litre of gasoline produces 2.3 kg of CO_2

∴ Annual production of CO_2 from burning of gasoline in cars $= 1248 \times 10^9 \times 2.3$ kg/year

$= 2870.4 \times 10^9$ kg/year

Since 25% of CO_2 overheads emission is incurred at production, refinery and downstream,

RADHIKA PATWARI

18CS10062

PAGE NO

DATE / /

$\therefore$ Amount of CO_2 produced due to automobiles $= \left(2870.4 \times 10^9 \frac{kg}{year}\right) \times 1.25$

$= 3588 \times 10^9$ kg/year

$= 3588 \times 10^6$ ton/year

$= 3.588$ gigaton/year

$\therefore$ Annual CO_2 emission from automobiles $= \underline{\underline{3.588 \text{ Gt}}}$.