

Authors' Name: Otaru, A.J., Odigure, J.O. & Okafor, J.O. (2013)

Book Title: Development of Predictive Model for Particulate Dispersion from a Cement Mill Stack

Publisher: LAMBERT Academic Publishing

ABSTRACT

This research work was necessitated as a result of high pollution rate of particulate matters within and outside cement plants in Nigeria. The study plans to develop a predictive model for particulate dispersion with an aerodynamic diameter of $10\mu\text{m}$ (PM10) from a cement mill stack and to identify a safety distance for human settlement and activities. The meteorological concentrations of PM10 have been measured using the SKC deployable particulate sampler both in the plant and far away from the cement mill stack. Concentration of PM10 was computed using the formulated Gaussian plume model that incorporates meteorological and source related factors to estimate particulates' concentration downwind from a cement mill stack. The simulated results are in agreement with the experimental results at an average value of 92% within a Gaussian distance of 200 – 2,000m. The simulated results of this work shows that the PM10 concentrations in the ambient air at a distance of about 1.5 – 4.5km from the stack is higher than the World Health Organisation standard annual average value of $260\mu\text{g}/\text{m}^3$ and 2.0 – 4.0km from the stack was also higher than the Nigerian Federal Ministry of Environmental standard annual average value of $500\mu\text{g}/\text{m}^3$. Due to other fugitive emissions from cement plants, a simulated safety distance beyond 7.0km from the plant is recommended for human settlement and activities