

Emissions and Ambient Air Monitoring Trends of Lower Olefins Across Texas Over the Past 10 Years

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Abstract

Texas has the largest ambient air monitoring network in the country with approximately 85 monitors that measure ambient air concentrations of volatile organic compounds (VOCs). The lower olefins, including 1,3-butadiene, ethylene, isoprene, and propylene, are a group of VOCs that can be measured in both 24 hour/every 6th-day canister samples and continuous 1-hour automated gas chromatography (AutoGC) samples. Based on 2012 Toxics Release Inventory data, the total reported industrial air emissions in Texas for these olefins, as compared to total national reported air emissions, were 79% for 1,3-butadiene, 62% for ethylene, 76% for isoprene, and 54% for propylene, illustrating that Texas industries are some of the major emitters. The purpose of this study was to look at the patterns of annual average air monitoring data from 2002 to 2012 using Texas Commission on Environmental Quality (TCEQ) data for these four lower olefins. It should be emphasized that monitors may not be located close to or downwind of the highest emitters of these lower olefins. In addition, air monitors only provide a snapshot in time of air concentrations for their respective locations, and may not be able to discriminate emissions between specific sources.

In 2012, the highest annual average air concentration for 1,3-butadiene was 1.28 ppbv, which was measured at the Port Neches Avenue L monitoring site in Region 10-Beaumont. For ethylene, the highest 2012 annual average air concentration was 5.77 ppbv, which was measured at the Dona Park monitoring site in Region 14-Corpus Christi. Although reported industrial emissions of isoprene are predominantly from the Houston and Beaumont regions, trees are natural emitters of isoprene, and the highest ambient air concentrations tend to be from regions with large areas of woody vegetation. This was observed with Region 5-Tyler, which had the two highest isoprene annual average air concentrations for 2012: 0.56 ppbv at the Karnack monitoring site and 0.47 ppbv at the Longview monitoring site. For propylene, the highest 2012 annual average air concentration was recorded at the Baytown monitoring site in Region 12-Houston, which was 5.78 ppbv. A significant portion of the total 2012 industrial propylene emissions were also reported in Region 12-Houston. Although some individual monitors showed increased annual averages from 2002 to 2012, there was a general decreasing trend present across the state for all four lower olefins examined. The annual average air concentrations of the four lower olefins were well below their respective Air Monitoring Comparison Values and are not expected to cause long-term or chronic adverse health effects.