

STUDY ON AIR POLLUTION IN URBAN AREA OF INDIA

Shivani Awasthi^{1*} and Vinodni Nigam²

¹School of Environment Biology, APS University Rewa, Madhya Pradesh, India.

²Head of Department, GDC Rewa, Madhya Pradesh, India.

Article Info

Received 29/12/2013

Revised 16/01/2014

Accepted 19/01/2014

Key words: Air pollution, Long-term exposure, Cancer.

ABSTRACT

Air pollution can harm us when it accumulates in the air in high enough concentrations. Millions of Indians live in areas where urban smog, particle pollution, and toxic pollutants pose serious health concerns. People exposed to high enough levels of certain air pollutants may experience: 1-Irritation of the eyes, nose, and throat, 2-Wheezing, coughing, chest tightness, and breathing difficulties, 3-Worsening of existing lung and heart problems, such as asthma, 4-Increased risk of heart attack. In addition, long-term exposure to air pollution can cause cancer and damage to the immune, neurological, reproductive, and respiratory systems. In extreme cases, it can even cause death.

INTRODUCTION

Primary pollutants – sources there are 5 primary pollutants, which to gather contribute more than 90% of global air pollutions these are as follows:-

Carbon monoxide co.

Nitrogen oxide NO₂

Hydro carbons HC.

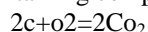
Sulphur oxide, SO_x

Particulate Part.

Carbon Monoxide (co)

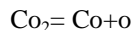
CO is a colorless odorless and tasteless gas above -192 °C soluble in water the basic chemical reaction regarding CO are:-

1- In complete combustion of fuel or carbon-containing compound.



2- Reaction b/w CO₂ and carbon-containing materials at elevated temperature in industrial process e.g. in blast furnaces.

3- Dissociation of CO₂ see high temp



Natural process e.g. volcanic, respiration material gas

emission electrical discharge seeding storms seed germinate marsh gas production 8- Hour average CO concentration (ppm)

Nitrogen oxide Nox

Natural bacterial action discharge about 5x10⁹ tones of Nox mainly in the form of NO from man made sources annually releases 5x10⁷ tones of NoX. End product of Nox is HNO₃ which rapidly react to form various particulate nitrates $HO + NO_2 = HNO_3$

Concentration profile of NoX

In urban area Nox levels follows a regular pattern depending on sunlight and traffic density.

1- Before day light NO and NO₂ levels remain fairly stable.

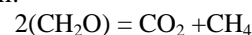
2- As the traffic rush begins and increases the levels of NO increase and become maximum.

3- O₃ build-up as NO level drops below 0.1 ppm.

4- In the evening (5-8pm) the NO level again goes up during the evening traffic rush.

Hydrocarbons and photochemical smog

Natural resources emit large quantities of hydrocarbons in the atmosphere CH₄ is the major hydrocarbon emitted into the atmosphere to be produced by bacteria in the anaerobic decomposition of organic matter in water sediments and soil.



Corresponding Author

Shivani Awasthi

E-mail: shivaniawasthi786@gmail.com



Domosticaletd animal contribute 85 tones of city to the atmosphere each year petroleum 55%, cool 3.3%, wood 2.2% disposal burning 28.3% solvent evaporation 11.3%.

Photochemical smog

The harmful effect of hydro carbon pollution are not due to the hydrocarbons themselves beet the product of photochemical reaction in which. They are involved hydrocarbons do not react with readily with sunlight but they are reactive towards other substance produced photochemically.

It also occurs by some, PAN, co, o₃ photochemical so mg is chart by brown fumes with the eyes and longs. Some level is maximum during early morning traffic rush hours then decrease during the remaining day light hours.

Particulates or aerosols

Small, solid particles and liquid droplets are collectively termed as particulate various types of aerosols are:-

(a) **Dust** :- dust is made up of solid particles larger than colloids and capable of temporary suspension on are most of the dust particles settle to the ground as dust full but particles 5.04 or smaller in size tenet to form stable suspension.

(b) **Smoke**: - Smoke consists of finely divided particles produced by incomplete combustions it consist of carbon particles des or other combustible materials.

(c) **Mist**: - mist is a low concentration dispersion of liquid particles of large size natural mist particles formed form water vapors in the atmospheric ranges form 500-40 min size.

(d) **Fog**: - Fog is a visible aerosol in which dispersed phase is liquid. In natural fog the size of particles range from 41-1.0.

(e) **Fumes**: - these are solid particular generated by condensation from the gaze state.

METHODOLOGY

Air Analysis

Sampling of air and its analysis was carried art for as per the standers of central pollution Board (India) high volume air sampler were used for the monitoring of super deed particulate matter and gases pollutants.

Suspended Particulate Matter (S.P.M.)

The ambient spm concentration were determined by collecting the particulate matter for on A Pre weight glass fiber filter paper of 20x25cm size and reweighted after sampling. In order to avoided humidity falter and other material losses the filter paper were always over dried at 80c later cooled and kept in dissipaters before weighing.

The SPM result is reported as micro germs per

cubic meter of air drawn through filter (Ug/m³). The high volume air sampler was calibrated as the sampling site to avoid error dele to shift in calibration.

Calculation: Weight of the suspend deed particles (w) = W₂-W₁ (gms).

Where

W₂ = Weight of filter paper after sampling (gms)

W₁ = Weight of fresh filter paper (gms)

Volume of air sampled (V) = Q.T. (Cubic Meter)

Were

Q = Average Sampling rate

T = Sampling time (Minutes)

$$Q = \frac{Q_1 + Q_2}{2}$$

Where Q₁ = Initial sampling rate Indicated by orifice matter at

The start of sampling

Q₂ = Final sampling rate Include -d b1 the orifice m

Meter Fust.

Cone of Spm = W/V (gms/wbic meters)

Analysis of Oxide of Nitrogen

Nox are collected by bubbling air through a sodium hydroxide-Sodium arsenate, solution to from a stable solution of sodium nitrate. It was analysis by taking 10ml of sample in which 1.Qm1of Hydrogen peroxide solution, 10.0ml of sulphonilamide solution and 1m ml of NEDA Solution were added and deeply mixed. After a 10 minute colure development Interval, absorbance was measure at 540 nm against the blank ug nitrogen dioxide 1m1 was real from the standard curve.

Calculation

The Volume of air samples was calculated as follows:-

$$V = \frac{F_1 + F_2}{2} \times T \times 10^{-6}$$

Where

V = Volume of air sampler m³

F₁ = Measured Flow before sampling

F₂ = Measured Flow exampling m11min

T = Time of Sampling min

$$\text{Mass of No}_2\text{inage/m}_3 = \frac{(ag\text{No}_2/m1) \times 3}{V \times 0.35}$$

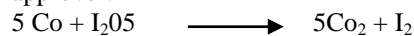
Where

35 = Volume of absorbing reagent used in sampling ml.

V = Volume of air sampling, mtr, cube

0.35 = over all over ale efficiency.

Analysis of Carbon mono oxide has been analyzed as per. 55182 part x. The basic principle of this method is the fallowing relation between co and Iodine pent oxide at 135'c to 150'c to gelid cartoon dioxide and fading approver.



The concentration of co air sampler can be determined by analysis of the amount of iodine produced;



the air sampler should be free from iodine vapor or cor. Substance like water vapor, unsaturated hydrocarbons, aldehydes and other organic compounds. Where may react with iodine peroxide or the liberated iodine and cause interference it is there for necessary to pass the air sampler thorough a purification assembly consisting of activated carbon and efficient drying agent a chromic acid wash tower and some solid absorbent to remove CO₂. The dry air is then passed through a u-tube is liberated according to the above reaction. If co is present. The iodine liberated in the reaction is absorbed in Ki solution and titrated with sodium thiosulphate solution.

Air quality Index

For achieving air Quality Index it was assumed that all the pollutant parameters are of equal Importance. The procedure of calculation of AQZ dewlapped by tiwari and manzoor Ali (1987) is that let there be 'n' air quality parameters pi (I=1, 2, 3-n) if vi is the observed value of Para meter pi in the ambient air and vsi is stander value recommended for this parameters then the quality rating for this parameter pi is given by the equation.

$$Qi = \frac{1000xvi}{Vsi} \dots \dots \dots (1)$$

If 'n' number of pollutant parameters are considered for the ambient air and Vsi is stander value recommended for this parameter, then the quality, 'n' number of quality rating are obtained for the observed values, the geometric mean of these 'n' quality observed rating was found out and designated as AQZ.

$$AQZ = \left[\sum_{i=1}^n Qi \right]^{\frac{1}{n}} \dots \dots \dots (2)$$

By taking common logarithm of both sides, the relationship was simplified and reduced to:-

$$AQZ = Antilog \left[1/n \sum_{i=1}^n Qi \right]^{1/n} \dots \dots \dots (3)$$

The AQI was calculated for different parameters Using equation (1) and (3) other parameters like co, H₂S, HF were not calculated since they were not required in assessment of cement dust pollution's.

Experimental

Meteorological studies: Effect of pollution on receptor, animal and inanimate, depends on atmospheric conditions therefore; knowledge of meteorological characteristics in studies areas is important ant. Transport and diffusion of the pollutants in the atmospheres is governed by meter logical falter wind speed, wind direction and atmospheric stability are called primary or the dispersion and dilution of the placement depends mainly on these secondary meteorological parameters are temperature, humidity, solar radiation pressure and visibility etc.

The meteorological data was collected meteorological station at Rewa.

Relative Humidity

Moisture in the atmosphere changes the nature and characteristic of pollutants at night the grand loses heat by radiation and the air in contact with grounded becomes curler. If the air is humid the cooling will bring the air to the salutation point to form fog-fog provide surface area for suspended dues to coalesce and grow in the size to settle out from the atmosphere and also enhance chemical reaction or the gasses pollutants.

Highest humidity recorded in September month (89%) Lowest humidity recorded in to June month (16%)

Rain fall

The rainy season in the region extends from June to September tabulated data show that maximum rain fall were in month of gust (478.6mm), Respectively. The average rain fall were recorded as 87.2mm, 34.26mm and 61.58mm respectively.

Air Quality: The study sets escorted for ambient air monitoring is given belong. The distance and direction of these paints are also shown with respect to the plant.

Ambient air Quality analysis - 2013

Graph

1. Ambient air quality analysis spm.
2. Ambient air quality analysis So₂.
3. Ambient air quality analysis Nox.
4. Ambient air quality analysis co.

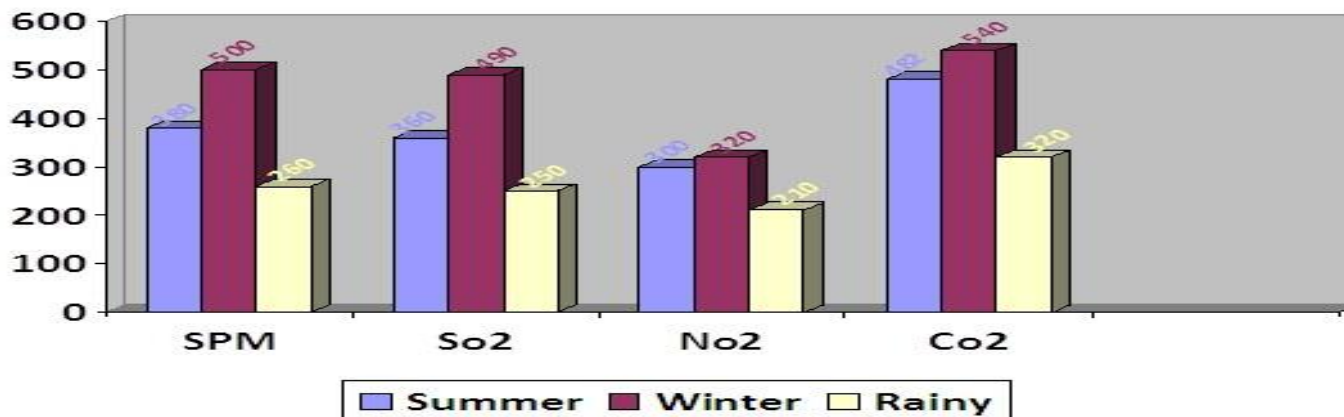
Table 1. Primary pollutant sources and amount

Pollutant sources	Weight of the pollutants Produced						Total weight
	CO	NOX	HC	SOX	C ₂ OH	23.4	
Trans potation.	69.7	10.1	10.8	0.8	1.2	1.0	93.6
Full combustion (sources)	1.2	11.8	1.4	21.9	4.6	1.3	42.2
Industrial process	7.8	0.7	9.4	4.3	6.3	2.7	31.0
Solid waste disposal	7.8	0.6	1.6	0.1	1.1	-	11.2
Miscellaneous	8.5	0.4	6.3	0.1	1.3	-	16.6
Total weight of each pollutant processed	9.5	23.6	29.5	27.0	-	19.5	194.6



Table 2. Ambient air Quality Analysis

Gasses	Summer	Winter	Rainy
SPM-380 Contestation (in)	380	500	260
So ₂	360	490	250
No ₂	300	320	210
Co ₂	482	540	320

Fig 1. Gasses level in different session at urban area**CONCLUSION**

Air pollution is dangerous for human health. In 2012 so₂ level in air during summer 360µg/m², in winter 490 µg/m², rainy 250 µg/m². The spm level in summer 380 µg/m², in winter 500 µg/m² and in, rainy 260 µg/m, NO₂

level in summer 300 µg/m², in winter 320 µg/m², in rainy 210 µg/m², CO₂ level in summer 484µg/m², winter 540 µg/m² and rainy season winter 320 µg/m. We concluded the air pollution level high in summer season.

REFERENCES

1. Inn ECY and Y Tanaka. (1953). Absorption coefficient of ozone as the ultraviolet and visible regions. *J Opt Soc Am*, 43, 870.
2. Hearn KG. (1961). Absorption of ozone in the ultraviolet and visible region of the spectrum. *Proc. Phys. Soc*, london, 78, 932.
3. Demore WB and O Reaper. (1964). Hartley band extinction coefficients of ozone in the gas phase and in liquid nitrogen carbon monoxide and argon. *J Phys Chem*, 68, 412.
4. Griggs M. (1968). Absorption coefficients of ozone in the ultraviolet and visible regions. *J Chem Phys*, 49, 857.
5. Becker KH, U Schurath and H Seitz. (1974). Ozone olefin reactions in the gas phase 1. Rate constants and activation energies. *Int Jour of Chem. Kinetics*, 725.
6. Clyre MAA and JA Coxon. (1968). Kinetic studies of oxyhalogen radical systems. *Proc Roy Soc*, A303, 207.
7. Simons JA, RJ Paur, Ha Webster and EJ Blair. (1973). Ozone ultraviolet photolysis vi. The ultraviolet spectrum. *J Chem Phys*. 59, 1203.
8. Operating and instruction manual, dasibi ozone monitor, model 1003 ah, dasibi environmental corp, Glendale, Ca.
9. Cherniack I and RJ Bryan. (1965). A comparison study of various types of ozone and oxidant detectors which are used for atmospheric air sampling. *Japca*, 15(8), 351,155.
10. California air quality data, (1981). California air resources board, vol. Xiii no. 1, January-March, 3.
11. Wendt JJ Kowalski, Am Bass, C Ellis and M Patapoff. (1978). Interagency comparison of ultraviolet photometric standards for measuring ozone concentrations. *Nbs special publication*, 529.
12. Altshuller ap and af Wartburg. (1961). the interaction of ozone with plastic and metallic materials in a dynamic flow system. *Intl Jour Air and Water Pollution*, 4, 70.
13. Transfer standards for calibration of ambient air monitoring analyzers of ozone, (1979). epa 600/4-79-056.
14. Hodgeson JA, RK Stevens and Be Martin. (1972). A stable ozone source applicable as a secondary standard for calibration of atmospheric monitors, 149-158.
15. Technical assistance document for the calibration of ambient ozone monitors, (1979). epa 600/4-79-057.

