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MATHEMATICAL MODEL FOR THE STUDY EFFECTS OF METEOROLOGICAL CONDITIONS ON DISPERSION OF POLLUTANTS IN AIR

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ABSTRACT:- The purpose of the present work was to investigate air quality that contained pollutant gases (SO_2 , NO_2 , CO) released from the thermal power plant as case study. Gaussian Plume Model and the computer program (visual basic 6) is used to calculate concentrations dispersion of gas pollutants at different meteorological conditions (wind speed, ambient temperature); maximum concentration values, downwind distance and required effective stack height estimation.

A typical theoretical investigation of a case study concerning existing air pollution problems at an industrial area (4Km) downwind distance by using the computer program. The results showed that the concentration of SO_2 (890 $\mu g/m^3$) released from stack may is higher than the EPA standard. Also the optimum point of the ground level concentration of pollutants decreases with increasing effective stack height.
Keywords: Dispersion model, Pollutant gases, Power plant.

INTRODUCTION

Contaminate gases, liquid and particulate matter discharges into the air are transported over along distance by large-scale air-flows and dispersed by small-scale air-flows or turbulence, which mix contaminates with clean air. This dispersion by the wind is a very complex process due to the presence of different sized eddies in atmospheric flow [(1)].

The major portion of the recognized air pollutants are gases such as carbon monoxide (CO), the oxides of nitrogen (NO_x), the oxides of sulfur (SO_2), unburned hydrocarbons and particulate matter (dusts, smokes, mists, aerosol). These pollutants are emitted by different sources, such as: transportation, electric power generation, refuses burning, industrial and domestic fuel burning) [(2)]. Increasing air pollution levels due to rapid urbanization and growth in industrial emissions are now causes of major concern in many large cities of the world [(3-6)]. When strategies to protect public health are under consideration, establishing ambient air quality standards and regulations have been introduced in order to set limits on the emissions of pollutant[(7)]. To achieve these limits, consideration was given to mathematical and computer modeling of air pollution. Therefore, air quality models are indispensable tools for assessing the impact of air pollutants on human health and the urban environment [(8)].

The necessity for such models has increased tremendously especially with the rising interest in the early warning systems in order to have the opportunity to take emergent and preventive action to reduce pollutants when conditions that encourage high concentrations are predicted. On the other hand, long-term forecasting and controlling of air pollution are also