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"Studies on Benzene & Toluene Pollutant & Their Removal by Vedic Yagya Over Meerut Area of Delhi NCR"

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Abstract **– In this paper, the practical work was carried for a duration approximately two years. Sampling of Benzene and toluene was carried Monthly basis & 24 hours twice in a month & data was collected. The present study is very useful to regulatory authorities & administration to understand problems of air pollution in the Meerut area of NCR & helpful in prevention of Air Pollution. Benzene & Toluene are considered as a characteristic of the carcinogenic and toxic contaminants of ambient air quality of Meerut. Benzene and toluene are carcinogenic and hazardous to biotic life and no safe level of exposure can be recommended. In Meerut City, the residential area, commercial and industrial area during four seasons at 3 different locations viz. summer, Monsoon, Post monsoon & Winter. Variations in levels of Benzene & Toluene were observed during these seasons. This paper also gives brief knowledge about effects of VadicYagya (hawan) on pollutants & their removal reaction between pollutants & environment.**

Keywords- **Benzene, Toluene , Gas Chromatography-Flame Ionization Detector.**

I. INTRODUCTION

The pollution and temperature rise problem has increased rapidly due to number of construction and highway projects and cutting of hundreds of trees in Meerut area of NCR. Industrial processes and motor vehicles are the major sources of Benzene in the environment. Benzene & Toluene both are carcinogenic & very harmful to human health. Long term exposures can result in bone marrow depression & lower level of benzene causes nonspecific symptoms including fatigue, headache, and appetite loss, leukemia or cancer. Toluene is produced during the process of making gasoline & other fuels from crude oil, making coke from coal & as a byproduct of styrene.

Toluene gets in to the environment when solvents or paints, nail polish, rubber cement, inks & adhesives have been discarded. It quickly evaporates in to the air & combine with oxygen to form benzaldehyde and cresol, which is very harmful to people. Toluene causes health affects from both short term & also long term exposure. Exposure to benzene is linked to genetic changes, increased proliferation of bone marrow cells and occurance of certain chromosomal aberrations in humans & animals.

Approximately 150,000 deaths estimated in South Asia alone due to the exposure of air pollutants [7]. In the present study measurements of concentrations of the Benzene & Toluene have been carried out. The tests were conducted at residential, commercial & Industrial site in three different locations in Meerut Area. The four different seasons, Summer season (March to June), Monsoon season (July to September), Winter season (December to February) & Post Monsoon season (October to November) were considered.

II. MATERIAL AND METHODS

Sampling sites: Meerut is a city in the indian state of Uttar Pradesh. The city lies 70 km northeast of the national capital New Delhi & 46 km from Ghaziabad. Meerut covers an area of approx.2500 sq.km. It is located between the plains of two prominent rivers-Ganga& Yamuna. There are four railway stations in Meerut that connect it to rest of the country. It is one of the important industrial hub in western Uttar Pradesh and comprises many micro, small and medium scale industries. The sampling locations were selected based on residential, commercial, and industrial areas. The sampling locations were as follows:

Shastri Nagar (Residential): It is purely residential area. The sample location was built on the roof single stored building. C block, vasundhara colony, Tejgarhi, Ansal colony, B block are the nearby localities to shastri Nagar.
Begumpul (Commercial): It is predominated commercial area. The sampling location was on the roof of a single stored building. Abu lane, Meerut college & kachahari road are the are the nearby localities to Begumpul.

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2. Partapur Industrial Area (Industrial)- Partapur is home to a large spectrum of commercial organization like Dayal Fertilizers, Dayal Infotech , Parag dairy and Kanohar electrical etc. It is purely industrial area mainly comprising heavy & Medium Industries.

3.Sampling and storage or samples- Benzene & Toluene are more prominent in filters & while sample extract can be stored for 6 months below -20oC. The charcoal tubes include varying amount or activated charcoal. The two types of layer were found in sample tubes, sampling layer and the control layer. The ambient air was sucked through the tube using a portable low flow and constant volume sampler (with a flow rate of about 20-25 ml / min. and sampling duration 150-180 minutes) in a way that first or all, the air flow saved the sampling layers. Tubes were wrapped with aluminum foil and placed in an opaque, clean and air tight container which was immediately sent back to laboratory and placed in a refrigerator (<4oC). The sampler was located at 2.0 to 3.0 meters height, above the ground level at the sampling sites.

4. Analysis- Samples were collected through active sampling technique (sorbent tubes) was desorbed by conventional solvent (CS2, 2ml) in a sonicator for 30 minutes. The desorbed samples was analyzed by using Gas chromatograph (GC) fitted with capillary column and Flame ionization Detector (FID).

5. Effects of Vadic Yagya on Pollutants, involved reactions & mechanism:

Mango Wood + O2(Oxygen) ⟶ HCHO (Formaldehyde)

The aromatic & antibiotic herbs burn in atmosphere, their fragrance removes the foul air & purifies the atmosphere, when they burn in the atmosphere at the time of Vedic Yagya. The air gets purified when it comes in contact with fire & lighter it until the yagya process have been continued. Generally, mango wood have been used in this process & their reaction are as follows This formaldehyde gas kills the harmful bacterias & thus helps to purified the atmosphere (Trellow Scientist(France)). The aqueous solution of formaldehyde is known Formalin which is used to preserve the Specimens & Vegetables in biology practical Laboratory (Scientist Tautlic).

6. Reactions of Cow's Ghee with wood-

Ghee + O2 (burnt) ⟶ combine with dust particles ⟶ Wash out as Rain

This whole process naurishes the earth & improve the vegetation. It is already reported that the fragrance of burning of cow's ghee in Yagya remove the effects of radiation from the atmosphere.(Dr. Shirowic –Russian Scientist) It is also reported that fumes of yagya kills the bacteria of number of disease like T.B, Measeles, small pox etc. By the burning of Mango wood with cow'ghee , also librates O2 to a large extent,which shown by following reaction as-

$CO2 + H2O + 112{,}000 \text{ calorie} \longrightarrow HCHO + O2$

Finally, we can say that vedic Yagya is the process by which we return the atmosphere, what we have taken from the atmosphere.

III. RESULTS AND DISCUSSION

Benzene & Toluene were monitored at three sites in Meerut on monthly basis during Jan.2016-Dec.2017. Benzene & Toluene compounds measured using GC-FID technique.

1. Benzene (Seasonal, Annual Variations & their statistical data analysis)-

The result of Monthly (8 hrly.) data for two years study during Jan2016-Dec.2017 shows that benzene Conc. in Meerut area of NCR varies between 25±19.1 ng/m^3 at Shastrinagar, 28.5±19.3 ng/ m^3 at Begumpul & 33.6±21 ng/ m^3 at Partapur Industrial area Meerut. The Combined two years of seasonal & total average value of Benzene Conc. (ng/ m^3) During Jan. 2016-Dec.2017 (fig.1).

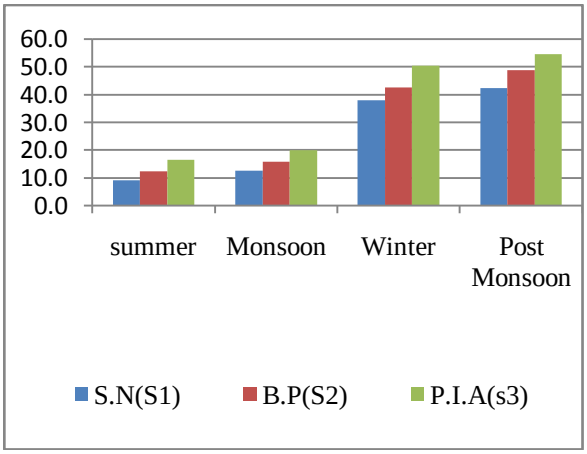

Fig.1 Combined 2 years of Seasonal & Total Average value of Benzene Conc. (ng/ m^3) During Jan. 2016-Dec.2017.

Two year monthly Maximum & Minimum value were recorded at Shastrinagar i.e.62.8 ng/ m^3 during November & 6.7 ng/m3 during July in Meerut area of NCR. The Combined two year of monthly & total average value of Benzene Conc. (ng/ m^3) during Jan.2016-Dec.2017(Fig.2) Two year combined annual average value in order of increasing Conc. at different sites were as Shastrinagar (25 ng/ m^3) < Begumpul (28.5 ng/ m^3) < partapur Industrial Area(33.6 ng/ m^3) during Jan.2016-Dec.2017(Fig.2).

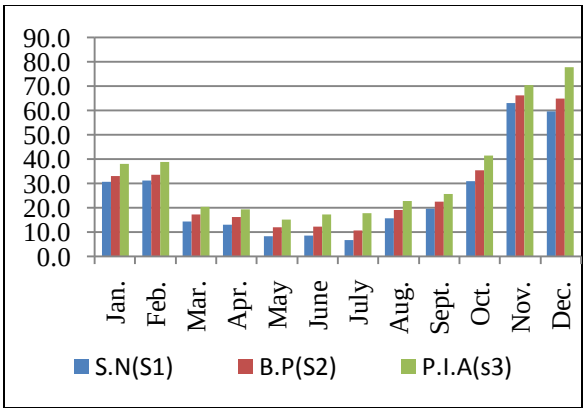

Fig.2 Combined two year of Benzene Conc. (ng/ m^3) during Jan.2016-Dec.2017.

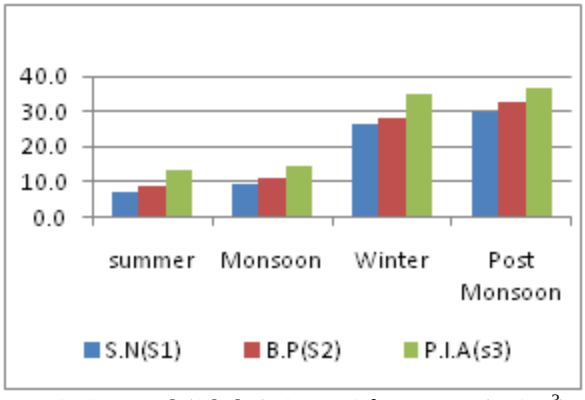

Fig.3 Seasonal (8 hrly.) Conc. Of Benzene (ng/ m^3) during Jan.2016-Dec.2016.

The highest & Lowest variation in 8 hrly concentration were observed at Shastrinagar (% CV = 65.2) & at Partapur Industrial Area (% CV = 52.1) respectively during 2016. The Benzene Conc. (ng/m3) During Jan.2016-Dec.2016 (Fig.4).

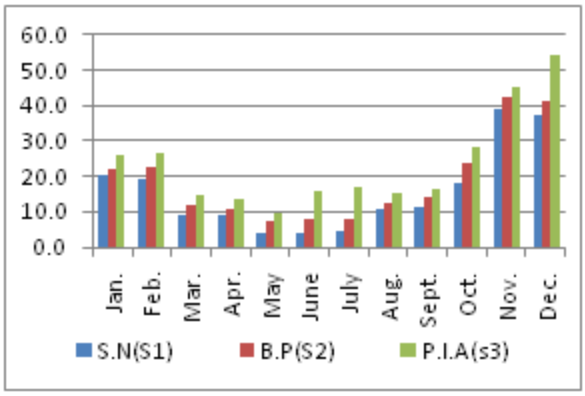

Fig.4 Benzene Conc. (ng/m3) During Jan.2016-Dec.2016.

Total Annual average values for Meerut (all sites combined) has increased from (18.5 ng/ m^3), at Shastrinagar to (25.3 ng/m3) at Partapur Industrial area during 2017.The Monthly & Average Conc. of Benzene (ng/m^3) During Jan.2017-Dec.2017 (Fig.5)

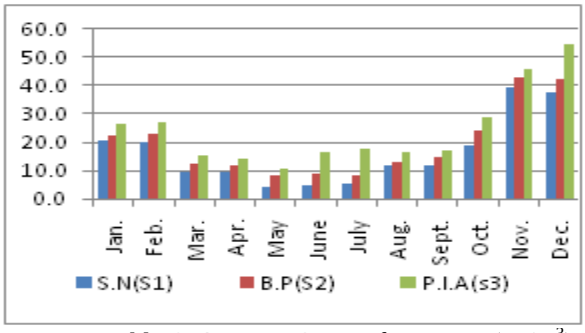

Fig.5 Monthly & Average Conc. of Benzene (ng/m^3) During Jan.2017-Dec.2017).

The seasonal (8 hrly.) Conc. Of Benzene (ng/ m^3) during Jan.2017-Dec.2017 (fig.6).

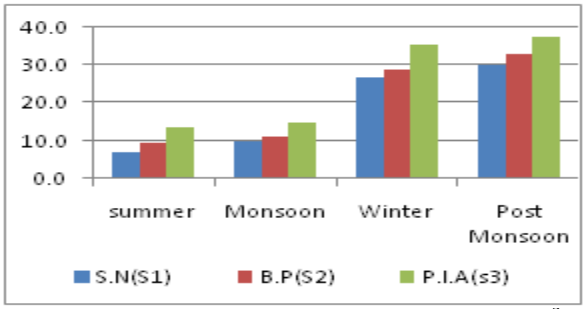

Fig.6 Seasonal (8 hrly.) Conc. Of Benzene (ng/ m^3) during Jan.2017-Dec.2017.

2. Toluene (Seasonal, Annual Variations & their statistical data analysis)- The result of Monthly (8 hrly) data for two years study during Jan2016-Dec.2017 shows that Toluene Conc. in Meerut area of NCR varies between 48.8 ±29.5 ng/ m^3 at Shastrinagar,50.4 ±29.2 ng/ m^3 at Begumpul & 54.4±29.9 ng/ m^3 at Partapur Industrial area Meerut. The Combined two years of monthly & total average value of Toluene Conc. (ng/ m^3) During Jan. 2016-Dec.2017 (fig.7).

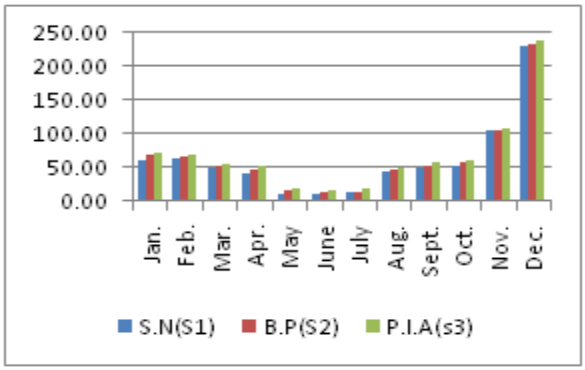

Fig.7 Combined 2 year of Toluene Cons.(ng/ m^3) during Jan.2016-Dec.2017.

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Two year monthly Maximum & Minimum value were recorded at Shastrinagar i.e. 231..5 ng/ m^3 during December & 12.6 ng/m3 during May in Meerut area of NCR. Two year combined annual average value in order of increasing Conc. at different sites were as Shastrinagar (62.9 ng/ m^3) < Begumpul (65.9 ng/ m^3) < Partapur Industrial Area(69.3 ng/ m^3) during Jan.2016-Dec.2017.The Combined two years of seasonal & total average value of Toluene Conc. (ng/ m^3) During Jan. 2016-Dec.2017(fig.8).

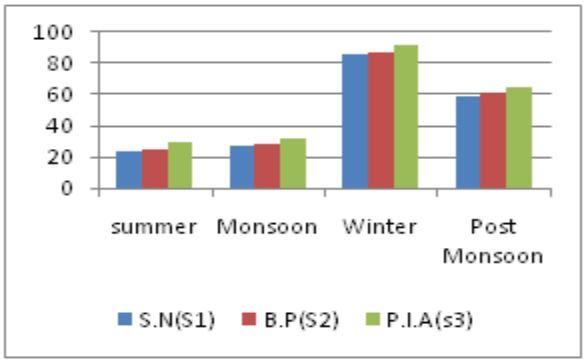

Fig.8 Two year combined seasonal (8 hrly.) Conc. of Toluene (ng/m3) During Jan.2016-Dec.2017.

Two year combined seasonal & total average Toluene level for Meerut (all sites combined) worked out to be 76.8, 87.4, 263.9, 186 & 153.5 ng/ m^3 for summer, monsoon, winter, post monsoon & total average respectively.Total Annual average values for Meerut (all sites combined) has increased from (42.4 ng/ m^3) at Shastrinagar to (47.63 ng/m3) at Partapur Industrial area during 2017 (fig 9).

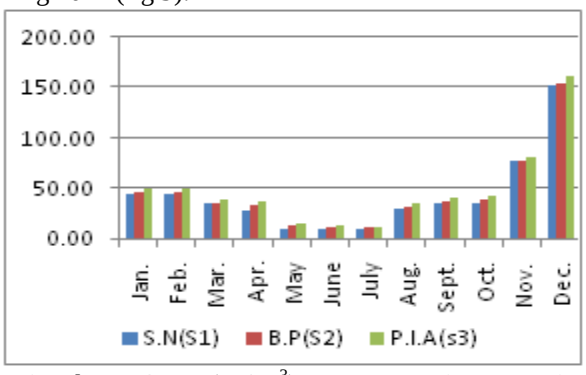

Fig.9 Toluene Conc. (ng/ m^3) During Jan.2017-Dec.2017.

The seasonal (8 hrly.) Conc. Of Toluene (ng/ m^3) during Jan.2017-Dec.2017 (fig 10).The highest & Lowest variation in 8 hrly concentration were observed at Shastrinagar (% CV = 65.34) & at Partapur Industrial Area (% CV = 59.72) respectively during 2016.The Monthly & Total average Conc. (ng/ m^3) of Toluene during Jan.2016-Dec.2017 (fig.10).

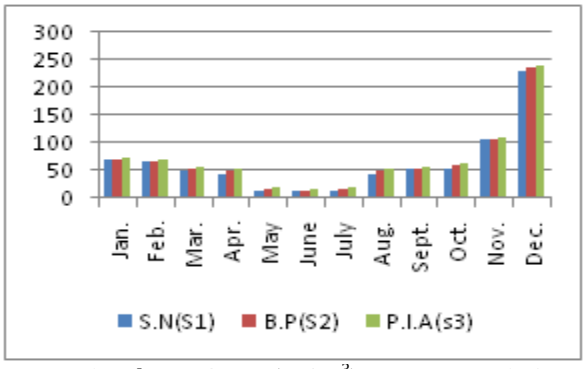

Fig.10 Toluene Conc. (ng/ m^3) During Jan.2016-Dec.2017.

The seasonal & Total average Conc. (ng/ m^3) of Toluene During Jan.2016-Dec.2016 (fig.11).

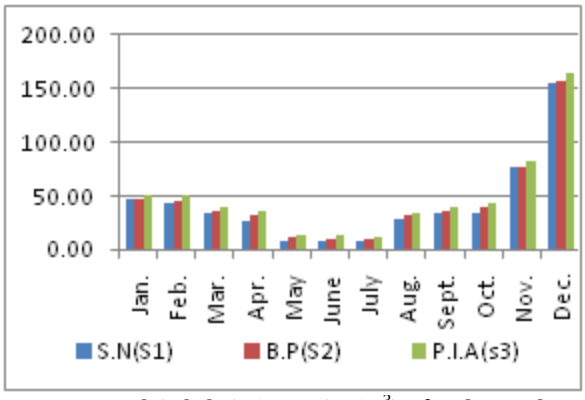

Fig.11 seasonal (8hrly.) Conc. (ng/m^3) of Toluene during Jan.2016-Dec.2016.

The Seasonal (8 hrly.) Conc. Of Toluene (ng/m^3) during Jan.2017-Dec.2017 (Fig:12).

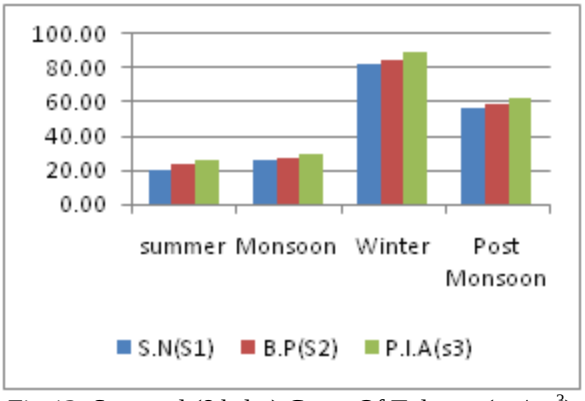

Fig.12: Seasonal (8 hrly.) Conc. Of Toluene (ng/ m^3) during Jan.2017-Dec.2017.

IV. CONCLUSION

This paper describe the two years (Monthly & total seasonal 8 hrly.) average value of Air Pollutants Benzene & Toluene for Meerut area (all sites combined) of Delhi NCR. The conclusion of this study is that the concentration of Toluene (235ng/ m3) found greater than

Benzene (68.9ng/ m3) in all sites of Meerut area of NCR. The Result & Discussion of this paper showed that minimum levels were obtained for benzene air pollutant than toluene air pollutant were found. The overall level of Toluene was approximately 3 times greater than the level of Benzene . This paper also describe the that vedic Yagya is the process by which we return the atmosphere , what we have taken from the atmosphere. The Pollutants levels were highest during winter season & lowest during monsoon season at all sites as expected due to inversion & low wind conditions during winter (less mixing & dispersion of pollutants in the atmosphere), while due to washout during monsoon.

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