Environment Canada Environnement Canada

Determination Of 2-Butoxyethanol In Consumer Products

Prepared for Environment Canada and Health Canada

Project J4077 - Final Report

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EXECUTIVE SUMMARY

On August 9, 2003, the Ministers of the Environment and of Health published their final decision on the assessment of 2-Butoxyethanol (2-BE) in the *Canada Gazette* and recommended that 2-BE be added to the *List of Toxic Substances in Schedule 1 under the Canadian Environmental Protection Act, 1999 (CEPA 1999)*.

Glycol ethers are widely used in consumer products. In particular, 2-BE is one of the principal compounds added to a wide range of consumer products.

The intent of this study is to gather further information on the potential exposure and toxicity to further quantify the risks associated with the use of consumer products containing 2-BE. Specifically, this study measures the headspace concentrations and the emission factors under controlled conditions. This study also verifies the actual concentration of 2-BE in products.

In this evaluation, 30 products were selected by Health Canada for testing. The basis for selection included commercial availability and representation of a range of different product types, such as paints and coatings, cleaners, etc. The products were then acquired from retail sources in quantities similar to those that an ordinary consumer would buy. Since it is too complex to evaluate each and every scenario for possible use, an alternate approach was established to determine possible exposure levels and risks for this analysis. This involved measurement of emissions of 2-BE in controlled chamber tests with each product and then subsequent modeling of a range of exposures under product use scenarios using the measured emission factors. The general description of the approach is outlined below.

Firstly, the content of 2-BE in products and the concentrations in the headspace (the air above a measured quantity of product) were measured for all 30 test-products. Based on the initial results, a subset of 20 products was selected by Health Canada to measure emission factors of 2-BE in a well-controlled chamber environment.

An exposure model was used to translate emission factors measured in the chamber tests to airborne concentrations of 2-BE for each product. The exposure model accounted for factors

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such as amounts of each product typically used, typical room sizes and typical ventilation rates. The results of the exposure modeling are reported separately.

A summary of product characteristics related to emission factors and measured emission factors constituting the main outcome of this study, are tabulated below.

Product type	2-Butoxyethanol concentration[1]	2-Butoxyethanol concentration[2] (%)	2-Butoxyethanol emission factor[3] (mg m^{-2} h^{-1})
	Range	Average	Average
Polyurethane interior stain	3-7%	11.5%	1763
Semi-trans stain	1-5%	3.4%	469
Alkyd interior stain	10-30%	11.2%	691
Interior wood stain	5-10%	6.9%	329
Water-based glass and mirror cleaner	>1%	7.9%	694
Aqueous acidic cleaner	1-4%	2.4%	364
Instant spot remover	7%	6.3%	758
Glass and surface cleaner	0.5 - 1.5%	1.0%	172
Heavy duty degreaser	3-7%	5.3%	1098
Paint and varnish remover	<10%	4.8%	103
Lacquer thinner	27%	58.1%	2861
Liquid carpet stain remover	7-13%	9.8%	1287
Glass cleaner	10%	8.6%	976
Water-based cleaner	25-35%	16.9%	1063
Water-based odour neutralizer	5-10%	7.6%	647
General cleaner, water-based	0.5-1.5%	1.3%	184
General cleaner,	7-13%	8.2%	1086

degreaser			
Water-based cleaner, degreaser	8-17%	7.7%	899
All purpose cleaner, water-based	3-7%	5.3%	772
Glass cleaner, water-based	0.5-1.5%	1.3%	182

[1]as stated by supplier.
[2]as measured concentration for each product in this study.
[3](mg m^{-2} h^{-1}) = emission factor, assumes steady-state equation, in milligram per meter squared of applied product per hour.

For the 20 products that underwent complete analysis (product concentrations, headspace, and emissions tests), two, a polyurethane interior stain and a lacquer thinner had significantly higher measured 2-BE concentrations, almost double those stated by the supplier (see Table). One product, a water-based cleaner, had about half the indicated 2-BE concentration. These discrepancies were confirmed by additional analyses to avoid possible analytical bias that may have contributed to the observed discrepancies. The emission factors ranged from about 100 to 2900 mg m^{-2} h^{-1}. Six products had emission factors exceeding 1,000 mg m^{-2} h^{-1}. Generally, products with higher 2-BE content exhibited higher emission factors, although it was not generally possible to predict the emission factors on this basis only since products were mixtures of substances, including other organic compounds and colloids for example, that affected the emission factors. For example, a polyurethane stain had the second highest emission rate at 1763 mg m^{-2} h^{-1} but only 11.5% of the product was composed of 2-BE compared to a lacquer thinner that had about a 55% higher emission factor than the polyurethane stain but over 5 times the content of 2-BE (58%).

Careful application of these emissions results in detailed-use scenarios will allow assessment of the relative exposures and hence the risks associated with using products containing 2-BE.