International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

A STUDY ON AIR QUALITY AND AIR QUALITY INDEX OF WADI TOWN

Dr Shivasharanappa G Patil[1], Adil Irshad[2]

[1]Professor, Dept. of Civil Engineering, PDA College of Engineering Kalaburgi, Karnataka, India
[2]PG student, Dept. of Civil Engineering, PDA College of Engineering, Kalaburgi, Karnataka, India

---

Abstract - *The humans are exposed to air pollution, it can cause respiratory related diseases and aggravate the conditions such as asthma, bronchitis etc. Energy needs of the industries and domestic activities are met by burning fuels which also emit poisonous wastes leading to air contamination. Sulphur dioxide (SO2), nitrogen dioxide (NO2) and particulate matter (PM10 and PM2.5) are known to be the major air pollutants in India. Degradation of air quality in Indian cities is mainly due to emissions from the vehicles on road and railway tracks. In the past few decades or so, there has been a tremendous raise in road transportation, increase in the number of fuel consuming vehicles and establishment of large number of industries have resulted in drastic increase in the concentration of gaseous and particulate matter in air.*

Key Words: Air quality measurement, air quality index of wadi town

1. INTRODUCTION

Air pollution is a major threat to human health. The United Nations Environment Programmed has estimated that, globally, 1.1 billion people breathe in unhealthy air. Epidemiological studies have shown that concentrations of ambient air particles are associated with a wide range of effects on human health, especially on the cardio-respiratory system. The World Health Organization (WHO) has estimated that urban air pollution is responsible for approximately 800,000 deaths and 4.6 million people lose their lives every year around the globe. Air pollution is associated with increased risk of acute respiratory infections (ARI), the principal cause of infant and child mortality in developing countries

Ambient Air Quality (AQI) of Wadi town and its surroundings was monitored using a set of dust samplers, viz., APM-460, APM-550 and APM-433. The pollutants considered for the assessment of air quality were Sulphur dioxide (SO2), nitrogen dioxide (NO2), ammonia (NH3) and particulate matter (PM10) which gave a measure of pollution content in the air. The sampling sites have been monitored for 24 hours on an 8 hourly. Air quality was quantified in terms of concentrations of PM10, NO2, SO2 and NH3. Annual Air Quality index of presently selected sites of Wadi town has been determined to assess the degree of atmospheric pollution [1]. Human activities since preindustrial time have resulted in large increase in air pollution. Air pollutants are substances which when present in the atmosphere adversely affect the human health, animals, plants, or microbial life; damage materials, or interfere with the normal activities of life. In this project the air quality index in industrial places of Wadi town will be calculated.

1.1 OBJECTIVES

- Appreciate that air is important type of matter that can be polluted as a result of rapid industrialization.
- To measure the concentration levels of (PM10) and gaseous pollutants like Sulphur dioxide(SOx), Nitrogen dioxide(NOx).
- To evaluate the air quality index (AQI) of Wadi town.

2 MATERIALS

Monitoring Particulate matter

Respirable Suspended Particulate Matter (RSPM) PM_{10}:

Respirable Suspended Particulate matter are particulate matters with aerodynamic diameter less than or equal to 10 micrometers, thus also named as PM_{10}. They are produced from combustion processes, vehicles and industrial sources.

Envirotech APM 460BL:

The APM 460 sampler uses an improved cyclone with sharper cut-off (D50 at 10 microns) to separate the coarser particulates from the air stream before filtering it on the glass microfibre filter. By using the APM 460, measurement of respirable Particulate Matter can be done accurately and TSPM (Total Suspended Particulate Matter) can also be assessed by collection of dust retained in the cyclone cup.

Monitoring SO_X NO_X

Gas sampling is done to characterize the chemical, thermal, and hydrological properties of a surface or subsurface hydrothermal system. Various methods are applied to obtain samples used for determination of the composition of gases present in soils or hydrothermal discharges The APM 411 TE is designed as an attachment to 8operate with Envirotech's Respirable Dust or High-Volume Samplers and $PM_{2.5}$ samplers. When paired with an appropriate dust sampler, the APM 411 TE allows the user to collect gaseous pollutant samples (for monitoring SO_2, NO_X, NH_3, Ozone, etc.) as well as dust samples simultaneously.

2.1 METHODS

Particulate Matter (PM_{10}) in ambient air (Gravimetric Method)

Principle of the method

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 cut-point 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

Sulphur dioxide in ambient air (Improved West and Geake method)

Principle of the method:

Modified West & Geake Method (IS 5182 Part 2 Method of Measurement of Air Pollution: Sulphur dioxide). Sulphur dioxide from air is absorbed in a solution of potassium tetra chloromercurate (TCM). A dichloro sulphitomercurate 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 para-rosaniline and formaldehyde to form the intensely coloured Pararosaniline methylsulphonic acid. The absorbance of the solution is measured by means of a suitable spectrophotometer.

Place 30 ml of absorbing solution in an impinger and sample for four hours at the flow rate of 1 L/min. After sampling measure the volume of sample and transfer to a sample storage bottle.

Nitrogen dioxide in ambient air (Modified Jacob and Hochheiser Metho0d)

Principle of the method:

Modified Jacobs & Hochheiser Method

(IS 5182 Part 6 Methods for Measurement of Air Pollution: Oxides of nitrogen).

Ambient nitrogen dioxide (NO_2) is collected by bubbling air through a solution of sodium hydroxide and sodium Arsenite. The concentration of nitrite ion (NO_2) produced during sampling is determined colorimetrically by reacting the nitrite ion with phosphoric acid, sulphanilamide, and N-(1-naphthyl)- ethylenediamine di-hydrochloride (NEDA) and measuring the absorbance of the highly coloured azo-dye in a spectrophotometer at 540 nm.

Place 30 ml of absorbing solution in an impinger and sample for four hours at the flow rate of 0.2 to 1 L/min. After sampling measure the volume of sample and transfer to a sample storage bottle.

3 RESULTS AND DISCUSSIONS

The air quality monitoring of the SIX selected locations have been monitored in and around Wadi town is discussed in this chapter. The concentration of primary pollutants like Suspended Particulate Matter, Nitrogen Dioxide and Sulphur Dioxide were determined. The data and results are presented in tables and graphs for convenient of analysis. Based on the data and results documented discussions were made.

Table 3.1: 24 Hour average Concentration of Suspended Particulate Matter, Sulphur Dioxide, Nitrogen Dioxide during summer. (all values in µg/m³)

SL No	Code	Location	PM10	SO_X	NO_X
1	ARW1	CPP ACC Cement	385.9	98.5	92.6
2	ARW2	ACC hospital	324.6	70.6	81.5
3	ARW3	Hanuman temple Zafhrawadi	95.6	21.9	11.2
4	ARW4	D.A.V Public school	98.7	8.4	7.6
5	ARW5	SBI Bank	224.6	29.5	25.6
6	ARW6	Super market	361.5	34.6	44.6

3.2 Particulate matter PM10

The concentration of PM10 in locations ARW1, ARW2, ARW5, ARW6 were exceeding the standard limits (100µg/m3) prescribed by NAAQS (National Ambient Air Quality Standards) except sampling points ARW3 and ARW4 were the values are well within the limits during summer season.

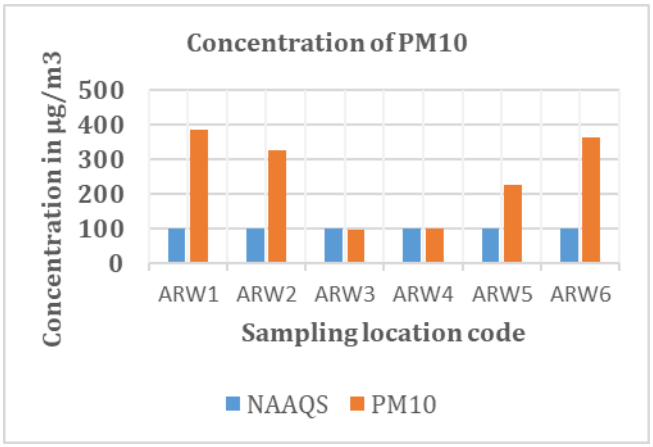

Fig 3.2.1

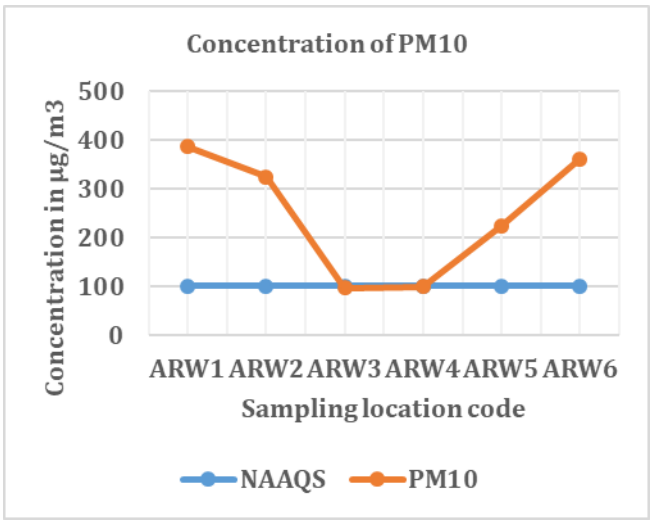

Fig 3.2.2

3.3 Sulphur dioxide SO_X

The concentration of SO_x in all six locations were almost five locations of sampling ARW2, ARW3, ARW4, ARW5 and ARW6 the values from these locations are well within the limits (80µg/m³) as per NAAQ volume. While the location AEW1 were the concentration of SO_x exceeds its limits during summer season.

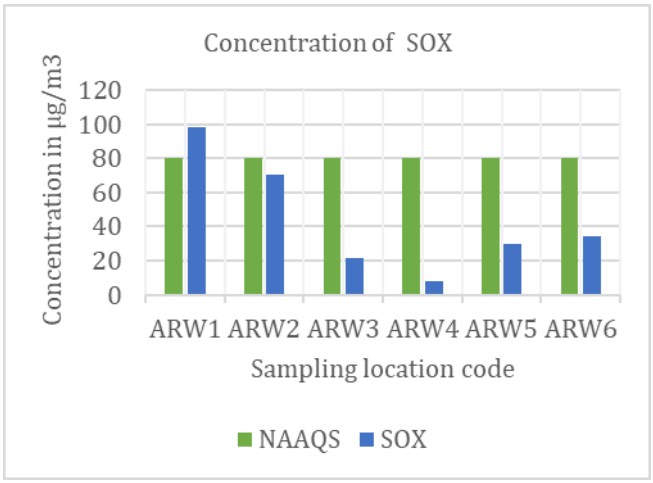

Fig 3.3.1

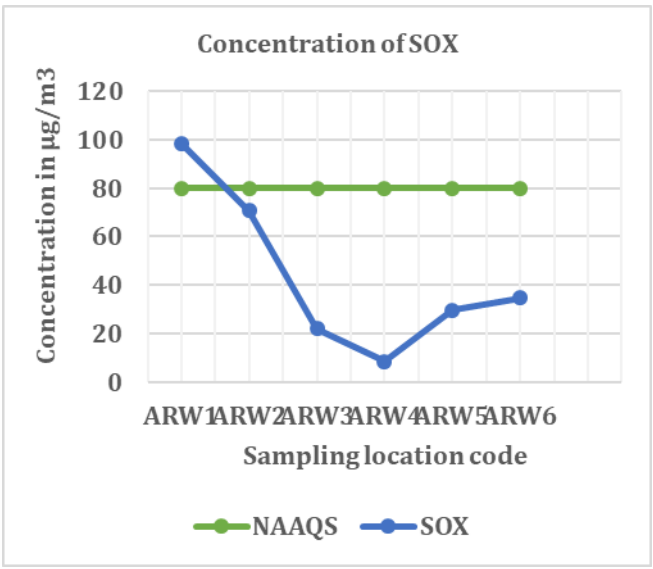

Fig 3.3.2

3.4 N Nitrogen dioxide NO_X

The concentration of NO_X in sampling location ARW1 and ARW2 were exceeds the standard limits (80µg/m³) prescribed by NAAQS volume. While other five sampling location ARW3, ARW4, ARW5, ARW6 were we got values well within the limits during summer season.

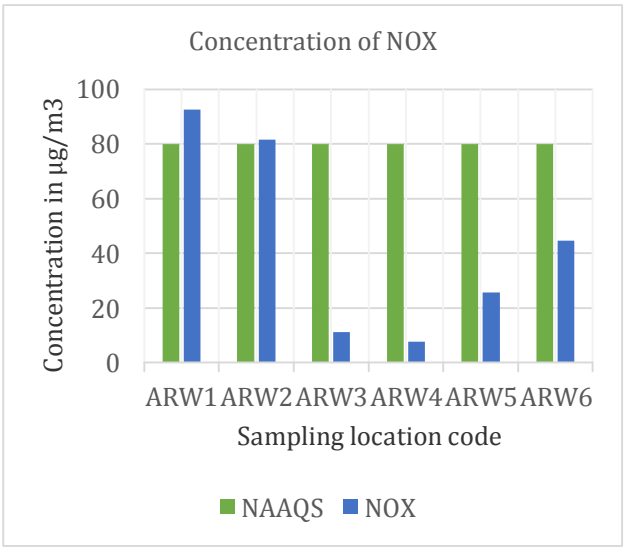

Fig 3.4.1

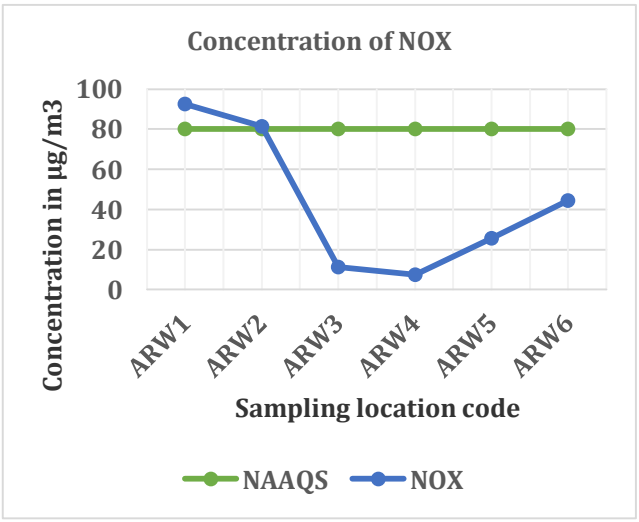

Fig 3.4.2

3.5 AIR QUALITY INDEX

The data obtain from monitoring of ambient air at six locations within the study area are used to calculate the AQI for each area during study period using CPCB's AQI calculator XL spread sheet.

Sampling locations	AQI	Associate health impact	
ARW1	345		Severe
ARW2	275		Unhealthy
ARW3	101		Poor
ARW4	96		Moderate
ARW5	183		Poor
ARW6	314		Severe

Fig 3.5.1

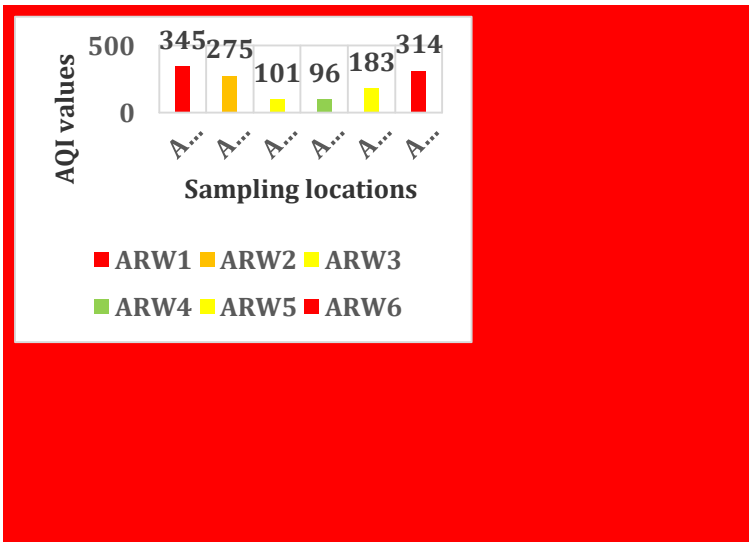

Fig 3.5.2

4. CONCLUSIONS

Based on the results the following conclusions are drawn.

1. Among all six sampling locations the all-time worst air quality was found at CPP ACC cement (ARW1) and wadi super market (ARW2).
2. The lowest air pollution was found at D.A.V Public school (ARW4).
3. Except CPP ACC Cement and super market the concentration of sulphur dioxide SO_X and Nitrogen dioxide NO_X are within permissible limits of NAAQS (National ambient air quality standards)
4. AQI of CPP ACC cement and super market were severely polluted areas and it is very unhealthy for the public causes some various health problems
5. Overall AQI of wadi town is within permissible limits.

REFERENCES

1 K.S. Goverdhan Rathla, T. Sankarappa, J.S. Ashwajeet and R. Ramanna "A Study of Air Quality Index in and Around Belagavi City, Karnataka State, India" Vol. **3(4),** 1-7, June (2015)

2 P.Thilagaraj1, R.Ravinder2, R.Kesavan3 "A study on air pollution and its impact on human health in chennai city" iosr journal of mechanical and civil engineering (iosr-jmce) e- issn: 2278-1684, p-issn : 2320–334x pp 01-2005

3 Kingham, S and Dorset, W "Assessment of exposure approaches in air pollution and health research in Australia and New Zealand" Clean Air Quality and Climate Change, forthcoming

4 Sanjoy Maji1, Sirajuddin Ahmed, and Weqar Ahmad Siddiqui1 "Air quality assessment and its relation to potential health impacts in Delhi, India" doi: 10.18520/v109/i5/902-909

5 SS Asadi, Ravali koppula,Sravanth.B Sambaturu, K.Ashwita, M.V.Raju "Analysis of air quality for environmental management A model study from talangana state" vol 8 issue 3 march 2017 pp842-852

6 S.Harinath, Usha.N.Murthy "Air quality index in industrial area of banglore city" JIPC26(2) (2010) pp235-237

7 Sadhana Chaurasiaa, Pragya Dwivedib, Ravindra Singhc and Anand Dev Guptad "Assessment of ambient air quality status and air quality index of Bhopal city (Madhya Pradesh), India" ISSN 2250-1770 INT J CURR SCI 2013, 9: E 96-101

8 K. Simkhada, K. Murthy V and S. N. Khanal "Assessment of ambient air quality in Bishnumati corridorKathmandu metropolis" IJEST Vol. 2, No. 3, pp. 217-222 2005

9 Md. Senaul Haque, and R.B. Singh "Air Pollution and Human Health in Kolkata, India":

A Case Study www.mdpi.com/journal/climate Climate **2017**, 5, 77; doi:10.3390/cli5040077 Received: 29 June 2017; Accepted: 22 September 2017; Published: 12 October 2017

10 Punith Y N, D.P.Nagarajappa "Monitoring of SPM,SO2,NO2 and air quality index in selected areas of Davengere city during summer season" ISSN:2455-5703 volume 2 Issue 11 October 2017.

11 Sarath K. Guttikunda , Rahul Goel , Pallavi Pant "Nature of air pollution, emission sources, and management in the Indian cities"http://dx.doi.org/10.1016/j.atmosenv.2014.07.006 1352-2310/© 2014 Elsevier Ltd. All rights reserved.

12 Gowtham sarella, Dr Anjali k khambete " Ambient air quality analysis using air quality index –A case study of Vapi ISSN 2349-6010 Vol 1 Issue 10 March 2015

13 Sumit Sharma,Jai Malik, Sangeetha Wilson, Meena Sehgal,Sachin Kumar, Sunil Dhingra, Suneel Pandey, Anju Goel, Hina Zia, Ilika Mohan, Atul Kumar,

Akshima T Ghate, "Measures to Control Air Pollution in Urban Centres of India: Policy and Institutional framework" w w w . t e r i i n . o r g policy brief February 2019.

14 Durdana Rais Hashmi, Akhtar Shareef and Razia Begum "Preliminary determination of air quality index (aqi) along busy roads in karachi metropolitan, Pakistan" ISSN: 2277-9655 DOI: 10.5281/zenodo.398803.

15 Shivangi Nigam, B.P.S. Rao1, N. Kumar, V. A. Mhaisalkar "Air quality index – a comparative study for assessing the status of air quality ISSN 0976-2973 vol 6 April-June 2015 pp1-8 www.anvpublication.org

16 Richa Mahtta, Sumit Sharma, "Air pollution in Punjab" T E R I. 2015

Air pollution in Punjab New Delhi: The Energy and Resources Institute. 16 pp.

17 N Pon Saravanan "Indoor Air pollution" danger at home General article January 2004.

18 Jana Spiroska , Md. Asif Rahman , Saptarshi Pal "Air Pollution in Kolkata: An Analysis of Current" Status and Interrelation between Different Factors Volume 8, No. 1, 2011 DOI: 10.2478/v10306-012-0012-7

19 SA Rizwan, Baridalyne Nongkynrih, and Sanjeev Kumar Gupta "Air pollution in Delhi: Its Magnitude and Effects on Health" http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3612296/ 11-2014

20 C. P. Kaushik*, Ravindra Khaiwal, Krishan Yadav, Surender Mehta and A. K. Haritash "Assessment of ambient air quality in urban centres of Haryana (India) in relation to different anthropogenic activities and health risks" Article *in* Environmental Monitoring and Assessment · December 2006 DOI: 10.1007/s10661-005-9161-x · Source: PubMed https://www.researchgate.net/publication/6888711.

BIOGRAPHIES

Description: PhD Professor, Dept. of Civil Engineering, PDA College of Engineering Kalaburgi, Karnataka, India

Description PG student, Dept. of Civil Engineering, PDA college of Engineering, Kalaburgi, Karnataka, India