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Ambient Air Quality Monitoring In the Nighbourhood of Thermal Power Stations at Neyveli

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A short-term Ambient Air Quality survey has been carried out in the neighbourhood of Thermal Power Stations at Neyveli from December 2014 to February 2015. Concentrations of each pollutant were plotted against different sites selected so that comparison can be made and seen that highest PM10 concentration was recorded at Vadakkuvellur site as 82.0 µg/m3. 8 hour average concentration observed at all industrial, commercial and residential sites were much above the standard concentrations of PM10 established by CPCB. Among all the sites, concentration of 37.4 µg/m3 was observed as highest concentration of SO2 at Vadalur. Standard value provided by CPCB is 80 µg/m3 so all values recorded at different sites is less than the standard values. The concentration of NO2 was highest at 18.8 µg/m3 at Vadalur. Among all sites concentration of NO2 was highest at site. These values are less than the standard values provided by CPCB. During the study period it was concluded that the levels of SO2, PM10 and NO2 are well within the limits prescribed by CPCB. This is due to effective control measures continuously being adopted by NLC. The less efficient mechanical precipitators have been replaced with highly efficient electrostatic precipitators. The massive afforestation measures taken by NLC also serve as a sink for absorbing pollutants. These types of studies around power plants are to be continued to detect the trends in pollution levels due to the impact of Thermal Power Station.

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I. INTRODUCTION

India, a developing country, is one of the first ten industrial countries of the world (Sharma, 2007). Because of the enhanced anthropogenic activities (Goyal and Sidhartha, 2003) in India, air pollution problems have become a topic of intense debate at all platforms. According to a study released by World Economic Forum in Davos, India has the worst air pollution in the entire world, beating China, Pakistan, Nepal and Bangladesh.

The World Health Organization estimates that about two million people die prematurely every year as a result of air pollution, while many more suffer from breathing ailments, heart disease, lung infections and even cancer. The air quality monitoring program in India was started in 1967 by the National Environmental Engineering Research Institute (NEERI) (then named CPHERI, Central Public Health Engineering Research Institute).The monitoring was expanded to include regular monitoring at three stations in 1978. The CPCB initiated the National Ambient Air Quality Monitoring (NAAQM) program in the year 1984 with seven stations at Agra and Anpara. Subsequently, the program was renamed as National Air Monitoring Programme (NAMP). The number of monitoring stations under the NAMP has increased, steadily, to 295 by 2000-2001 covering 99 cities/towns in 28 States and 4 Union Territories (CPCB, 2003). Under NAMP, four air pollutants, viz., sulphur dioxide (SO2), oxides of nitrogen as NO2 and suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM/PM 10), have been identified for regular monitoring at all the locations. Besides this, additional parameters such as respirable lead and other toxic trace metals, hydrogen sulphide (H2S), ammonia (NH3) and polycyclic aromatic hydrocarbons (PAHs) are also being monitored in 10 metro-cities of the country since 1990.

The monitoring of meteorological parameters such as wind speed and direction, relative humidity and temperature were also integrated with the monitoring of air quality. Further, for real time data collection, automatic monitoring stations at few places had also been installed. Ambient air quality monitoring was carried out manually using high volume samplers and respirable dust samplers with gaseous attachments. The samples were analyzed in the laboratory and sent to the Pollution Assessment Monitoring and Survey (PAMS), division of CPCB. Neyveli Lignite Corporation (NLC), an integrated industrial complex, situated in a massive campus of 480 sq.km area houses two Mines, two Thermal Power Stations at Neyveli inTamil Nadu, India. Presently, 17 million tonnes of lignite is mined and 2070 MW of power is generated. This study is essentially carried out when the NLC has proposals for greater exploration of the lignite deposit and power generations to an extent of 3810 MW capacities during the immediate future. Therefore, this study assesses the impact of emissions on the ambient air quality. In this regard, Ambient Air Quality Monitoring is to be essentially carried out in the neighbourhood of Thermal Power Plants in Neyveli. The objectives of this study is to conduct a short term ambient air quality Monitoring (sampling and analysis) in the neighborhood of Thermal Power Plants in Neyveli.

II. METHODOLOGY

According to the CPCB (Central pollution control board) the methods prescribed for the pollutant gases and the particulate pollutants are very sensitive ones yet percentage of errors are very less. The methods prescribed for the gases SO2, NOx and the particulate pollutants TSP, PM10 are respectively: (i) Modified West and Gaeke method (ii) Modified Jacob Hochheiser method (iii) High Volume method (iv)Cyclonic flow technique The purpose is to lay down an uniform and reliable method for sampling and analysis of SO2 and NOx in the ambient air and also to lay down an uniform and reliable method for measurement of TSP and PM10 in the ambient air of Neyveli.

High Volume Samplers are the basic instruments used to monitor ambient air quality. In this study, Envirotech APM 415 with its attachment for gaseous pollutant monitoring APM 411 will be used. In these samplers, air-borne suspended particulates (SPM) are measured by passing air at a high flow-rate of 1.1 to 1.7 cubic meters per minute through a high efficiency filter paper (Whatman 934-AH Glass Microfiber Filters) which retains the particles. The instrument measures the volume of air sampled, while the amount of particulates collected is determined by measuring the change in weight of the filter paper as a consequence of the sampling. In High Volume Sampler provisions have been made for simultaneous sampling of gaseous pollutants. Gaseous attachment contains three impinger bottles of 35 ml capacity for simultaneous absorption of different gaseous pollutants. Here the air is passed through suitable reagents that would absorb specific gases where gaseous pollutants like SO2, NOx etc. are analyzed subsequently by simple wet chemistry method to determine the concentration of specific pollutant. The gaseous sampling requires only a few LPM (1-3 LPM) of air flow. This absorbing solution is placed within the impinger bottles placed in between ice cubes or cold water, for complete absorption of sparsely soluble gases.

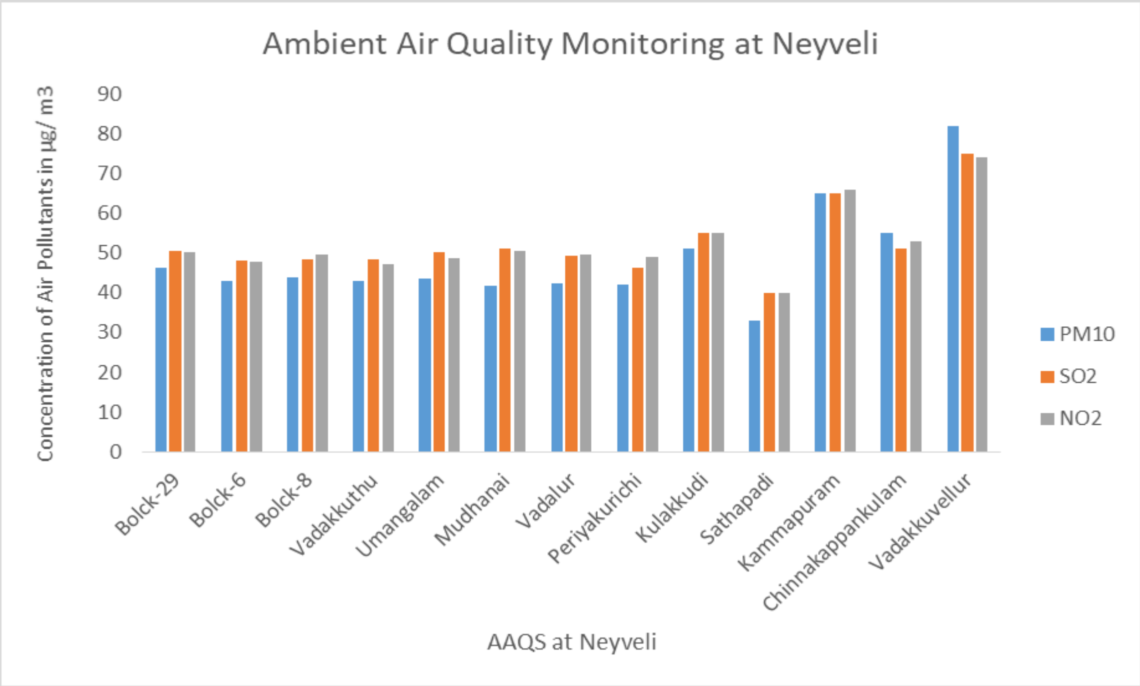
These absorbing solutions can then be taken directly to the laboratory for analysis. PM 10 sampler PM 2.5/ 10 Sampler is an advanced sampler conforms to the USEPA and CPCB norms. This sampler uses a set of Impactors standardized by USEPA to separate coarse particulates from the air stream. For sampling of PM 2.5, particles with aerodynamic diameter larger than 10 microns are trapped by using the opposed jet impaction over a filter paper of specified Whatman number 7582-004 37mm diameter supported on surface by silicon oil and those having a diameter between 2.5 and 10 Microns are trapped over PTFE filters using the WINS Impactor. But for sampling of PM 10, WINS Impactor unit is replaced by PM 10 impactor assembly. Finally air stream leaving the WINS Impactor consists of only fine particulates with an aerodynamic diameter smaller than 2.5 microns. The flow is controlled by microprocessor based flow controller for maintaining the flow rate constant at 16.67 LPM. This instrument also has two other sensors for the temperature and pressure. All the parameters like sampling period, flow rate etc. were set in control module. The instrument samples for a specific period.

III. RESULTS & DISCUSSION

This chapter presents the wind roses, and concentration of different pollutant such as PM 10, SO2 and NO2 at different selected sites. As it has been discussed in methodology that first step was to decide sampling sites on the basis of wind roses. So firstly wind rose diagrams were plotted for period of December 2014 to February 2015. Wind data was collected twice a day at mentioned site for the study period of Three months.

Table -1 : Maximum Average Concentrations of pollutant at different sampling sites

	PM_{10}			**SO_2**			**NO_2**		
Location	**Dec**	**Jan**	**Feb**	**Dec**	**Jan**	**Feb**	**Dec**	**Jan**	**Feb**
Bolck-29	46.2	50.4	50.3	1.8	1.8	2.7	16.8	16.1	16.6
Bolck-6	42.9	48.1	47.7	1.8	1.8	2.8	17.4	16.3	16.4
Bolck-8	44.0	48.4	49.7	1.6	1.8	2.7	17.6	15.9	17.0
Vadakkuthu	42.9	48.5	47.3	1.8	1.9	2.7	18.0	17.3	17.6
Umangalam	43.5	50.3	48.8	2.5	3.6	4.7	17.4	17.2	16.6
Mudhanai	41.7	51.1	50.6	2.7	3.6	4.1	17.4	18.1	18.0
Vadalur	42.5	49.3	49.7	1.8	2.7	**37.4**	18.0	16.7	**18.8**
Periyakurichi	42.2	46.4	49.0	1.7	2.7	3.7	17.4	16.4	17.1
Kulakkudi	51.0	55.0	55.0	6.8	6.6	6.3	16.2	17.2	18.6
Sathapadi	33.0	40.0	40.0	6.5	6.3	5.5	16.1	17.2	17.2
Kammapuram	65.0	65.0	66.0	6.8	6.5	6.1	16.2	17.2	18.2
Chinnakappankulam	55.0	51.0	53.0	7.0	6.5	6.1	16.3	17.2	18.1
Vadakkuvellur	**82.0**	75.0	74.0	6.8	6.7	6.3	16.9	17.9	18.4



Measurement of pollutants concentration After selection of sampling site, monitoring of 3 pollutants i.e. PM 10, SO2 & NO2 was done. Concentrations of different pollutants at different sampling sites were listed in Table 5.1. Concentrations of each pollutant were plotted against different sites selected so that comparison can be made. From Table 1 it can be seen that highest PM 10 concentration was recorded at Vadakkuvellur site as 82.0 µg/m3. 8 hr Average Concentration observed at all industrial, commercial and residential sites were much above the standards concentrations of PM 10 established by CPCB. Among all the sites, concentration of 37.4 µg/m3 was observed as highest concentration of SO2 at Vadalur. Standard value provided by CPCB is 80 µg/m3 so all values recorded at different sites is less than the standards. The concentration of NO2 was highest at 18.8 µg/m3 at Vadalur. Among all sites, concentration of NO2 was highest at site. These values are less than standard values provided by CPCB.

IV. CONCLUSION

A short-term Ambient Air Quality survey has been carried out in the neighbourhood of Thermal Power Stations at Neyveli from December 2014 to February 2015. Concentrations of each pollutant were plotted against different sites selected so that comparison can be made from Table 5.1 and Figure 5.1 it can be seen that highest PM10 concentration was recorded at Vadakkuvellur site as 82.0 µg/m3. 8 hour average concentration observed at all industrial, commercial and residential sites were much above the standard concentrations of PM10 established by CPCB. Among all the sites, concentration of 37.4 µg/m3 was observed as highest concentration of SO2 at Vadalur. Standard value provided by CPCB is 80 µg/m3 so all values recorded at different sites is less than the standard values. The concentration of NO2 was highest at 18.8 µg/m3 at Vadalur.

Among all sites concentration of NO2 was highest at site. These values are less than the standard values provided by CPCB. During the study period it was concluded that the levels of SO2, PM10 and NO2 are will within the limits prescribed by CPCB. This is due to effective control measures continuously being adopted by NLC. The less efficient mechanical precipitators have been replaced with highly efficient electrostatic precipitators. The massive afforestation measures taken by NLC also serve as a sink for absorbing pollutants. These types of studies around power plants are to be continued to detect the trends in pollution levels due to the impact of Thermal Power Station.

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