AIR POLLUTION IN THE CITY OF COLOMBO IN RELATION TO VOLATILE ORGANIC COMPOUND CONCENTRATION

Perera G B S [1], Jayaratne R N R [2], Sugathapala A G T [1]
[1]Department of Mechanical Engineering, Faculty of Engineering, University of Moratuwa, Sri Lanka
[2] Chemical And Microbiology Section, Industrial Technology Institute, Sri Lanka
bimalka.nced@yahoo.com

Abstract

Field measurements of predominantly transport induced Volatile Organic Compound (VOC) concentrations at seven major road traffic junctions in the city of Colombo, namely Dehiwala, Kollupitiya, Fort, Maradana, Boralla, Narahenpita and Grandpass, are presented. Grandpass has most congested road, thermal power station and an industrial zone. Maradana and Borella both have high population and vehicle density with mixed traffic. Dehiwala, Kollupitiya and Fort are urban towns in coastal areas having high sea breeze. Fort is the most popular public transport hub having main bus station and train station with diesel fueled vehicles. Narahenpita is highly commercialized area. Vehicle counts were conducted simultaneously considering the different type of vehicles and as a total in each location. Further air from the exhaust line of different type of vehicles were collected using Teflon air bags and VOC component were analyzed using GCMS. Hourly spot measurements were carried out beside the road during the medium traffic flow at these sites using MiniRAE Lite TVOC monitor in month of May 2017. Further Total VOC (TVOC) levels were measured on road by fixing TVOC monitor inside a moving vehicle keeping air flow tube outside the shatter of vehicle. Detailed 24 hour measurements were conducted at five locations to understand the pollutant variation with in the day in the year 2018, using the mobile monitoring unit belongs to ITI with NIST traceable USEPA approved equipments.

Weekly average TVOC hourly median concentrations beside the roads in ppb were 226.5, 194.5, 190.0, 99.0, 91.5, 72.5 and 56.0 at the sites Grandpass, Maradana, Borella, Dehiwala, Narahenpita, Kollupitiya, and Fort, respectively. The corresponding on the road TVOC concentrations in ppb were 536.0, 321.5, 216.0, 195.0, 189.0 and 183.0 between Narahenpita to Grandpass, Maradana to Borella, Borella to Narahenpita, Fort to Maradana, Kollupitiya to Fort and Dehiwala to Kollupitiya, respectively. It was clearly showed that TVOC levels were high on the road than beside the road. This could be explained by the immediate tail-pipe emissions (undiluted) from the ongoing vehicles were higher than the beside the road measurements. 24 hour measurements were fairly equivalent to the above observations. Highest vehicle fleet in many cases

were cars, three wheelers and motor bicycles. Further in Kollupitiya, Narahenpita and Dehiwala, highest vehicle fleet was cars and in Borella, Maradana, Grandpass and Fort, highest vehicle fleet was three wheelers.

24 hour roadside measurements were carried out at the Grandpass junction. Time series data on TVOC concentrations follow the typical traffic pattern during the day at Grandpass site having a sharp peak from 6.30am to 7.30am in the morning and a broaden peak from 5pm to 8pm in the evening when the power plant was not in action. However, when the power plant was in action, Time series data on TVOC concentrations were high during early morning hours from 3am to 5am. GCMS analysis results found out that there are number of carcinogenic compounds are emitting from exhaust line of different type of vehicles.

Keywords: Air Pollution, Volatile Organic Compounds, Colombo