International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 3, Issue 1, pp: (72-79), Month: April 2015 - September 2015, Available at: www.researchpublish.com

Seasonal Variation in Carbon Monoxide Poisoning In Gauhati University, Gauhati, Assam, India

[1]Nisha.Sharma, [2]Hari P.Sarma, [3]Debajit Dutta

[1]Research Fellow (MAPAN Project) Department of Environmental science, Gauhati University, Gauhati
[2]Rector (G.U) & Prof. Department of Environmental science, Gauhati University, Gauhati
[3]Asstt.Prof.Department of Chemistry, L.T.K.College, Azad, Lakhimpur, Assam

Abstract: **Air pollution is emerging as one of burning environmental issues which need to be monitored for the prospect of the living beings and the world in a larger aspect. Owing to the growth of heavy transportation and urbanization concentration level of pollutants in the natural air has increased especially in certain areas leading to air pollution. Inhaling of such pollutants for a long time cause adverse effects to human health. As preventive measures, Traditional air quality monitoring methods, such as building air quality monitoring stations, but such methods turned to be typically expensive. In addition, monitoring stations are generally less densely deployed and so provide low resolution sensing data. This paper focuses on the Echo Tech Serinus 30 Carbon Monoxide Analyzer (Instrument) under Modelling Air Pollution and Networking (MAPAN) project installed in the Department of Environmental Science, Guahati University, sponsored by the Metrological Department, Pune which is an urban Air quality monitoring system. The system consists of sensor nodes, a gateway, and a control center managed by the Lab VIEW program through which sensing data can be stored in a database. This system is installed in the Environmental Science Department to monitor the carbon monoxide (CO) concentration level in the natural air from various sources. The results of the experiment-cum-case study show that the proposed system is suitable for micro-scale air quality monitoring.**

Keywords: **Carbon monoxide, dizziness, COHb (carboxy haemoglobin)**

I. INTRODUCTION

Carbon monoxide (CO) is a poisonous, colourless, odourless, and tasteless gas. Although it has no detectable odour, CO is often mixed with other gases that do have an odor.CO is a common industrial hazard resulting from the incomplete burning of natural gas and any other material containing carbon such as gasoline, kerosene, oil, propane, coal, or wood. Forges, blast furnaces and coke ovens produce CO, but one of the most common sources of exposure in the workplace is the internal combustion engine. Carbon monoxide is harmful when breathed because it displaces oxygen in the blood and deprives the heart, brain, and other vital organs of oxygen. Large amounts of CO can overcome you in minutes without warning—causing you to lose consciousness and suffocate. Besides tightness across the chest, initial symptoms of CO poisoning may include headache, fatigue, dizziness, drowsiness, or nausea. Sudden chest pain may occur in people with angina. During prolonged or high exposures, symptoms may worsen and include vomiting, confusion, and collapse in addition to loss of consciousness and muscle weakness. Symptoms vary widely from person to person. CO poisoning may occur sooner in those most susceptible: young children, elderly people, people with lung or heart disease, people at high altitudes, or those who already have elevated CO blood levels, such as smokers. Also, CO poisoning poses a special risk to foetuses. CO poisoning can be reversed if caught in time. But even if you recover, acute poisoning may result in permanent damage to the parts of your body that require a lot of oxygen such as the heart and brain. Significant reproductive risk is also linked to CO.

II. OBJECTIVE OF THE EXPERIMENT-CUM-CASH STUDY

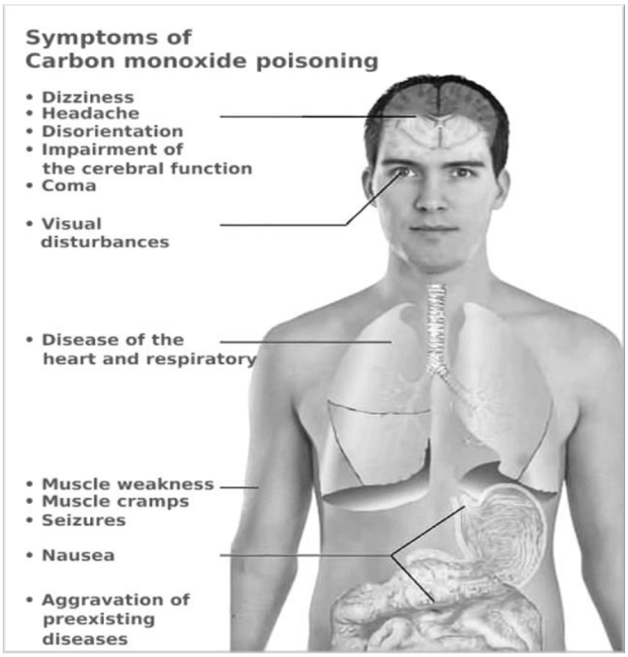
The objective of the proposed experiment-cum-case study was to focus on the concentration level of various pollutants especially Carbon Monoxide in the natural air.Thereafter, to find out a suitable method to monitor the concentration level of such pollutants.

III. METODOLOGY FOR THE EXPERIMENT-CUM-CASH STUDY

For the said experiment-cum-case study data were collected from the MAPAN project, GU.(MAPAN) and other secondary sources.

Effect of CO: Carbon monoxide is not toxic to all forms of life. But when it gets concentrated to haemoglobin, gets absorbed to the lungs and instead of transporting oxygen to the various parts of the body it transports carboxyhaemoglobin. So inhaling CO can lead to hypoxic injury, nervous system damage, and even death. The acute effects produced by carbon monoxide in relation to ambient concentration in parts per million are listed below:

Concentration	Symptoms
35 ppm	Headache and dizziness within six to eight hours of constant exposure
100 ppm	Slight headache in two to three hours
200 ppm	Slight headache within two to three hours; loss of judgment
400 ppm	Frontal headache within one to two hours
800 ppm	Dizziness, nausea, and convulsions within 45 min; insensible within 2 hours
1,600 ppm	Headache, increased heart rate, dizziness, and nausea within 20 min; death in less than 2 hours
3,200 ppm	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
6,400 ppm	Headache and dizziness in one to two minutes. Convulsions, respiratory arrest, and death in less than 20 minutes.
12,800 ppm	Unconsciousness after 2–3 breaths. Death in less than three minutes.



Sources of CO: Carbon monoxide is a product of combustion of organic matter under conditions of restricted oxygen supply, which prevents complete oxidation to carbon dioxide (CO_2). Sources of carbon monoxide include cigarette smoke, house fires, faulty furnaces, heaters, wood-burning stoves, internal combustion vehicle exhaust, electrical generators, propane-fueled portable stoves, and gasoline-powered tools such as leaf blowers, lawn mowers, high-pressure washers, concrete cutting saws, power trowels, and welders. Exposure typically occurs when equipment is used in buildings or semi-enclosed spaces.

Concentration	Source
0.1 ppm	Natural atmosphere level
0.5 to 5 ppm	Average level in homes
5 to 15 ppm	Near properly adjusted gas stoves in homes
7,000 ppm	Undiluted warm car exhaust without a catalytic converter

Echo Tech Serinus 30 Carbon Monoxide Analyzer (Instrument) under MAPAN PROJECTS A SUITABLE ALTERNATIVE FOR MONITORING CO:-

As the concentration level of various pollutants in the natural air is increasing day by day at an alarming rate. So researchers have been developing a number of air quality monitoring systems. Keeping the increasing concentration level of various pollutants in the natural air, the Department of Environmental Science has undertaken various steps to monitor the concentration level of various pollutants in the natural air. In that connection two years back.

Echo Tech Serinus 30 Carbon Monoxide Analyzer (Instrument) under MAPAN project was installed in the Department of Environmental Science, GU. It is a modern air monitoring system which has introduced an outdoor monitoring system that utilized the outdoor environments for sensing data through the sensor nodes pre-equipped to it. It is installed in the Department campus to monitor the air quality of Gauhati University. The whole system is pre-equipped with sensor node consisted of a microcontroller, an on-board Global Positioning System (GPS) unit, and a set of sensors to detect the concentrations of Ozone (O3), CO, and Nitrogen dioxide (NO2), Volatile Organic Compounds (VOC), Particulate Matter (PM), and Carbon dioxide (CO2) etc. The sensor node transmits sensing data to a gateway via a protocol, and the gateway sends the data to a control centre via the GSM network. The data allowed researchers to do statistical analyses. The system transfers the sensing data to the control centre without any interruption for 24 hours.

Fig: 1 Echo Tech Serinus 30 Carbon Monoxide Analyzer
(Pollutants detector, pm 2.5 & pm 10, wind direction & wind speed sensor)

Fig: 2 chart showing month wise ppm level of CO in GUAHATI UNIVERSITY campus

Months	April	May	June	July	August	September	October	November	December
PARA	CO	CO	CO	CO	CO	CO	CO	CO	CO
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
00:00	0.51	0.46	0.46	0.37	0.31	0.4	0.58	0.65	0.96
01:00	0.50	0.44	0.42	0.32	0.28	0.37	0.52	0.54	0.93
02:00	0.49	0.37	0.39	0.31	0.28	0.37	0.48	0.52	0.83
03:00	0.48	0.37	0.39	0.31	0.28	0.35	0.47	0.5	0.75
04:00	0.49	0.37	0.39	0.31	0.28	0.33	0.47	0.47	0.67
05:00	0.52	0.39	0.37	0.31	0.27	0.34	0.46	0.46	0.62
06:00	0.53	0.39	0.42	0.34	0.28	0.39	0.48	0.53	0.71
07:00	0.52	0.39	0.42	0.35	0.29	0.41	0.48	0.59	0.77
08:00	0.51	0.42	0.43	0.36	0.31	0.4	0.47	0.59	0.73
09:00	0.50	0.5	0.44	0.34	0.31	0.43	0.47	0.55	0.64
10:00	0.55	0.61	0.46	0.34	0.37	0.5	0.51	0.55	0.57
11:00	0.52	0.6	0.44	0.32	0.37	0.47	0.5	0.52	0.53
12:00	0.50	0.45	0.41	0.35	0.31	0.35	0.46	0.37	0.56
13:00	0.50	0.48	0.41	0.33	0.31	0.37	0.45	0.36	0.51
14:00	0.47	0.53	0.43	0.31	0.33	0.41	0.48	0.37	0.49
15:00	0.51	0.53	0.43	0.32	0.34	0.41	0.54	0.39	0.48
16:00	0.56	0.5	0.46	0.35	0.35	0.41	0.49	0.34	0.44
17:00	0.60	0.52	0.49	0.37	0.32	0.41	0.44	0.43	0.47
18:00	0.64	0.44	0.36	0.35	0.29	0.38	0.49	0.51	0.7
19:00	0.64	0.5	0.4	0.38	0.31	0.4	0.55	0.62	0.82
20:00	0.65	0.51	0.41	0.42	0.33	0.47	0.57	0.69	0.87
21:00	0.64	0.56	0.44	0.46	0.37	0.48	0.56	0.7	1.01
22:00	0.64	0.52	0.49	0.45	0.4	0.48	0.6	0.74	1.17
23:00	0.55	0.48	0.44	0.44	0.35	0.46	0.57	0.73	1.08
AVG	0.54	0.47	0.43	0.36	0.32	0.41	0.5	0.53	0.72
MIN	0.23	0.22	0.08	0.18	0	0.18	0.06	0.24	0.11
MAX	1.06	1.27	1.01	1.03	0.77	0.94	1.24	2.13	2.34

Fig: 3 Monthly variations of WS from April to December- 2014

Month	April	May	June	July	August	September	October	November	December
DAY	Average	Average	Average	Average	Average	Average	Average	Average	Average
PARA	WS	WS	WS	WS	WS	WS	WS	WS	WS
UNITS	m/s	m/s	m/s	m/s	m/s	m/s	m/s	m/s	m/s
0:00	0.6	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.3
1:00	0.6	1.0	0.9	0.9	0.9	0.8	0.9	0.9	0.3
2:00	0.6	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.3
3:00	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.3
4:00	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3
5:00	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.3
6:00	0.8	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.3
7:00	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.2
8:00	1.5	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.3
9:00	1.6	1.2	1.1	1.2	1.1	1.1	1.0	1.1	0.4
10:00	1.7	1.5	1.4	1.4	1.4	1.4	1.3	1.3	0.6
11:00	1.7	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1
12:00	1.9	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2
13:00	1.9	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.4
14:00	1.7	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.4
15:00	1.4	1.3	1.3	1.2	1.2	1.2	1.1	1.2	1.2
16:00	1.3	1.0	0.9	1.0	0.9	0.9	0.8	0.9	1
17:00	1.1	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.6
18:00	0.7	0.9	0.8	0.8	0.8	0.7	0.7	0.8	0.3
19:00	0.6	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.3
20:00	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.7	0.2
21:00	0.6	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.3
22:00	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.3
23:00	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.3
AVG	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.5
MIN	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MAX	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.9

Fig: 4 Monthly Variations of AT from April to December-2004

Months	April	May	June	July	August	September	october	November	December
DAY	Average	Average	Average	Average	Average	Average	Average	Average	Average
PARA	AT	AT	AT	AT	AT	AT	AT	AT	AT
UNITS	oC	oC	oC	oC	oC	oC	oC	oC	^{0}C
0:00	21.2	21.1	21.1	21.1	21.1	20.9	20.8	20.7	18.2
1:00	20.9	20.7	20.7	20.7	20.7	20.6	20.5	20.4	18.0
2:00	20.5	20.3	20.3	20.3	20.3	20.3	20.2	20.0	17.8
3:00	20.1	19.9	19.9	19.9	19.9	19.8	19.8	19.6	17.7
4:00	19.8	19.6	19.6	19.6	19.6	19.5	19.4	19.3	17.6
5:00	19.7	19.4	19.4	19.4	19.4	19.4	19.3	19.1	17.6
6:00	20.3	20.1	20.1	20.1	20.1	20.0	20.0	19.9	18.4
7:00	21.7	21.4	21.4	21.4	21.4	21.3	21.2	21.1	19.7
8:00	23.1	22.7	22.7	22.7	22.7	22.6	22.5	22.3	20.7
9:00	24.6	24.3	24.3	24.3	24.3	24.0	23.9	23.8	21.9
10:00	26.0	25.8	25.8	25.8	25.7	25.4	25.3	25.2	22.8
11:00	26.8	26.6	26.6	26.6	26.4	26.2	26.1	25.8	23.6
12:00	27.5	27.4	27.4	27.4	27.2	26.9	26.7	26.5	24.0
13:00	27.9	27.8	27.8	27.8	27.6	27.2	27.0	26.8	24.1
14:00	27.9	27.8	27.8	27.8	27.6	27.2	27.0	26.8	23.4
15:00	27.6	27.6	27.6	27.6	27.4	27.1	26.9	26.6	21.6
16:00	26.9	26.9	26.9	26.9	26.7	26.4	26.2	26.0	20.3
17:00	25.7	25.7	25.7	25.7	25.5	25.3	25.1	24.9	19.8
18:00	24.7	24.7	24.7	24.7	24.5	24.4	24.2	24.0	19.3
19:00	23.8	23.8	23.8	23.8	23.6	23.5	23.3	23.0	19.0
20:00	23.0	23.0	23.0	23.0	22.8	22.7	22.5	22.3	18.7
21:00	22.8	22.8	22.8	22.8	22.6	22.3	22.1	21.9	18.5
22:00	22.3	22.3	22.3	22.3	22.1	21.9	21.8	21.5	18.3
23:00	21.6	21.6	21.6	21.6	21.5	21.3	21.2	21.0	18.3
AVG	23.6	23.5	23.5	23.5	23.4	23.2	23.0	22.9	19.9
MIN	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	14.5
MAX	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	26.5

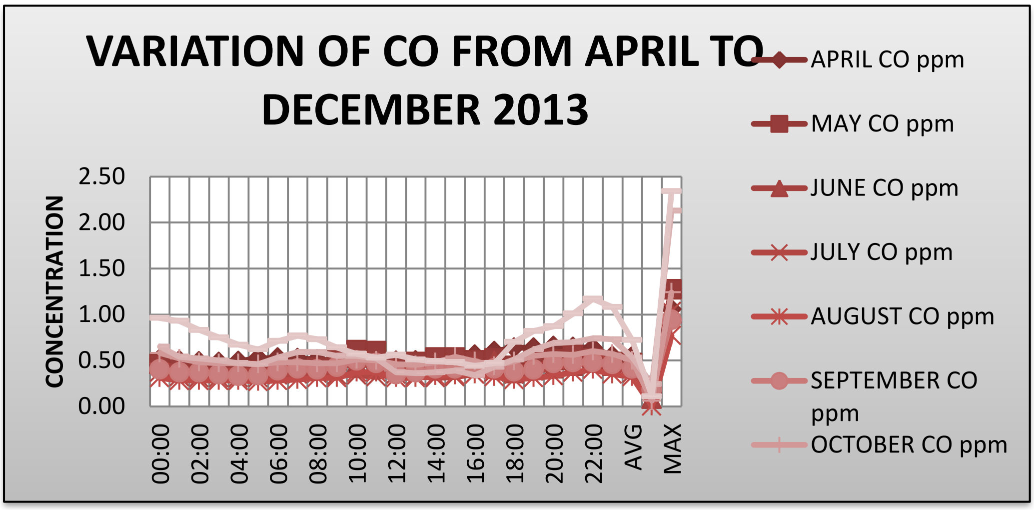


Fig: 5 Variation of CO from April to December 2013

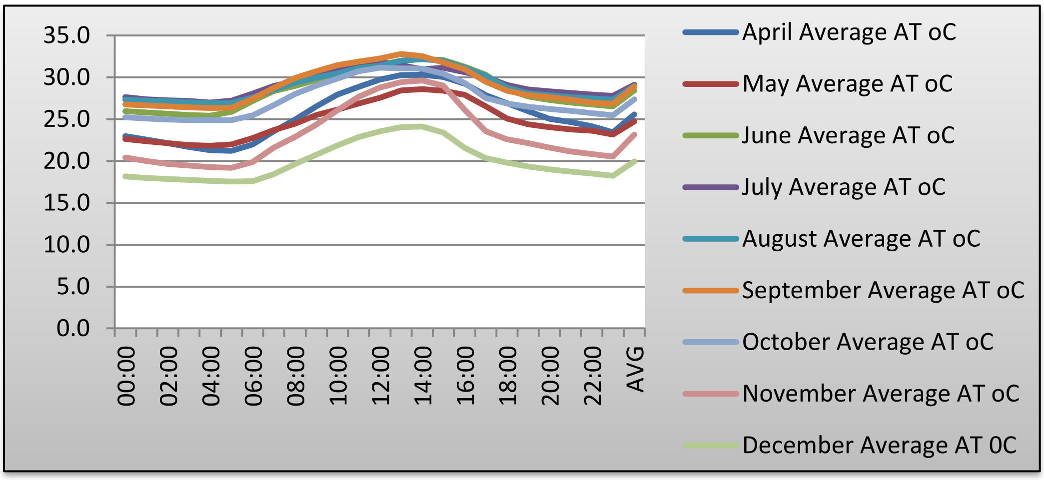


Fig: 6 temperature

Fig.5 Plot of monthly' CO poisoning cases and of monthly mean weather parameters; Fig.6 temperature;

In 1971, the U.S. Environmental Protection Agency (EPA) promulgated the National Ambient Air Quality Standard (NAAQS) for CO of 9 ppm for 8 hours and 35 ppm for 1 hour to protect susceptible population groups from adverse effects resulting from CO exposures in the outdoor environment. In comparison to the standard concentration level of CO, the concentration level of CO in the GU campus is below the hazardous level as shown by the month-wise data collected from the system shows. Further the above data shows that the concentration level of CO in and around the GU campus keeps on changing at various intervals. It may be due to the rate of traffic at GU area. The concentration level of CO in the month of December is comparatively high than the rest of the months. During the winter season trees shed leaves so absorption of CO takes place at a very low rate and this might be the reason. Further, also the excessive combustion process during the winter season leads to enhancement of CO in the Natural air.

IV. CONCLUSIONS

CO exposure continues to be a matter of great concern all around the world due to its association with high incidence of morbidity and mortality. In this regard, Assam is not lagging behind especially Guwahati, the gateway to North East. Though, the concentration level of CO in Guwahati University campus is comparatively low at present. But it is increasing day by day owing to the growth of transportation, industrialization and others and in near future it may lead to adverse consequences to human in particular by increasing the daily mortality rate. So it is high time to ponder over the matter and to adopt need based steps to monitor the concentration level of CO as well as other pollutants in the natural air for the healthy growth of human beings. In this regard, I would like to offer a few suggestions which are as follows:-

1. Mass awareness should be created by organising seminars, workshops and others.
2. Proper monitoring technology like MAPAN project should be installed especially in those areas where concentration level of pollutants is alarming.
3. Provisions should be adopted to display concentration level of pollutants at public places.
4. Proper law and regulations should be adopted

REFERENCES

[1] SYun DR, Cho SH. A study of the incidence and Therapeutic measures on carbon monoxide poisoning in Seoul's Kor Med Assoc 1977; 20: 705-13. (In Korean).

[2] Korea Central Meteorological Office. Annual report of the central meteorological office, 1969-78. Seoul: CMO,

[3] Yun DR. Various aspects of carbon monoxide poisoning. J Kor Med Assoc 1965; 8: 72-5. (In Korean).

[4] Korea Bureau of Statistics. Mortality by cause of death in 1979. Seoul: KEPB, 1980.

[5] Lee OH. Review on carbon monoxide poisoning in Korea. Kor J Environ Health Soc 1978; 5: 25-39. (In Korean).

[6] Bin SD. Epidemiology of briquette gas poisoning. J Kor Med Assoc 1968; 11: 863-8. (In Korean).

[7] Kim YI, Cho SH, Kim JS, Yun DR, Kim ID. An Epidemiological study on carbon monoxide poisoning inUrban slum areas. J Kor Med Assoc 1980; 23: 879-87.