

CE 213-A

ASSIGNMENT- 4 (Air Pollution)

Emissions from an existing power plant have been found to produce an SO_2 concentration of $20 \times 10^{-6} \text{ g/m}^3$ at a distance of 800 m directly downwind from the stack when the wind speed is 4 m / s from the north during a class C stability situation. At a later date another plant is built 200 m to the west of the original plant. It burns 1818 kg/hr of fuel oil which contains 0.5% sulfur. The second plant has an effective stack height of 60 m, and it has no SO_2 emission control. For the same atmospheric conditions listed above, solve Q 1 and Q2 given below.

Q-1: Total amount of SO_2 released from second plant

Q-2: Estimate the percentage increase in SO_2 concentration at the downwind site due to the second plant. (Given value of stability class C $\sigma_y = 86.1 \text{ m}$ $\sigma_z = 52.6 \text{ m}$)

Q-3: Mass Balance - Simple Box Model.

A city with dimension $W \times L \times H$ (7 km x 13 km x 1.5 km) had a wind velocity of 4 m/s. The upwind concentration of SO_2 is $10 \mu\text{g/m}^3$. The emission rate for the city is $4.5 \times 10^{-6} \text{ g/s.m}^2$. What is the concentration of SO_2 over the city?

Q-4: Estimate the plume rise for a 2 m diameter stack whose the exit gas has a velocity of 34 m/s when the wind velocity is 4 m/s, the pressure is 1 atm and the stack and surrounding temperatures are 85°C and 33°C respectively. (Consider neutral condition)

Q-5: State the working principle of scrubbers, electrostatic precipitator and catalytic convertor