AMBIENT AIR QUALITY MONITORING IN CHANDRAPUR CITY

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ABSTRACT

The project investigate the concentration of pollutant sulphur dioxide, nitrogen oxide, particular matter (PM10 & PM2.5), total suspended particulate (TSP) and varies metal like lead(Pb), arsenic(As), and nickel(Ni) generated from various source like automobiles, industries over the ambient air quality of the major pollutants. The rate of emission and concentration of these gases in the ambient air is studied by the following laboratory method – (a) Modified West and Gaeke method for determination of sulphur dioxide in ambient air, (b) Modified Jacob and Hochheiser method for determination of nitrogen oxides in ambient air, (c) High volume method for determination of TSP in the ambient air, (d) Cyclonic flow technique for the measurement of PM10 & PM2.5. (e) AAS/ICP method (for sampling on EPM 2000 or equivalent filter paper) for lead(Pb), arsenic(As) and nickel(Ni).

As per our result it is found that NOx concentration and PM10 concentration were above the stipulated CPCB standard (24 hourly SO2) is 80 and (24 hourly PM10) 100. The level SO2, PM2.5 and metals like lead(Pb), arsenic(As) and nickel(Ni) are below permissible limit stipulated CPCB standard. As per our study further industrial development must be restricted in Chandrapur city otherwise hazardous situation may develop.

Keywords -- ***Ambient Air, Air Pollutants, Environmental Status, Indian Scenario, Quality Monitoring***

I. INTRODUCTION

In India, outdoor air pollution is restricted mostly to urban areas, where automobiles are the major contributors, and to a few other areas with a concentration of industries and thermal power plants. Apart from rapid industrialization, urbanization has resulted in the emergence of industrial centers without a corresponding growth in civic amenities and pollution control mechanisms. In most of the 23 Indian cities with a million-plus population, air pollution levels exceed World Health Organization's (WHO) recommended health standards. In every city, the levels are getting worse because of rapid industrialization, growing number of vehicles, energy consumption, and burning of wastes. Several cities face severe air pollution problems, with annual average levels of total suspended particulates (TSP) at least three times as high as the WHO standards. A study conducted by the World Bank indicates premature deaths of people in Delhi owing to high levels of air pollution (Review of air quality management system in India).

Chandrapur is a mineral rich district with a dense forest spread over 41.5 % of total land. Based on available minerals and abundant water, industries have been set up within and in the surrounding of Chandrapur City. The mineral based industrial development and rapid urbanization in this district has albeit resulted in pollution and environmental degradation and its effects are being felt on a wide scale. These industries are Western Coal Ltd. operates 26 coal mines in Chandrapur city and the surrounding areas. The mined coal is supplied to Super Thermal Power station at Chandrapur having a generation capacity of 2340 MW capacity and also having coal linkage to Durgapur open cast coal mine. Coal is transported to STPS by rail and aerial ropeway. WCL also supplies coal to the other industries like paper mills, sponge iron plants, cement industries etc. All WCL mines generally produce coal of E/F grade. Due to heavy demand of coal, WCL has increased their stipping ratio and coal production. WCL has been given conditional environmental clearances by MoEF, Government of India. They have obtained consents to operate those mines for the enhanced coal production. Since the coal mined at WCL has high ash content, the industries prefer washed coal. Ballarpur Paper mill is the major pulp & paper industry located at Ballarpur city, which is about 20 km from Chandrapur City. Due to abundant availability of coal, 6 sponge iron plant have also come up in this district, which are within a distance of 10 to 20 kms from Chandrapur city.

From the discussion the scope of present study, i.e. Coal mines, Thermal power station and transport of coal through city, sponge iron plant, produce huge amount of pollutant which pollute the environment. Thus, the ambient air quality of the city Chandrapur is needed to be studied in detail as it is a major concern to care for the health of the people residing in Chandrapur resulting due to air pollution. But since we are concerned about the pollution level in chandrapur city so, we have considered the monitoring sites inside the City.

II. LITERATURE REVIEW

2.1P. Roy, P. Kumar Sikdar, G. Singh, A. Kumar Pal (February 27, 2014)

A mining belt of Orissa is studied and the ambient mass concentration and the elemental composition in the PM10 samples were determined. The annual average concentrations of PM10 samples at each site were 144 ± 29 µg/m3, 191 ± 61 µg/m3, 90 ± 28 µg/m3, 60 ± 15 µg/m3, 106 ± 35 µg/m3, and 150 ± 36 µg/m3 and 312 respectively, indicating severe air pollution levels in Talcher. Variation of particulate matter with meteoro¬logical parameters like wind speed, relative humidity and temperature was observed. The study reveals that the particulate matter concentration drops substantially with the rise of wind speed above 1m/s. Elemental concentrations of PM10 were analyzed using an atomic absorption spectrophotometer. Correlation and mul¬tivariate analysis techniques, such as principal components analysis, were used for source apportionment to identify the possible sources of PM10 and quantified trace elements. Four factors were isolated by principal components analysis: soil dust or fugitive dust from mining associated activities, emissions from automobiles, emissions from thermal power plant and non-ferrous smelter, and identified as possible sources.

2.2Nilesh P. Nandanwar, Arty K. Dixit, Kirtiwardan R. Dixit, Sachin S. Wazalwar (March 1, 2014)

This paper is a comparative study between the ambient air qualities of Chandrapur district. It was observed that RSPM level in almost all station samples were higher during dry season. The pollution level of SO2, NOx and RSPM mass concentration was significantly increased in the area under industrial impact. From the observed data it was marked that the pollution was not so acute during dry season at all the six stations. In Industrial area like Ghughus the RSPM in winter season is found to be more than the CPCB limit and it is dangerous towards the pollution. Also the Quantity of RSPM is maximum in summer during the month of May and April in all the station due to the clear weather and hot climate. Concentration of NOx and SO2 is also increases during winter and summer season and it is significant in all station. The overall monitoring results reveal that the study area is highly polluted with respect to air quality.

National Aeronautics & Space Agency (December 5, 2013)

A new study led by Zifeng Lu of Decision and Information Sciences Division of Argonne National Laboratory in Argonne, USA, based on images taken by the Aura satellite between 2005 and 2012, says that SO2 emissions from India's thermal power plants has gone up by a whopping 71 per cent from what it was in 2005. The rapid rise in demand for power and the absence of regulations are seen as the reasons behind the drastic rise. The study was published online on December 5, 2013, in Environment science & Technology. Images released with the study show rising emissions from coal-fired power plants in central India, especially the Vidarbha region of Maharashtra, Chhattisgarh and Jharkhand.

2.3Central Pollution Control Board & IIT Delhi (2009)

A study led by Central Pollution Control Board in conjunction with IIT Delhi reveals that Chandrapur is rated 4thin the list of most polluted cities in India. They studied 88 cities in the country and scored each of them out of 100. The cities scoring above 70 out of 100 are considered as critically polluted cities. Chandrapur scored 83.88 out of 100 hence it is critically polluted

2.4Ministry of Environment & Forest, Central Pollution Control Board (December 24, 2009)

In a report released by the ministry of environment & forests (MoEF) and Central Pollution Control Board (CPCB) for year 2009 Chandrapur continues to remain the most polluted city of Maharashtra and fourth in India. The report, released on December 24 by MoEF minister Jairam Ramesh, has for the first time calculated a comprehensive environmental pollution index (CEPI) for 88 key industrial clusters in India. The CEPI scores for Chandrapur with the status of air (70.75), water (67.50) and land (66.50) pollution level. Any sub-index score of over 60 shows a critical level of pollution in the respective environmental component.

III. LIST OF MOST POLLUTED CITIES IN INDIA

This list is based on studies done in 2011

1. Ankleshwar-Gujrat
2. Vapi-Gujrat
3. Ghaziabad-Uttar Pradesh
4. **Chandrapur-** Maharashtra
5. Korba-Chhattisgarh
6. Bhiwadi-Rajasthan
7. AngulTalcher- Orissa
8. Vellore-Tamil Nadu
9. Singrauli- Uttar Pradesh
10. Ludhiana- Punjab
11. Najafgarh drain basin- Delhi
12. Noida-Uttar Pradesh
13. Faridabad – Uttar Pradesh

Hence it's a matter of growing concern to monitor the air quality of our city.

IV. AIR QUALITY MONITORING

4.1-Scope Field of application:

The method is applicable to measurement of the complete range of concentration of air-borne suspended particulate in the range of 0.1 to 10 micron size over designated time interval and other gaseous pollutants. The size of sample taken allows other analysis to be carried out latter.

This method is applicable to the measurement of mass concentration of suspended particulate matter through respirable dust sampler in ambient air. During presence of significant suspended particulate level in the environment a satisfactory sample may be obtained within 8 hours duration, at an average flow rate between 1.1

to 1.5 m3/minute. For determination of the mean concentration of respirable particulate matter in ambient air, a sampling frequency with 8 hours averaging time for 24 hours is usually recommended under national ambient air quality monitoring programme (NAAQN).

4.2-Principle Of Operation

Ambient air laden with suspended particulates enters the system through the inlet pipe. As the air passes through the cyclone, coarse, non-respirable dust is separated from the air stream by centrifugal forces acting on the solid particles. These particulates fall through the cyclone's conical hopper and collect in the sampling bottle placed at its bottom. The fine dust forming the respirable fraction of the total suspended particulate (TSP) passes t5hropugh cyclone and is carried by the air stream to the filter paper clamped between the top cover and the filter adopter assembly. The respirable dust (RPM) is retained by the filter and the carrier air exhausted from the system through the blower. The minimum concentration can be measured by this method is up to 1 micro gram per meter cube in air.

4.3-Apparatus

The monitoring of respirable dust fraction (PM10) can be done along with the total suspended particulate matter by using special type of high volume sampler in which a small cyclone is attached to separate coarse particles (larger than 10 micron)from the air stream before filtering it on the 0.3 micron pore size filter.

4.3.1-Filter Media

Glass fibre filter (Whatman GF/A or equivalent), having a collection efficiency of at least 99% for particles up to 0.3 micro meter diameter, are suitable for quantitative measurement of concentrations of suspended particulates. If more detailed trace analysis of suspended particulates is contemplated, care must be exercised to use filter papers that contain low background concentration (blank values) of pollutants being measured .

The whatnan EPM 2000 filter paper are usually suitable for trace analysis purposes, since this contain minimum background interference of pollutants. EPM 2000 filter paper exhibit high air flow rate, high chemical purity and excellent particle retention capacity.

5.3.2-Respirable Dust Volume Sampler

Principle:

Air is drawn into a covered housing and through a filter by a high flow rate blower at 1.1 to 1.5 cu-m/min that allows suspended particulate matter with diameters <10µm (Stokes equivalent diameter) to collect on the filter surface. Particles with diameters of 0.1 to 10 µm are collected on glass fiber filters. The mass concentration of PM10 µg/cu-m in ambient air is computed by measuring the mass of PM10 collected and the volume of air sampled. The size of the sample collected is usually

adequate for further analysis of trace elements. The sample of air is first drawn into a cyclone separator, which passes only the smaller particles with diameter less than 10 µm. These are then collected on the filter, as before, while the larger "non-respirable" particulates are collected in a removable dust collector cup. PM10 is calculated by measuring the mass collected on the filter and the volume of air sampled, while NRPM is calculated by measuring the mass collected on the dust collector cup and the volume of air sampled.

Range and sensitivity:

Sampling at an average of 1.1cu-m/min for 24 hours, given an adequate sample, even in an atmosphere having concentrations of particulates as low as 1µg/cum. If particulates levels are unusually high, a satisfactory sample may be obtained in 6 to 8 hours or less. For determination of average concentrations of suspended particulates in ambient air, a standard sampling period of 24 hours is recommended. Weights are determined to the nearest milligram, air flow rate are determined to the nearest 0.05 cu-m/min, times are determined to the nearest 1 minute, and mass concentrations are reported to the nearest microgram per cubic meter (µg/cu-m).

Interferences:

Particulate matter that is oily, such as photochemical smog or wood smoke, may block the filter and cause a rapid drop in airflow at a non uniform rate. Dense fog or high humidity can cause the filter to become too wet and severely reduce the air flow through the filter. Glass-fiber filters are comparatively insensitive to changes in relative humidity, but collected particulates can be hygroscopic.

Descriptions:

APM451 is normally utilized for measuring suspended particulate matter with simultaneous provision for measuring pollutant gases. The APM 451 sampler is capable of drawing ambient air through a 400 square centimetre portion of a clean 20.3 cm by 25.4 cm. glass fibre filter, at a flow rate between 0.9 to 1.2 cubic meter per minute. The blower must be able to operate continuously for 24 hours period with input voltage of 220 volt, 50 Hz and shall be properly earthen.

- Main housing: the respirable dust sampler usually installed in a suitable main housing made of un painted sturdy aluminum as the housing is subjected to extremes of temperature, humidity and all type of air pollutants. The main housing should be rectangular (400*300*65 mm) and must be provided with a gable roof having 40 degree to horizontal so that the filter is protected from precipitation and particle less than 10 micro meter size to be collected on filter surface.
- Filter holder: a stainless steel filter holder assembly with rubber gasket to hold 25*20 cm filter paper. Net size of filter paper for suction after putting the filter holder frame shall not be less than 23cm*18 cm.
- Blower: should be of standard make capable of 24 hour with flow rate 1.1 to 1.7 m3/min
- Voltage stabilizer: an automatic voltage stabilizer to keep the voltage between 210 to 230 at 50 to 60 Hz shall be provided
- Automatic timer and totalizer: the respirable dust sampler should have a timer for 4 to 24 hours of setting with intermediate on-off. It should have in addition a time totalizer to indicate hours and minutes.
- Calibrated monometer: flow rate in m3/min is measured by calibrated manometer.
- Gaseous sampling: gas inlet should be on the pipe after the aluminum hopper but before the blower. There can be three inlet for different gases or one inlet through manifold. A calibrated rotameter should be installed for checking flow rate.

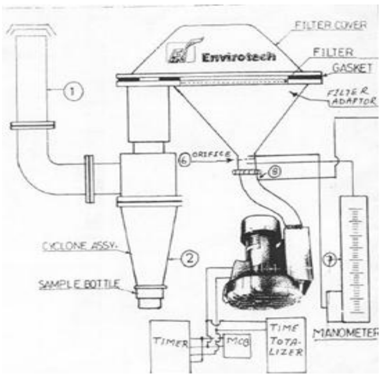

Figure 4.1-cross-section of respiraible dust volume sampler

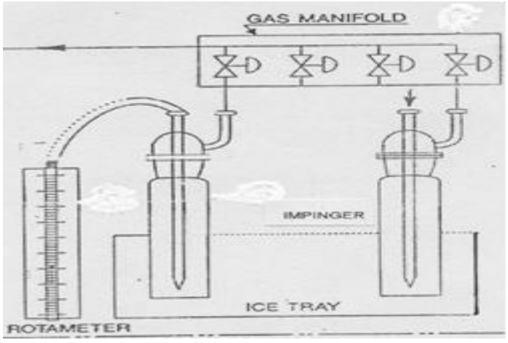

Figure4.2- Gaseous Attachment

4.4- Modified West And Gaeke Method For Measurement Of So2

Title:

Method for determination of Sulphur Dioxide in Air (Modified West and Gaeke Method).

Purpose:

The purpose is to lay down an uniform and reliable method for determination of sulphur dioxide (SO2) in ambient air.

Principle:

Sulphur dioxide from air is absorbed in a solution of potassium tetrachloromercurate (TCM). A dichlorosulphitomercurate complex, which resists oxidation by the oxygen in the air, is formed. Once formed, this complex is stable to strong oxidants such as ozone and oxides of nitrogen and therefore, the absorber solution may be stored for some time prior to analysis. The complex is made to react with pararosaniline and formaldehyde to form the intensely colored pararosaniline methylsulphonic acid. The absorbance of the solution is measured by means of a suitable spectrophotometer.

Concentration of sulphur dioxide in the range of 25-1050 µg/cu-m can be measured under the

conditions given are measure concentration below 25 µg/cu-m by sampling larger volumes of air, but only if, the absorber efficiency of the particular system is first determined and found to be satisfactory. Higher concentration can be analyzed by using smaller gas samples of a suitable aliquot of the collected sampler. Beer's law is followed through the working range from 0.03 to 1.0 absorbance unit. This corresponds to 0.8-27 µg of sulfite ion in 25 ml of final solution calculated as sulphur dioxide. The lower limit of detection of sulphur dioxide in 10 ml absorbing reagent is 0.75 µg based on twice the standard deviation, which represent a concentration of 25 µg/cu-m in an air sample of 30 litres.

Scope:

This method is applicable for the measurement of concentration of sulphur dioxide present in ambient air.

4.5-Modified Jacob And Hochheiser Method For Determination Of Nox In The Atmosphere

Title:

Method for determination of Nitrogen Dioxide in the Atmosphere (Sodium Arsenite method).

Purpose:

The purpose is to lay down a uniform and reliable method for sampling and analysis of nitrogen dioxide in ambient air.

Principle:

Ambient nitrogen dioxide (NO2) is collected by bubbling air through a solution of sodium hydroxide and sodium arsenite. The concentration of nitrite ion (NO2) produced during sampling is determined colorimetrically by reacting the nitrite ion with phosphoric acid, sulfanilamide, and N-(1-naphthyl)-ethylenediamine dihydrochloride (NEDA) and measuring the absorbance of the highly colored azodye at 550 nm.

Scope:

This method is applicable to 8 hours and 24 hours integrated sampling of NO2 in ambient air.

4.6- Measurement Of Respirable Suspended Matter (Pm10) By Cyclonic Flow Techique

Title:

Method for measurement of Respirable Suspended Particulate Matter (PM10) in ambient air (Cyclonic Flow Technique).

Purpose:

The purpose is to lay down an uniform and reliable method for determination of PM10 (Particulate matter less than 10µm diameter) in ambient air.

Principle:

Air is drawn through a size-selective inlet and through a 20.3 x 25.4 cm (8 x 10 in) filter at a flow rate which is typically 1132 L/min. Particles with aerodynamic diameter less than the cutpoint of the inlet are collected by the filter. The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM10 in the designated size range is calculated by dividing the weight gain of the filter by the volume of air sampled.

Scope:

This method is applicable for measurement of PM10 in the ambient air.

4.7-Sampling of air

To determine the concentration of various air pollutants present in the ambient atmosphere, as well as the concentration of varies air pollutants emitted in to the atmosphere from the source , it is necessary to the standard sampling procedure to be adopted. If the air sampling is collected from ambient atmosphere then it is called as 'Ambient air quality sampling' and if air sample is collected from the source then it is called as source sampling or stack sampling

4.7.1-Basic Requirement Of Air Sampling:

Following are the varies basic requirement of air sampling

1) The sample collected must be representative in terms of time and location.
2) The sample volume should be large enough to permit accurate analysis.
3) The sampling rate must be such as to provide maximum efficiency of collection.
4) The duration of sampling and frequency of sampling should reflect accurately the occurrence of fluctuations in pollution level.
5) For gas sampling, the gas stream should be sampled at several points and maximum number of sample should be taken to get the average value.

4.7.2-Sampling Principles/ Methods

Sedimentation:

This method is adopted for the particles whose diameter exceeds about 10 micron and which are capable to settle from the air by the action of gravity. Sampling should be carried out by placing an open container in an outdoor area. This method is widely used in dust fall areas.

Filtration:

This method is suitable for collecting suspended particles having size less than 10u to 0.1u. This method employs the principle of filtration. When the of air containing particulates, passes through the filter containing sub-micrometer pores size, the particulates matters present in the air stream retained on filter and hence removed.

Impingement Method:

In this method, the main basic principle is based on inertia force. Separation of particulates from an air stream is brought by abrupt collision against a flat surface. The apparatus used may be either dry or wet. Wet impingers collect particles by causing them to impact on a dry surface. In both the type, collection result as a result of inertial force, as the particle tend to resist a change in direction when the air stream is deflected by surface after impact.

Electrostatic Precipitation:

In this method, the main basic principle is the principle of electrical energy. Application of a potential difference of 12-30KV across sample airflow, leads to collisions between particles and ions to produce electro statically charged particles. These charged particles are then collected on an electrode whose charge is opposite to that of the particles. This is suitable for 10-0.2u size particles.

Centrifugal Method:

Most of the centrifugal devices are constructed on the principle of centrifugal force. The dust moving at high velocity is directly tangentially into a cylindrical chamber, in which it forms a confined vortex. The centrifugal force tends to drive the suspended particles to the wall of cyclone body, from which they drop into a dust collection chamber. This method is suitable for the particles greater than 5u sizes.

Absorption:

The basic principle is the principle of absorption. In this method, effluent gas passed through the liquid absorbents that remove one or more pollutants. This method is suitable for the sampling f various gaseous pollutants such as SO2, NOX, H2S, CO and HF.

Adsorption:

The basic principle is principle of adsorption. Adsorption can be brought by passing an air or gas stream through adsorption columns containing adsorbents, such as silica gel, activated charcoal or any other suitable agent, after adsorption, the different pollutants can be extracted from the column by adopting suitable technique. This type of sampling is used especially for ozone and hydrocarbon.

Condensation:

In this method, the gas stream is cooled in suitable containers, hence condensation of volatile substances takes place. This method is useful for volatile substances

V. IDENTATIONS AND EQUATIONS

Suspended Particulate Matter (SPM): (1)

SPM (µg/m3)= (FW-IW) x 106 / V

Where, FW – Final Weight of Exposed filter paper

IW – Initial Weight of Exposed filter paper

V - Volume of air

V = Final meter reading –Initial meter reading) x Flow Rate (1.1)

1.1 – Standard Flow Rate

Respirable Suspended Particulate Matter (RSPM): (2)

RSPM (µg/m3)= (FW-IW) x 106 / V

Where, FW – Final Weight of Exposed filter paper

IW – Initial Weight of Exposed filter paper

V - Volume of air

V = (Final meter reading –Initial meter reading) x Flow Rate (1.1)

1.1 – Standard Flow Rate

Gaseous sampling: (3)

SO2 (µg/m3) = (Absorbance x Slope value x 1000) / (Total Time Exposed in minutes x Flow rate)

Gaseous sampling: (4)

NO2 (µg/m3) = (Absorbance x Slope value x 1000) / (Total Time Exposed in minutes x Flow rate)

These sampling is done by chemical analysis by using absorbing media of mercuric chloride, potassium chloride, sodium hydroxide & sodium arsenite.

VI. Observation & Tables

6. 1 Particulate Matter

The minimum and maximum values 24 hourly were varied between 46-140 µg/m3 while average Suspended PM10 concentrations varied in the range of 61-110 µg/m3 respectively. The highest concentration among the locations was observed at Durgapur and lowest at Babupeth among the locations monitored which may be due to Durgapur Thermal Power Plant, windblown dust, unpaved road etc. The PM10 concentrations among 6 locations 4 locations are above permissible limit and remaining 2 locations are below permissible limit, stipulated standards for NAAQS (24 hourly PM10=100 µg/m3).

The minimum and maximum values of 24 hourly average PM2.5 concentrations varied in the range 20-46 µg/m3 and average concentration ranged between 24-42 µg/m3 respectively. The highest concentration among all the locations was observed at Shriram Nagar and lowest at Gandhi Chauk and Ram Nagar locations. The PM2.5 concentrations for other locations were observed within stipulated standards for NAAQS (24 hourly PM2.5 =60 µg/m3).

6. 2Gaseous Pollutants

The minimum and maximum concentrations of SO2 and NOx were observed in the range of 8-41 µg/m3 and 27-170 µg/m3 and average concentration ranged between 10-24 µg/m3 and 42-116 µg/m3 respectively. Highest concentration among all the locations of SO2 was found to be in Tukum and lowest concentration of SO2 was found to be in Babupeth. Highest concentration among all the locations of NOx it was found in Durgapur and lowest in Shreeram Nagar. The levels of SO2 were below the stipulated CPCB standards (24 hourly SO_2 is 80 µg/m3) The NOx concentrations among 6 locations 5 locations are above permissible limit and remaining 1 locations are below permissible limit, stipulated CPCB standards (24 hourly for NOx is 80 µg/m3)

6. 3 Particulate Associated Toxic Pollutants:

Airborne particles are important carriers of metals, some of which possess toxic properties. The concentrations and size distributions of trace metals are governed by the nature of emissions to the atmosphere, as well as rates of wet and dry deposition, cloud processing, and exchange of air between the boundary layer and the free troposphere, and chemical transformations. The elevated metal concentrations, can pose a serious risk to human health.

6.4 Lead Concentrations

The observed lead concentration at all the locations varied between 0.04-
0.14 ug/m3 and presented in Table 6.4. As seen, concentrations of Pb are within the permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards (Pb=1.0 ug/m3).

6.5 Arsenic Concentrations

The permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards (As=06 ng/m3) & all the observations were within limits.

6.6 Nickel Concentrations

The observed Ni concentration at all the locations varied between 0.4-0.9 ng/m3. And were within the permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards of India (Ni=20 ng/m3).

VII. CONCLUSION

Ambient air quality was assessed using six monitoring station in Chandrapur city, the studies have clearly revealed the levels of air pollutants for SO_2,NOx, PM10, PM2.5 and metal like lead, arsenic and nickel. The results obtained from this assessment are as given below.

The main sources of SO_2 emission in the environment of Chandrapur city are Coal and oil combustion, biological decay of sulphide, bacteria. In Candrapur, These sources do not have great enflurnce on environmental pollution. Therefore,as per our study it is found that the concentration of SO_2 emission in Chandrapur city is within the permissible limit stipulated CPCB standards (24 hourly SO_2 is 80 µg/m3).

The main sources of NOx emission in the environment of Chandrapur city are Coal and oil combustion, automobile exhaust, electrical storms. The high concentration of NOx is mainly due to several open and close coal mines ond their transfer within the city or out side the city. The chandrapur thermal power plant i.e CSTPS use daily 1000 metric cube of coal from these coal mines. Because of high trafic in chandrapur the automobile exhaustion is also very high. Therefore, As per our study, except one station (Babupeth) concentration of NOx in Chandrapur city is found to be above permissible limit stipulated CPCB standards (24 hourly for NOx is 80 µg/m3).

The main sources of suspended particulate matter (PM10 & PM2.5) in environment of Chandrapur are due to coal mines, coal combustion, factories like cement, ferro-sulphale steel, sponge steel etc. and due to .poor quality of road network.As per our study the PM10 concentrations among 6 locations 4 locations are above permissible limit and remaining 2 locations are below permissible limit (Babupeth & Shreeram Nagar), stipulated standards for NAAQS (24 hourly PM10=100 µg/m3). The PM2.5 concentrations for all locations were observed within stipulated standards for NAAQS (24 hourly PM2.5 =60 µg/m3).

The metals like lead, arsenic and nickel do not have great sources of their appearance in the environment of Chandrapur city. Therefore, as per our study, the concentration of all these metals is below permissible limit. The results of these metals are as follow.

Concentrations of Pb are within the permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards (Pb=1.0 ug/m3). The observed arsenic concentrations at all the locations were not detected. The permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards (As=06 ng/m3). The observed Ni concentration at all the locations varied between 0.4-0.9 ng/m3. And were within the permissible limits of National Ambient Air Quality Monitoring (NAAQM) standards of India (Ni=20 ng/m3).

As per our study on ambient air monitoring it is found that further industrial development and increasing traffic volume is very critical for the environment of Chandrapur city. It should be noted that NOx and PM10 concentration in Chandrapur is above the permissible limit, for that government must take proper decision to control the environmental status of Chandrapur city.

REFERENCES

[1] .Ashit k. Mukharjee, Sanat k. Bhattacharya and Habibullah n. saiyed, "*assessment ofRespirable dust and its free silica contents in* different Indian coalmines", industrial health *2005, 43, 277–284*

[2] Mrinal k. Ghose & S. R. Majee, *"characteristics of hazardous airborne dust around an Indian surface coal mining area", Springer science + business media b.v. 2007*

[3] Candace Vahlsing & Kirk R. Smith, *"Global review of national ambient air quality standards for PM10 and SO2", (24 h) Air Quality Atoms Health DOI 10.1007/s11869-010-0131-2*

[4] Moti l. M ittal, *"estimates of emissions from coal fired thermal power plants in India",* department of environmental andoccupational health, university of south Florida, and Tampa, Florida, USA.

[5] Nilesh P. Nandanwar, Arty K. Dixit, Kirtiwardan R. Dixit, Sachin S.Wazalwar, *"Comparative Study of Ambient Air Quality around Chandrapur",* International Journal of Scientific Engineering and Technology (ISSN : 2277-1581) Volume No.3, Issue No.3, pp : 267-275 1 March 2014.

[6] Peter Stacey, Andrew Thorpe & Paul Roberts, *"Levels of Respirable dust and Respirable crystalline silica at construction sites", Health and Safety Executive 2011.*

[7] P. Roy, *"Source apportionment of ambient PM10. A case study from a mining belt* of *Orissa*", Department of Environmental Science and Engineering, Indian School of Mines, Dhanbad- 826004, Jharkhand, India.

[8] Maharashtra pollution control board, action plan for industrial cluster Chandrapur, cepi report nov-2010.

[9] Vedamadavan Bharath university, selaiyur Chennai assessment of ambient air quality in Coimbatore city, civil and environmental *research, issn 2224-5790, vol 2, no.1, 2012.*