

of implementing more stringent pollution control policies on volatile organic compounds, particularly carcinogenic benzene, with respect to the risk reduction in public health aspects.

Conclusion

After monitoring 67 volatile organic compounds at a downtown site with heavy traffic in Daegu city, toluene was found to dominate the other volatile organic compounds, followed by DMF, *m,p*-xylenes, MTBE, hexane and 1,2,4-TMB. The high level of DMF is not usual in many other Korean cities and DMF is used extensively in the textile/polymer industry, which is one of the major industries in Daegu city. A comparative study of the present results was made with the results previously reported at the same site to assess a long term trend in the volatile organic compound levels. The comparative study showed that the volatile organic compound concentrations in Daegu city were considerably lower (approximately 70% of the reductions for BTEX) than those measured ten years ago. The decrease in the ambient levels of benzene and other aromatic volatile organic compounds can be attributed to the intensive volatile organic compound reduction programs implemented by the governmental policy over the last 10 years.

A very similar pattern was observed in the diurnal variations of MTBE and aromatic volatile organic compounds, such as BTEX. In general, higher concentrations of volatile organic compounds are observed during rush hour in the morning and evening with relatively lower levels during the afternoon and night-time. These results clearly show the impact of vehicle exhaust on the increased levels of aromatic volatile organic compounds at the monitoring site. On the other hand, volatile organic compounds associated with industrial activities, such as DMF, MEK and trichloroethylene revealed different diurnal patterns from the aromatic volatile organic compounds, showing that vehicles are not the only sources of volatile organic compounds in this city. Advanced statistical analysis, such as principle component analysis and pollution rose, showed that vehicle emissions are the major sources of BTEX, TMBs and MTBE and mostly industrial emissions were the main sources of DMF, MEK and trichloroethylene.

The benzene data (0.43 ppb on average) measured in this study appeared to be well below the national standard (1.5 ppb). On the other hand, there may still be a health risk to the general public because benzene is a non-threshold pollutant. Therefore, to reduce the volatile organic compound levels in the urban atmosphere, mobile sources should be controlled first because they can be reduced by restricting the fleet volume and more stringent vehicle emission controls. At the same time, conventional industrial solvents should be replaced with more environment-friendly ones. As a long-term plan, some solvent intensive industries, such as the textile industries can be relocated away from the residential/commercial areas in a city.

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