

Airborne Concentrations of Benzene Associated with the Historical Use of Some Formulations of Liquid Wrench

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The current study characterizes potential inhalation exposures to benzene associated with the historical use of some formulations of Liquid Wrench under specific test conditions. This product is a multiuse penetrant and lubricant commonly used in a variety of consumer and industrial settings. The study entailed the remanufacturing of several product formulations to have similar physical and chemical properties to most nonaerosol Liquid Wrench formulations between 1960 and 1978. The airborne concentrations of benzene and other constituents during the simulated application of these products were measured under a range of conditions. Nearly 200 breathing zone and area bystander air samples were collected during 11 different product use scenarios. Depending on the tests performed, average airborne concentrations of benzene ranged from approximately 0.2–9.9 mg/m³ (0.08–3.8 ppm) for the 15-min personal samples; 0.1–8 mg/m³ (0.04–3 ppm) for the 1-hr personal samples; and 0.1–5.1 mg/m³ (0.04–2 ppm) for the 1-hr area samples. The 1-hr personal samples encompassed two 15-min product applications and two 15-min periods of standing within 5 to 10 feet of the work area. The measured airborne concentrations of benzene varied significantly based on the benzene content of the formulation tested (1%, 3%, 14%, or 30% v/v benzene) and the indoor air exchange rate but did not vary much with the base formulation of the product or the two quantities of Liquid Wrench used. The airborne concentrations of five other volatile chemicals (ethylbenzene, toluene, total xylenes, cyclohexane, and hexane) were also measured, and the results were consistent with the volatility and concentrations of these chemicals in the product tested. A linear regression analysis of air concentration compared with the chemical mole fraction in the solution and air exchange rate provided a relatively good fit to the data. The results of this study should be useful for evaluating potential inhalation exposures to benzene and other volatile chemicals that occurred during the past use of some formulations of Liquid Wrench and perhaps for some similar products containing these chemicals.

Keywords benzene, exposure assessment, industrial hygiene, Liquid Wrench