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A STUDY ON AMBIENT AIR QUALITY MONITORING IN CHIDAMBARAM

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Abstract: *This study reports the current status of ambient air quality in Chidambaram. The results reported pertain to an 24 hour continuously air sampling exercise carried out at each of the six locations using high volume sampler continuously for 8 hourly sampling for 3 days. The criteria pollutants, viz. Suspended Particulate matter (SPM), Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), and Carbon Monoxide (CO) measured are found to be slightly higher than that of the CPCB standard permissible limits, necessitating the immediate focus on ambient air quality monitoring in the study area . While vehicular emissions are the major sources of air contamination, increasing man made activities also contribute to particulate pollutions. It is concluded that ambient air quality in Chidambaram town need to be continuously monitored further to assess the status and to protect the public from vehicular emissions.*

Keywords: *High volume sampler, SO_X, NO_X, SPM, CO, Noise pollution*

1. Introduction

Air pollution may be described as contamination of the atmosphere by gaseous, liquid, or solid wastes or by-products that can endanger human health and welfare of plants and animals, attack materials, reduce visibility or produce undesirable odours. Although some pollutants are released by natural sources like volcanoes, coniferous forests, and hot springs, the effect of this pollution is very small when compared to that caused by emissions from industrial sources, power and heat generation, waste disposal, and the operation of internal combustion engines. Fuel combustion is the largest contributor to air pollutant emissions, caused by man, with stationary and mobile sources equally responsible. The air pollution problem is encountered outdoor as well as indoor.

The sources of air pollution are broadly classified as natural sources such as dust storm, forest fires, volcanoes, sea spray, plant pollen etc and manmade sources (domestic & industrial).

In India the ambient atmospheric conditions have progressively deteriorated due to urbanization, industrial development, lack of awareness, poor maintenance of motor vehicles and poor road conditions.

1.1 Health Effects of air pollution

Carbon Monoxide

Carbon monoxide is a colorless, odorless, poisonous gas emitted from the vehicle's exhaust as a result of incomplete combustion. It interferes with the blood's ability to carry oxygen to the brain, heart, and other tissues. Unborn or newborn children and people with heart disease are in greatest danger from this pollutant, but even healthy people can experience headaches, fatigue and reduced reflexes due to CO exposure. Carbon monoxide reduces the volume of oxygen that enters the bloodstream and can slow reflexes, cause drowsiness, impair judgment and vision and even cause death.

Sulfur Dioxide

Sulfur dioxide is emitted when fuel containing sulfur is burned in diesel engines. Sulfur dioxide exposure constricts air passages, creating problems for people with asthma and for young children, whose small lungs need to work harder than adult's lungs.

Nitrogen Dioxide

Nitrogen dioxide and related nitrogen oxides (NOx) are produced when fuel is burned. These compounds contribute to ozone formation and are a health problem themselves. The effect of NOx exposure on the respiratory system is similar to that of ozone and sulphur dioxide. Nitrogen oxides are by-products of fuel combustion and contribute to the formation of ground-level ozone. Health effects include coughing, shortness of breath, and decreased lung function.

Suspended Particulate Matter

Particulate matter includes microscopic particles and tiny droplets of liquid. Because of their small size, these particles are not stopped in the nose and upper lungs by the body's natural defenses but go deep into the lungs, where they may become trapped and cause irritation. Exposure to particulate matter can cause wheezing and similar symptoms in people with asthma or sensitive airways.

2. Study area

Vehicle emission is the major sources of pollutants in the Chidambaram city. The latitude and longitude of Chidambaram is 11.39 N and 79.69 E. Chidambaram is an

ancient southern town in the state of Tamilnadu, India. It is most important holy and pilgrimage centre attracting tourists, coming from all over India and Abroad. The town is named after the temple called "Chit Saba". The presiding deity is Lord Nataraja (king of dance). Chidambaram is one of the five Pancha Bootha Sthalams, the holiest Shiva temples each representing one of the five classical elements;. and His cosmic dance of bliss is believed to spin all worldly actions. Annamalai University, a residential unitary seat of higher learning adjoining Chidambaram has more than 75 years of standing with variety of faculties.It is one of the important temple towns in Tamilnadu state and also a taluk head quarters.

Chidambaram covers an area of 4.8 km² (1.9 sq mi) and had a population of 62,153 as of 2011. It is administered by a first-grade municipality. Tertiary sector involving tourism is the major occupation. Roadways are the major means of transportation with a total of 64.12 km (39.84 mi) of district roads including one national highway passing through the town.

Sampling stations

1. KVB (Annamalai nagar)
2. PC corner
3. Iyappan temple
4. Bus stand
5. Pachayappan school junction
6. Gandhi statue

Fig.1 shows the study area of sampling stations in and around Chidambaram city

Fig -1: Study area

3. Materials and Methods

The concentration level of pollutants in ambient air is calculated from the collected sample. Continuous monitoring method is applied on both gases & particulate matter. The pollutants analysed are SOX, NOx, SPM & CO. All samples were collected in February 2016 to March 2016. Air pollutants were collected and analysed for every eight hours continuously for 3 days. The air samples were collected by using High Volume Sampler. The apparatus was kept at a height of 2 m from the surface of the ground.

The samplings of the above pollutants were recorded continuously for 24-hours (06:00am to 02:00 pm, 02:00pm to 10:00pm and 10:00pm to 06:00am) on three days in each station using a High Volume Sampler. After 24 hours the samples were collected and record the reading by using UV spectrophotometer. In spectrophotometer set the nanometer range for SO_X 560nm and NO_X 540nm. The unit of Sulphur dioxide and Nitrogen dioxide is µg/m³. The carbon monoxide analysed from CO meter. Record the reading from CO meter in 10minuts interval on 24hours.Unit of carbon monoxide is mg/m³. In suspended particulate matter, before noted the empty weight of filter paper, the whatman filter paper GF/A (size 20.3cm × 25.4cm) was used. The filter paper was placed into the filter holder of the high volume sampler. Flow rate of suspended particulate matter is 1.8m³/min. Unit of suspended particulate matter is µg/m³.

The samplings were done at six different locations which are Karur vysa Bank (Annamalai nagar), PC Corner, Iyappan temple, Bus stand, Gandhi statue and Pachayappan school signal. The sampling and analysis of the samples was done as per NAAQ Standard methods of sampling and analysis (CPCB, Guidelines for measurement of ambient air pollutants)

3.1 Sound Level Meter

Noise pollution in India is assuming greater significance in urban environment due to its varying frequency and intensity. Presently the ambient noise level in Chidambaram Town of Cuddalore District, is an urban area in the state of Tamilnadu, has increased significantly due to increased vehicular density. Road traffic noise now produces serious community disturbance.

The noise levels were observed at these locations during sunny days from 6.00 a.m. to 10.00 p.m. (day time noise) and from 10.00 p.m. to 6.00 a.m. (night time noise) continuously for a period of one week with a time interval of fifteen minutes. The prevailing noise levels at all six sampling locations were observed. Noise observations were made at 1.2 m above ground level and at a distance of 2 to 3 m from noise sources. Noise levels recorded at six stations are given in Table 1.

S.NO	LOCATION	SOUND PRESSURE LEVEL(dB)	
		MIN	MAX
1	KVB(ANNAMALAI NAGAR)	56.7	67.6
2	PC CORNER	46.5	52
3	IYAPPAN TEMPLE	52.1	62.8
4	BUS STAND	60	78.5
5	PACHAYAPPAN SCHOOL JUNCTION	59	87.4
6	GANDHI STATUE	62.8	85.6

Table -1: Noise level at Six Stations

4. RESULTS AND DISCUSSION

The daily average concentrations were calculated in and around Chidambaram town. The corresponding graphs of concentration of each pollutant were plotted.

Sulphur Dioxide (SO_X)

This study shows that the Average concentration of SO_X was minimum of 38.67µg/m³ at PC corner and maximum of 71.45 µg/m³ at Bus stand (CPCB limit-80 µg/m³) as plotted in Fig 2.

Nitrogen Dioxide (NO_X)

The Average concentration of NO_X was minimum of 78.06 µg/m³ at Karur Vysa Bank and maximum of 130.21 µg/m³ at Pachayappan School junction. The movement of high vehicular is main reason and also poor road plan and ash from surrounding hotels and homes that also the reason for increasing Nitrogen dioxide (CPCB limit-80 µg/m³) as plotted in Fig 3.

Suspended Particulate Matter (SPM)

The average concentration of SPM was minimum of 176.78 µg/m³ at PC corner and maximum of 267.22 µg/m³ at Gandhi statue. The combustion engines from vehicles and open burning are the reason for increase SPM level (CPCB limit-200 µg/m³) as plotted in Fig 4.

Carbon Monoxide (CO)

The Average concentration of CO was 1.64mg/m³ minimum at PC corner and maximum of 2.56mg/m³ at Gandhi statue. The moving of motor vehicles and coal combustion are the main reason for increase CO level (CPCB limit-2 mg/m³) as plotted in Fig 5.

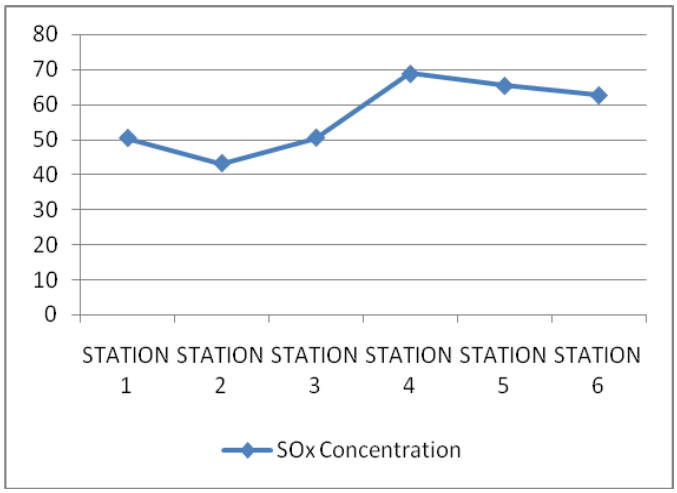

Fig 2: Average concentration of SO_X

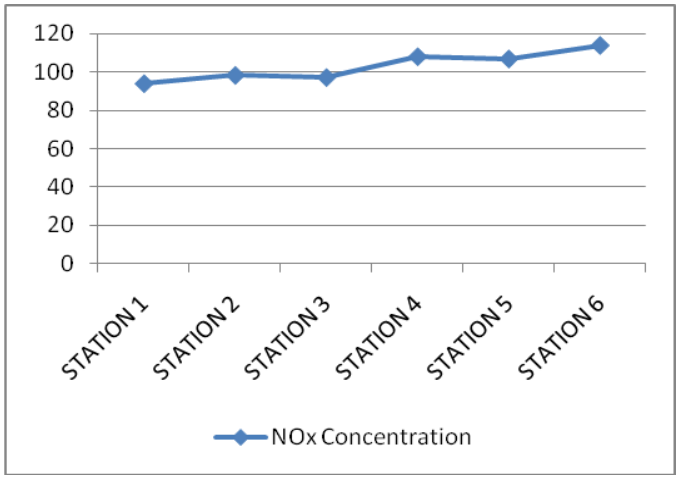

Fig 3: Average concentration of NO_X

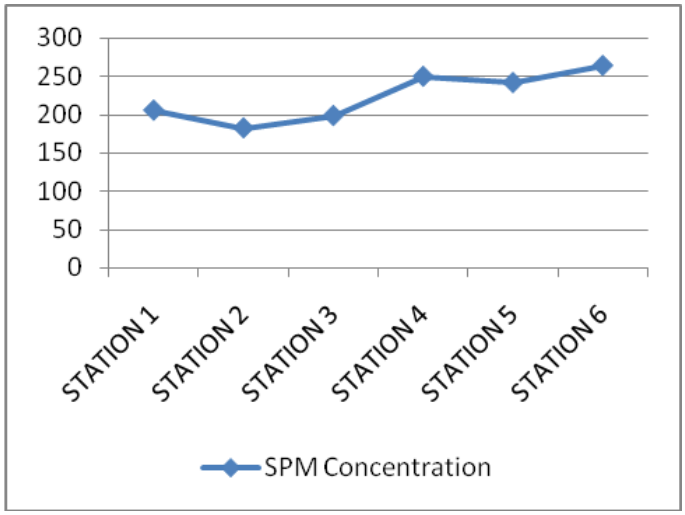

Fig 4: Average concentration of SPM

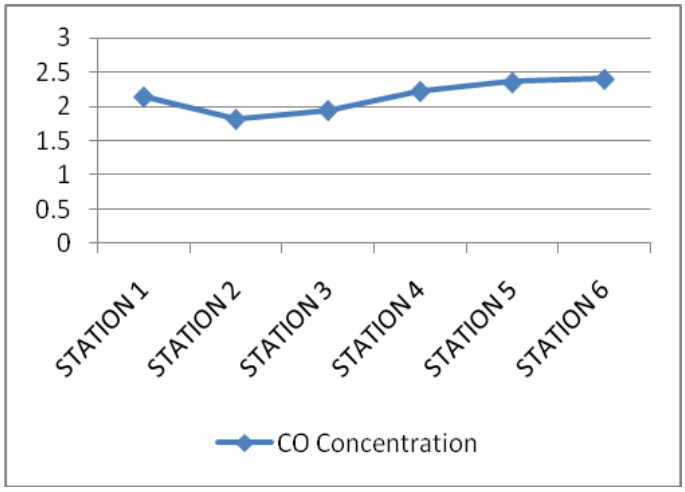

Fig 5: Average concentration of CO

Noise Level in dB at six stations

The noise level was measured in six different locations. The average minimum and maximum concentration of sound pressure level were observed. The noise level is increasing in peak hours morning 08:00am to 10:00am, afternoon12:00pm to 02:00pm and evening 04:30pm to 06:30pm. Especially in evening times the noise level is very high. The noise level is minimum at PC corner 46.5dB and maximum at pachayappan school junction 87.4dB.

Noise is now one of the major problems in Chidambaram city, pachayappan school junction and Gandhi statue the noise level is exceed the limit. This is mainly due to movement of heavy vehicle, horn sounds, loud speakers in temples and political gathering

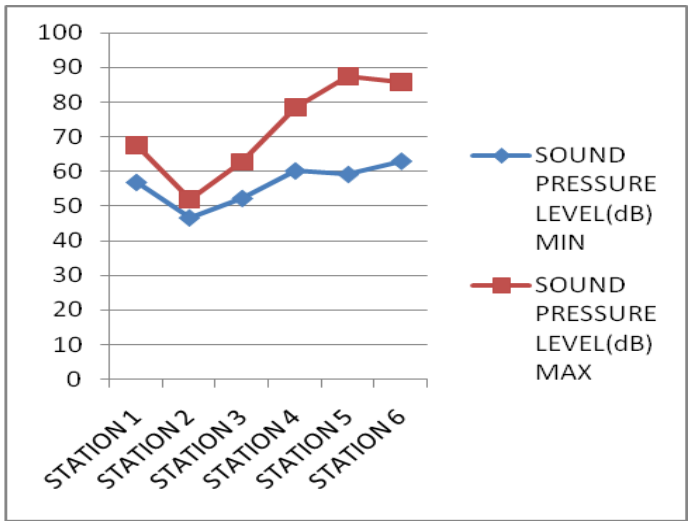

Fig 6: Noise level in six stations

5. CONCLUSIONS

Some concluding observations from this study are given below

1. The pollutant levels of SPM, NO2 and CO in the ambient air In and around Chidambaram town are found to be slightly higher than the permissible limits as per continuous sampling, while SO2 level is considerable within the limits. The pollution levels will get worsens further in future due to rapid increase in traffic volume in the town.
2. The study reports that the traffic related pollution in Chidambaram town is significant with possibly severe health problems, especially for people living in areas or in locations closer to the busy traffic zones.
3. Preventive measures against poor ambient air quality are to be assessed and implemented. Priority locations (like bus stand, near Gandhi Statue, and Pachayappan school junction) are to be considered seriously and proper regulations to be framed to control the pollutant generation rates.
4. It is further recommended that the Continuous monitoring need to be carried out to assess the pollutant levels regularly in and around Chidambaram town to protect the public from various health effects caused by vehicular emissions.

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