



# Analysis of Ambient Air Quality of Akola City, Maharashtra

**Dr. Amit P. Gawande**

*Assistant Professor, Department of Chemical Engineering, College of Engineering & Technology, Akola*

**DOI: 10.5281/zenodo.8223345**

## ABSTRACT

*Presence of certain substances in air adversely affects human health, environment and climate. These chemicals are mainly added due to human activities. Maintaining air quality requires regular monitoring, identification of source of pollution and adoption of preventive measure. The objective of this study is to identify air pollution trend in Akola and investigate the factors contributing towards it. Data for analysis has been obtained from state pollution control board website and has been used without any modification. Three criteria pollutants measured regularly and for longest period of time, sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and respirable particulate matter (PM<sub>10</sub>) have been investigated for air quality analysis.*

**Keywords:** Vehicular emission, Emission control, Pollution norms Akola City

## 1. INTRODUCTION

Accumulation of certain substances in the air which adversely affect the well being of human, plant, animals and the environment causes air pollution. These chemicals are added in many ways, for example pesticides, fumigants etc are released intentionally, hydrocarbons during fuel use and solvents escape when used (solvents etc.). Some of these chemicals change their nature by reactions in atmospheric conditions. Quality of air is maintained naturally as these chemicals disperse soon after release. Recent problem of air pollution is actually arisen as the rate of addition of pollutants is much more than its removal.

Air is everywhere and so is its influence. Polluted air can adversely affect the human health, buildings, monuments, plants, ecosystems and the list is endless. Polluted air has been linked to climate change as particulate matter absorb or reflect sun light and affect cloud formation and rainfall pattern of a place. Its health impact has been reported worldwide. World Health Organization (WHO) studies has reported premature death of 3.7 million people world over in 2012 due to air pollution<sup>2</sup> while in India positive association between air pollution and health impacts in cities like Delhi<sup>3</sup>, Hisar<sup>4</sup> and Hyderabad<sup>5</sup> has been reported.

Every country has issued air quality guidelines for pollutants concentration in air for protecting public health from air pollution in a country. In India, Central Pollution Control Board (CPCB) in its notification 2009<sup>6</sup> has identified 12 criteria pollutants, which are particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, benzene, ammonia, Benzo(a)Pyrene (BaP Particulate phase only), Arsenic and Nickel to be measured at national level through National Air Quality monitoring Program and for easy understanding of the pollution level by everybody CPCB has developed Exceedence Factor (EF) which is calculated by the formula shown by equation (1) given below. EF = Observed Annual Mean of Criteria Pollutants/Annual Standard for Respective Pollutant Air quality can be low, moderate, high or critical based on the following criteria:

- Critical pollution (C) : EF > 1.5
- High pollution (H) : EF ∈ [1.0 - 1.5]
- Moderate pollution (M) : EF ∈ [0.5- 1.0]
- Low pollution (L) : EF < [0.5- 1.0]

## 2. AIR POLLUTION MEASUREMENT IN AKOLA

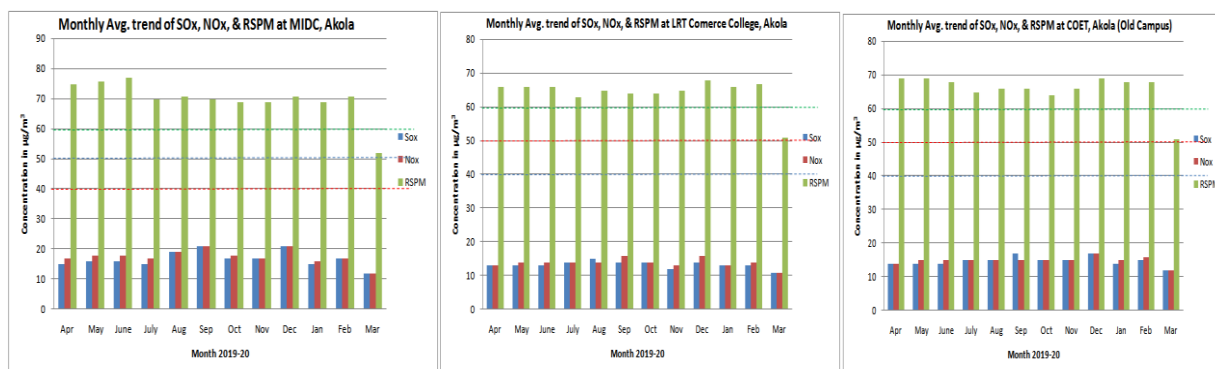
Air pollutants are measured under national ambient air quality program (NAMP) by monitoring stations which are shown in Figure 1 on a regular basis and MPCB publishes annual average of pollutants Sulphur dioxide (SO<sub>2</sub>), Nitrogen dioxide (NO<sub>2</sub>) and particulate matter with aerodynamic diameters less than 10mm (PM<sub>10</sub> or RSPM) in its website. The Exceedence Factor has been calculated by using these data from Equation 1 for six stations. These stations are selected as measurements for them are available for longest period of time (2006-15) and they also represent mixed urban, industrial and sensitive area.



### Assessment of Air Quality Trend

Table1: Monthly Reading recorded at MIDC, Water works, Akola, LRT Commerce College, Akola & COET, Akola (Old Campus)

Monitoring Station (MS)	Year	Month	Avg. Sox Max(50µg/m <sup>3</sup> )			Avg. NOx Max(40µg/m <sup>3</sup> )			Avg. RSPM Max(60µg/m <sup>3</sup> )		
			MS-1	MS-2	MS-3	MS-1	MS-2	MS-3	MS-1	MS-2	MS-3
MS-1 : MIDC, Water works, Akola MS-2 : LRT Commerce College, Akola MS-3 : COET, Akola (Old Campus)	2019	April	15	13	14	17	13	14	75	66	69
		May	16	13	14	18	14	15	76	66	69
		June	16	13	14	18	14	15	77	66	68
		July	15	14	15	17	14	15	70	63	65
		August	19	15	15	19	14	15	71	65	66
		September	21	14	17	21	16	15	70	64	66
		October	17	14	15	18	14	15	69	64	64
		November	17	12	15	17	13	15	69	65	66
	December	21	14	17	21	16	17	71	68	69	
	2020	January	15	13	14	16	13	15	69	66	68
		February	17	13	15	17	14	16	71	67	68
		March	12	11	12	12	11	12	52	51	51



Graph: Monthly Avg. trend of SOx, NOx, & RSPM at MIDC, Water works, Akola, LRT Commerce College, Akola & COET, Akola (Old Campus)

### 3. ANALYSIS OF FACTORS CONTRIBUTING TO AIR POLLUTION

Emission levels are not the only factor that determines concentrations of air pollutants. Factors like the weather, chemical transformations in the air, and transport of pollutants from outside Europe all play a role. This means that a reduction in emissions of a pollutant do not always translate to an equivalent reduction in concentrations of that pollutant.

As pollutants in the air cannot be seen with our naked eyes, we don't realize the sources of the increasing pollution level. In order to understand the sources of air pollution, we need to first go through the basic causes of air pollution.

- **Power Generation:**

Most of the air pollution takes place due to the burning of fossil fuels such as coal, oil, gasoline to produce energy for electricity. The release of carbon monoxide in high level indicates how much fossil fuel is burned. This also emits other toxic pollutants in the air. Inhaling air induced with pollutants due to the burning of natural gas and fossil fuel reduces heart's ability to pump enough oxygen causing one to suffer respiratory illness.

- **Industrial Activity:**

Industrial activities emit several pollutants in the air that affects the air quality more than we can even imagine. Particulate matter of size 2.5µ and 10µ, Oxides of Nitrogen, Oxides of Sulfur, and carbon monoxide are key pollutants that are emitted from industries that use coal and wood as their primary energy source for production of their goods. Industrial pollution effects associated with your health can range from irritation in your eyes and throat to breathing issues, at times can even lead to chronic illness.

- **Indoor Activity:**

Use of toxic products also called as Volatile Organic Compounds (VOCs), inadequate ventilation, uneven temperature, and humidity level can cause indoor air pollution, whether you are in office, school or at your comfortable home. House air pollution can take place due to ignorant factors, for instance, smoking tobacco inside



a room or leaving mold infected wall untreated. Use of wood stove or space heaters is capable to increase the humidity level which can directly affect the health a person in no time.

- **Wildfires:**

Climate change is not just increasing wildfire but also spiking air pollution. Burning stubble and farm residue is also a major contribution to wildfire. It causes increased PM<sub>2.5</sub> in the air which collides with other harmful substances like chemical gas and pollen creating smog.

- **Transportation Sector:**

Nearly 70% of the urban air pollution is contributed by vehicles. The burning of fossil fuels such as gasoline, diesel etc for transportation is the main cause of excessive release of carbon monoxide, Carbon dioxide, Oxides of Sulphur & Nitrogen are already creating havoc on various cities across the world. This sector is also responsible for emitting other toxic pollutants such as Lead oxide, or BTEX, which mixed in the fuels as octane boosters, in the air. Benzene from BTEX compound is identified as class-I carcinogen by WHO. Breathing in the air loaded with variety of harmful pollutants that too in uncontrolled proportions which are emitted due to the burning offuel for transportation, causes various life-threatening diseases including mental retardation, heart diseases, and even cancer.

#### 4. CONCLUSION

Air Quality Monitoring was carried out to know about the variation in concentration three major pollutants namely SPM, SO<sub>x</sub>, and NO<sub>x</sub> at the site selected for the study. The vehicles not only emit the RSPM, SO<sub>2</sub> and NO<sub>2</sub> but also HC and CO and their concentration in air is expected to have increased in the same proportion. Adoption of Bharat Stage VI has helped in controlling the air pollution. High concentration of RSPM level due to construction activity can be managed if proper care is taken during construction and follow some points given below:

1. Proper traffic management with installation of signal timer at every signal
2. Diversion of traffic according to density of vehicles
3. Awareness about minimal use of horns
4. Proper dust control measures are to be adopted for Particulate emission control.
5. Ban old vehicle from the road and the drive should be strictly followed without any exception.
6. Improvement of fuel quality and periodic inspection of the same.
7. Increase of electric vehicles which are powered by renewable sources.

#### 5. REFERENCES

- [1] Ramanathan, V.; Crutzen, P. J.; Kiehl, J.T.; Rosenfeld, D. *Aerosols Science*, 2001, 294, 2119-2124
- [2] WHO. Ambient (outdoor) air quality and health. Fact sheet 2014 31.
- [3] CPCB. Environmental Health Series: EHS/1/2008, Ministry of Environment & Forests, Govt. of India, 2008
- [4] CPCB, Environmental Health Series: EHS/1/2008
- [5] Kaushik, C.P.; Ravindra, K.; Yadav, K.; Mehta, S.; Haritash, A.K. *Environmental Monitoring and Assessment*. 2006,122, 27- 40
- [6] Integrated Environmental Strategies India Program, USEPA, Washington DC, USA, 2004
- [7] The gazette of India, Extraordinary, Part III - section 4, 2009
- [8] Indian Meteorological Department, Meteorological centre, Maharashtra 2008