

EXTENDED ABSTRACT

Study of the Emission of Volatile Organic Compounds from Gas Station in Tabriz City

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1. Introduction

Air pollution is a serious threat to human health, wildlife, and the environment that the problem is now one of the most serious issues facing mankind. Volatile organic compounds (VOCs) are one of the most prominent air pollutants that are of particular importance due to their serious toxicants as carcinogens. Due to the harmful effects of VOC compounds on human health, adverse effects on plant degradation and global climate change, it is necessary to prevent their release into the air. The most important sources of VOCs in urban areas are traffic and transportation, gasoline vapors, solvent use and etc. The emissions of VOC from gas stations can be considered seriously. According to research, one of the major sources of VOC pollutants in cities is gas-fueling stations. These studies have been evaluated by many researchers around the world and the volatile organic compounds content is often above the reported international standards (Gonzalez et al, 2002; Kountouriotis et al, 2014, Hicklin et al, 2018).

In 2006, three different gas stations were measured, with results ranging from 512 to 1275 $\mu\text{g}/\text{m}^3$ in New Delhi (Srivastav et al, 2006). In 2015, a study was carried out at six gas stations in Tehran that showed average concentrations in summer at 860 ppm and in winter at 434 ppm (Eisaei et al, 2015). In another study by Hicklin et al., Volatile organic compounds were distributed in gas stations using two models in Malta, which showed most gas stations were built in residential areas that exceed the standard level (Hicklin et al, 2018).

2. Methodology

2.1. Experimental study

There are 16 gas stations in Tabriz that are all investigated in this study. Fig. 1. shows the locations of these locations in the city.

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Fig. 1. Tabriz city map and location of gas stations

In order to evaluate the concentration, measurements were made in several different locations at the sites. These measurements were carried out at two levels next to the gas nozzles (center station) and within 5 m of the gas nozzles. The total VOC concentration was measured during the period using a portable measuring device, ION Science. The device is capable of accurately reporting 1 ppb to a total concentration of 20,000ppm.

3. Results and discussion

The total concentration of volatile organic compounds over the 8-month period was measured in the whole of the gas station. Since the duration of measurement is divided into four times intervals, it is necessary to investigate the concentration of volatile organic compounds at different time intervals. Fig. 2 indicates the mean concentration across all sites at different hours.

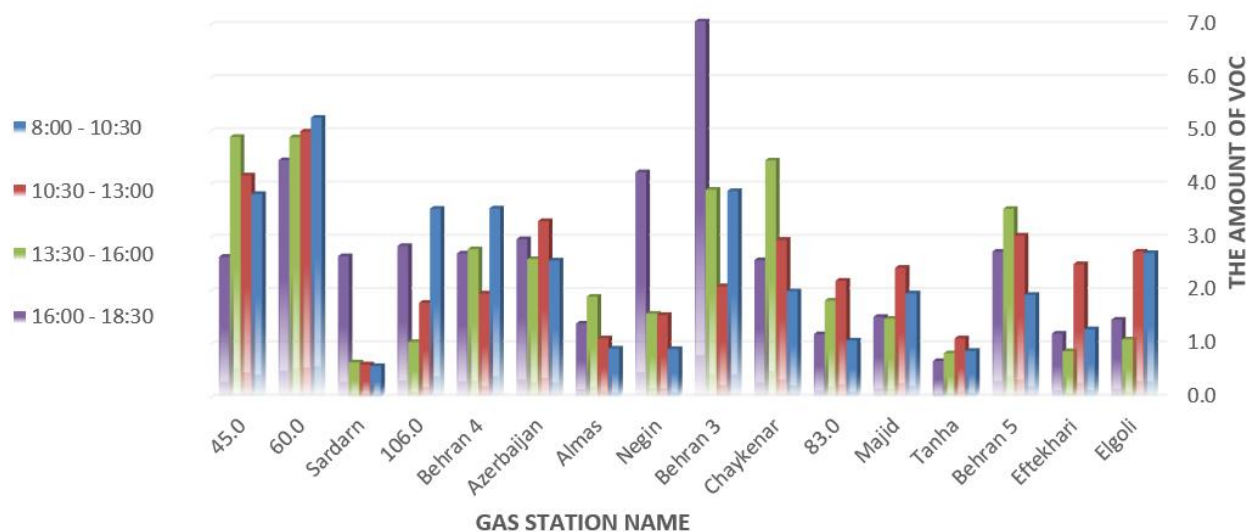


Fig. 2. The result of pairwise comparison in expert choice software: a) Criteria factor, b) Alternatives

It is better to have an accurate estimate of the amount of highly hazardous volatile organic compounds, BTEX. As mentioned earlier, these aromatic compounds are very harmful to human health. Table 1 shows the total concentration of volatile organic compounds (TVOC) and BTEX compounds. According to (Table. 1), it can almost be noted that 24% of the volatile organic compounds constitute the benzene component. Toluene, ethylbenzene and xylene exists 26%, 12% and 9% respectively, which will vary in different weather conditions and gasoline contents.

Table 1. The amount of BTEX and VOC compounds in 4 gas station

Name	Benzene/ TVOC (%)	BTEX/ TVOC (%)	BTEX	xylene	ethylbenzene	toluene	benzene	TVOC
Azerbaijan	23	70.3	5.2	0.3	1.3	1.9	1.7	7.4
106	22.9	82.9	2.9	0.4	0.6	1.1	0.8	3.5
45	23.6	71.4	14.2	2.1	2.2	5.3	4.7	19.9
Majid	29.1	70.9	5.6	0.9	0.8	1.7	2.3	7.9
Average	24	71.9	6.9	0.9	1.2	2.5	2.3	9.6

4. Conclusions

In a comparison between gas stations at different times of the day, it was found that the reason for the high concentration of volatile organic compounds in a station, was the high sales rate and the closed space of the station. The low emission at the two newly established sites indicated that new and healthy station equipment also had a positive effect on the low volatile organic compounds release. The most important factor in the emission of volatile organic compounds occurs when the fuel is discharged by the fuel truck.

5. References

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