Particulate suspended matter (PM_{10}), Particulate suspended matter ($PM_{2.5}$), and its Effects on Human Health in NFL Vijaipur Guna M.P.

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Abstract- Air pollution data is obtained from a number of fixed site monitors located throughout the study region. These monitors measure backgroundpollution levels at a number of time intervals throughout the day and adaily average is typically calculated for each site. A number of pollutants are measured including, particulate matter ($PM_{2.5}$ and PM_{10}). N.F.L. Vijaipur is nitrogenous fertilizer plant producing urea on high unit. With the commencement of commercial production of the Expansion project the gas based unit at Vijaipur now comprises of two 1520 ton per day Ammonia streams and four 1310 ton per day Urea streams and related off-site facilities. The level of PM_{10} in summer time is noticeable higher than in winter time. The number of respiratory cases varies with the increases of air pollution (PM_{10}/$PM_{2.5}$) and the changes between winter and summer time. To overcome this pollution my suggestion to N.F.L. Vijaipur that employees should use public transport at the time of office.

Keywords: Particulate Suspended Matter PM_{10} and $PM_{2.5}$ and N.F.L. as National Fertilizer Limited.

I. INTRODUCTION

N.F.L. (National Fertilizer Limited- a Govt. of India Undertaking) is India's highest producer of nitrogenous fertilizers. The company has four plants which are located at Nangal and Bathinda in Punjab Panipat in Haryana and Vijaipur in M.P. N.F.L. Vijaipur project is located in Guna district of Madhya Pradesh (35 Kilometres from Guna). It is spread over 1250 acres of lush green landscaped area comprising the factory area of 650 acres and the township which is spread in an area of 600 acres. The township is inhibited by approx. 6000 people. The factory area consists of various plants like Ammonia (I&II), Urea(I&II), Captive Power, DM, Cooling Towers (Urea & Ammonia), Bio-Fertilizer, Bagging, Pre-Treatment and Effluent Treatment plants in addition to Office buildings, Administration building, Conference halls, Fire Station, Canteens, Product handling conveyors, Urea Storage Silo (I&II).

Particulates are the complex mixture of multi component particles where size distribution, composition and morphology can vary significantly in space and time. Atmospheric aerosol size ranges from a few nanometres to tens of micrometres. Major component of particulates includes nitrates, sulphates, trace elements, organic material, soot and crustal components.

Air with dust enters in the sampler through circular omni directional inlet reaches to PM_{10} impactor where all particles having size more than 10micron are retained. Now air with particles having size less than 10 microns further proceed and pass through WINS impactor which is in well-shaped impactor. A filter dipped in impaction oil is kept in the well where particles hit at specific velocity (maintained by top critical hole of WINS Impactor) this results separation of particles above 2.5micron to 10micron. Only particles having size 2.5micron and below proceed further with air stream and accumulated on PTFE (Poly-tetra fluro-ethylene) membrane filter.

In India particulates are one of the major pollutants. The finer fraction (up to 2.5 micron) is known to impact human health critically. It is now well established that dust having size more than 10 microns in general do not reach in vital respiratory system. Thus it causes impact only on skin, eyes and soiling of clothes and surfaces.

Figure1. GIS map of the sampling location.

II. EXPERIMENTAL WORK

For the purpose of this study PM_{10} and $PM_{2.5}$ I have taken three different station or spot to compare the pollution at different season in N.F.L. Vijaipur Guna in M.P. using Ecotech AAS 127MFC. If PM_{10} monitoring are needed, then only WINS Impactor should not be fitted in the instrument. The results obtained are tabulated as below.

III. RESULTS AND DISCUSSION

Computation of Mass Concentration: Compute the average mass concentration (MC) of $PM_{10}/PM_{2.5}$ during the sampling period using the following formula with the information assembled data.

$$MC = \frac{DW \times 10^6}{V}$$

Where:

DW = The net change in the mass(g) of the 47mm PTFE membrane filter between the pre collection weighing and the post collection weighing.

10^6 = Conversion factor from grams(g) to micrograms(µg).

V = The volume (m^3) drawn through the filter.

Table1. Rainy Season: July 2015

Stations	PM_{10} (in µg/m^3)	$PM_{2.5}$ (in µg/m^3)
Central Lab	34	NIL
Cooling Tower	89	50
Bio/TEP Area	75	40

August 2015

Stations	PM_{10} (in $\mu g/m^3$)	$PM_{2.5}$ (in $\mu g/m^3$)
Central Lab	34	NIL
Cooling Tower	89	50
Bio/TEP Area	75	40

Table2. Winter Season: November 2015

Stations	PM_{10} (in $\mu g/m^3$)	$PM_{2.5}$ (in $\mu g/m^3$)
Central Lab	74	36
Cooling Tower	68	40
Bio/TEP Area	72	38

December 2015

Stations	PM_{10} (in $\mu g/m^3$)	$PM_{2.5}$ (in $\mu g/m^3$)
Central Lab	76	40
Cooling Tower	70	35
Bio/TEP Area	71	38

Table3. Summer Season: May 2016

Stations	PM_{10} (in $\mu g/m^3$)	$PM_{2.5}$ (in $\mu g/m^3$)
Central Lab	89	50
Cooling Tower	90	54
Bio/TEP Area	77	46

Stations	PM_{10} (in $\mu g/m^3$)	$PM_{2.5}$ (in $\mu g/m^3$)
Central Lab	90	52
Cooling Tower	92	55
Bio/TEP Area	78	47

IV. CONCLUSION

The most important finding is: (i) In generally, PM_{10} and $PM_{2.5}$ concentration (24hours) of six months (May, June, July, August, November and December) in research area is within municipal guidelines (100$\mu g/m^3$,24hours), and it varies with the change of seasons. From an above results I conclude that level of PM10 in summer time is noticeable higher than in winter time. (ii) The number of respiratory cases varies with the increases of air pollution ($PM_{10}/PM_{2.5}$) and the changes between winter and summer time. To overcome this pollution my suggestion to N.F.L. Vijaipur that employees should use public transport at the time of office. Due to more vehicle's used in township and factory too much pollution is occurring. Sometimes pollution control at source is not possible by preventing the emission of pollutants. Then it becomes necessary to install pollution control equipment to remove the gaseous pollutants from main gas stream. The pollutants are present in high concentration at the source and as their distance from the source increases they become diluted by diffusing with environmental air. Pollution control equipment to be used are wet collectors scrubbers gravitational settling cyclone separators and fabric filters.

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