

Occupational exposure at the ExxonMobil refinery in Beaumont, TX (1976-2007).

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Because crude oil and refined petroleum products can contain benzene and benzene is considered a known carcinogen by numerous independent and governmental agencies, including the International Agency for Cancer Research, the petroleum industry has implemented exposure control programs for decades. As part of the benzene control programs, significant exposure assessments have been performed; both qualitatively and through quantitative measurements. In this study, we evaluated the airborne concentrations of benzene and their variability over time at the ExxonMobil refinery in Beaumont, TX between 1976 and 2007. The results of 5854 personal air samples are included in this analysis; 3761 were considered non-task (≥ 180 min) personal samples, and 2093 were considered task-related (< 180 min) personal samples. Dock and loading rack samples were analyzed separately from the refinery samples because in addition to refinery products, employees at the dock and loading rack also handled chemical plant products. In general, the non-task personal refinery air samples indicated that exposures of the past 30 years were generally below the occupational exposure limit of 1ppm (mean = 0.30 ppm, SD = 3.1), were higher during routine (mean = 0.32 ppm, SD = 3.3) than turnaround operations (mean = 0.16 ppm, SD = 0.87), and decreased slightly over time. The job sampled most frequently during routine operations was that of process technician, and, as broken down by area, resulted in the following mean benzene air concentrations: coker (n = 146, mean = 0.014 ppm, SD = 0.036), lube extraction unit (n = 31, mean < 0.070 ppm), pipestills (n = 136, mean = 0.12, SD = 0.47), waste treatment (n = 107, mean = 0.20, SD = 0.28), and all other areas (n = 1115, mean = 0.059 ppm, SD = 0.36). Task-based samples indicated that the highest exposures resulted from the tank cleaning tasks, although the overall task mean benzene air concentration was 1.4ppm during routine operations. The most frequently sampled task during routine operations was blinding and breaking, and the mean benzene air concentrations associated with this task were statistically higher in the reformer area of the refinery (n = 311, mean = 3.2 ppm, SD = 7.9) than in all other areas (n = 200, mean = 0.92 ppm, SD = 3.1). However, task-related exposures were found to be statistically similar across job categories for a given task. This study thus provides a task-focused analysis for occupational exposure to benzene during refinery operations, and will be useful for understanding exposures at this refinery.