Toxics Use Reduction Institute

POLICY ANALYSIS

February 5, 2008

Lower Hazard Toxic Substance Designation Recommendation:
Isobutyl Alcohol (78-83-1), sec-butyl alcohol (78-92-2), n-butyl alcohol (71-36-3)

The TURA Science Advisory Board (SAB) has recommended designating isobutyl alcohol, sec-butyl alcohol, and n-butyl alcohol as lower hazard toxic substances under TURA. With this designation, the per substance toxics use fee for these three substances would be eliminated. Facilities in TURA-regulated SIC codes using these substances above the reporting threshold would continue to report chemical use and pay the facility base fee annually, and to prepare TUR plans every two years.

This policy analysis summarizes the scientific information considered by the SAB; considers the number of facilities that are likely to be affected by this change; reviews the regulatory context; and discusses the implications of this policy measure for the TURA program. Based on this analysis, the Toxics Use Reduction Institute supports the SAB's recommendation that isobutyl alcohol, sec-butyl alcohol, and n-butyl alcohol be designated as lower hazard toxic substances.

The goal of designating a substance in the lower hazard toxic substance category is to indicate it is less hazardous than other TURA-listed substances. Since all substances listed under TURA are hazardous, this designation does not indicate a lack of basis for concern. As with all substances listed under TURA, facilities should work to reduce or eliminate the use of lower hazard toxic substances.

1. State of the Science

Isobutyl, sec-butyl, and n-butyl alcohols are considered together in this policy analysis because they are similar in chemical structure and health and environmental effects. The principal hazards associated with these substances are neurotoxicity, irritation potential, and flammability. For a list of specific data examined by the Science Advisory Board in developing its recommendation, see Appendix A.

Acute toxicity

- As organic solvents, all three chemicals are neurotoxicants. Acute effects of exposure to isobutyl alcohol, sec-butyl alcohol, or n-butyl alcohol include adverse effects on the central nervous system, including headache, muscle weakness, giddiness, loss of coordination, confusion, delirium, and coma; gastrointestinal effects, including nausea, vomiting, or diahrrea; skin, eye, and throat irritation; difficulty breathing; and heart arrhythmias.[1]
- All three butyl alcohols have a relatively low vapor pressure. "Butyl alcohols have produced few cases of poisoning in industry because of their low volatility."[2]
- **"**Isobutyl alcohol presents a health hazard to employees involved in the paint industry, the processing of petroleum spirits, or as a general solvent since it volatilizes and is readily inhaled as an occupational air pollutant."[3]
- The LD_{50} values (oral rat) for isobutyl alcohol, sec-butyl alcohol, and n-butyl alcohol are 2460 mg/kg, 2193 mg/kg, and 800 mg/kg, respectively, indicating relatively low acute toxicity.
- The OSHA permissible exposure limits (PELs) for isobutyl alcohol, sec-butyl alcohol, and n-butyl alcohol are 100 ppm, 150 ppm, and 100 ppm, respectively. The ACGIH threshold limit values

(TLVs) are 50 ppm, 100 ppm, and 20 ppm, respectively. The NIOSH recommended exposure limit (RELs) are 50 ppm, 100 ppm, and 50 ppm, respectively. These relatively low occupational exposure limits are based on data showing irritant effects in humans. Animal exposure data indicate that central nervous system impairment can occur but at much higher airborne concentrations.[4]

Chronic toxicity

- Chronic effects of exposure to large amounts of isobutyl alcohol, sec-butyl alcohol, or n-butyl alcohol include chronic solvent encephalopathy, or "chronic painters' syndrome," characterized by mood changes, and impairment of cognitive function.[5]
- The International Agency for Research on Cancer (IARC) does not list isobutyl alcohol, sec butyl alcohol, and n-butyl alcohol as carcinogens.
- None of the butyl alcohols are listed on California's Proposition 65 list of reproductive or developmental toxicants.

Environment

- All three chemicals have relatively low persistence in water, soil and sediment and are unlikely to bioaccumulate.
- Due to their relatively low vapor pressure, the three butyl alcohols are not highly volatile.
- The chronic fish toxicity values for the three chemicals are 83 mg/L, 83 mg/L, and 72 mg/L, respectively, indicating relatively low aquatic toxicity.
- In the TURA Advisory Committee discussion of these chemicals, concern was expressed regarding biochemical oxygen demand (BOD) loading from alcohols.

Safety

All three substances are Class 1C flammable liquids (flash point above 73 degrees).[6]

Uncertainty

The hazards of all three substances are relatively well understood. Uncertainty does not play a significant role in development of our policy recommendations in this case.

2. Number of facilities affected

According to the 2005 TURA data, 9 facilities report for n-butyl alcohol, 3 facilities report for isobutyl alcohol and 2 facilities report for sec-butyl alcohol. These facilities are primarily in SIC codes 28xx (Chemicals and Allied Products) and 51xx (Wholesale Trade). The end uses for all three substances are primarily in paints, coatings, and thinners. Thus, a total of 14 facilities would be affected by designating the three butyl alcohols as lower hazard substances.

3. Regulatory Context

All three substances are regulated under several statutes at the federal level. However, they are not targeted as priorities at the federal or state level.

EPCRA	• Sec-butyl and n-butyl: reportable under TRI.[7]

CAA	• Not listed as Hazardous Air Pollutants[8]
RCRA	• Isobutyl and n-butyl alcohol are considered hazardous waste under certain circumstances[9]
CERCLA	• Isobutyl and n-butyl alcohol: Facilities required to notify National Response Center if release ≥ 5,000 lb.[10]
OSHA PEL	• Isobutyl: 100 ppm • sec-Butyl: 150 ppm • n-Butyl: 100 ppm
ACGIH TLV (TWA)	• Isobutyl: 50 ppm • sec-Butyl: 100 ppm • n-Butyl: 20 ppm
SDWA	• Not regulated as drinking water contaminants[11]
FDA	• Permitted as a food additive under certain circumstances[12]

International

- In Canada's Domestic Substance List categorization, isobutyl alcohol and n-butyl alcohol meet the Government of Canada Categorization Criteria, while sec-butyl alcohol does not. These categorization criteria indicate that there is a basis for concern, such that further attention to the chemical is required, based on one of the following metrics: persistence, bioaccumulation, inherent toxicity to humans or non-human organisms, or potential for high exposures.[13]

4. Implications for the TURA program

Designation of isobutyl alcohol, n-butyl alcohol, and sec-butyl alcohol as lower hazard substances would mean facilities no longer would be required to pay the per-substance toxics use fee of $1,100 for these substances. Based on 2005 reporting data (14 reports for these substances), the total revenue loss to the TURA program would be $15,400. Companies would continue to report and plan for these chemicals, so the program would still receive reporting data and the companies would still gain the benefits of planning.

Appendix A: Data the SAB considered

iso butyl alcohol (78-83-1)

International Agency for Research on Cancer (IARC)	not listed
PBT Profiler:	
Half life in water	15 days
Half life in soil	30 days
Half life in sediment	140 days
Half life in air	2.3 days
Bioconcentration factor	3.2
Chronic Fish (ChV)	83 mg/L
LD50	2460 mg/kg (oral rat)
Reference Dose	.3 mg/kg/day
Flash Point	82.4 F

sec butyl alcohol (78-92-2)

International Agency for Research on Cancer (IARC)	not listed
PBT Profiler:	
Half life in water	15 days
Half life in soil	30 days
Half life in sediment	140 days
Half life in air	1.7 days
Bioconcentration factor	3.2
Chronic Fish (ChV)	83 mg/L
LD50	2193 mg/kg (oral rat)
Reference Dose	Not available
Flash Point	75.2 F

n butyl alcohol (71-36-3)

International Agency for Research on Cancer (IARC)	not listed
PBT Profiler:	
Half life in water	8.7 days
Half life in soil	17 days
Half life in sediment	78 days
Half life in air	1.9 days
Bioconcentration factor	3.2
Chronic Fish (ChV)	72 mg/L
LD50	800 mg/kg (oral rat)
Reference Dose	.1 mg/kg/day
Flash Point	95 F

Appendix B: Glossary of Regulatory Terms

ACGIH	American Conference of Governmental Industrial Hygienists
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
EPCRA	Emergency Planning and Community Right to Know Act
FDA	Food and Drug Administration
MCL	Maximum Contaminant Level
NIOSH	National Institutes of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Tier II	Chemical inventory reporting requirements for facilities subject to EPCRA
TRI	Toxic Release Inventory
TWA-PEL	Time-weighted average - Permissible Exposure Limit
TWA-REL	Time-weighted average – Recommended Exposure Limit
TWA-TLV	Time-weighted average - Threshold Limit Value

[1] R.E. Gosselin, R.P. Smith, H.C. Hodge. *Clinical Toxicology of Commercial Products* 5th ed. Baltimore: Williams and Wilkins, 1984, summarized in Hazardous Substances Data Bank, available at http://toxnet.nlm.nih.gov/ (search by chemical name) , viewed January 2008.

[2] Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 559, summarized in Hazardous Substances Data Bank, http://hazmap.nlm.nih.gov/cgi-bin/hazmap_generic?tbl=TblAgents&id=325, viewed January 2008.

[3] G. Tangredi et al.; Riv Med Lav Ig Ind 5: 325-37 (1981), summarized in Hazardous Substances Data Bank, available at http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+78-83-1, viewed January 2008.

[4] American Conference of Governmental Industrial Hygienists (ACGIH), *Documentation of the Threshold Limit Values and Biological Exposure Indices*, 7th edition, 2001. Note: For isobutyl alcohol and sec-butyl alcohol, the ACGIH values are based on eye and respiratory irritation; for n-butyl alcohol, the values are based on both eye and respiratory irritation, and effects on the central nervous system.

[5] National Library of Medicine, HazMap: Occupational Exposure to Hazardous Agents, http://toxnet.nlm.nih.gov/ (search by chemical name). List of agents that cause CNS solvent syndrome, available at http://hazmap.nlm.nih.gov/cgi-bin/hazmap_adveff?form=adveff&Ag_Neurotoxin=4; description of chronic solvent encephalopathy available at http://hazmap.nlm.nih.gov/cgi-bin/hazmap_generic?tbl=TblDiseases&id=325, viewed January 2008.

[6] NIOSH Pocket Guide

[7] United States Environmental Protection Agency, Toxics Release Inventory, www.epa.gov/tri/chemical/RY2005ChemicalLists

[8] United States Environmental Protection Agency, Technology Transfer Network, Air Toxics Website, "The Clean Air Act Amendments of 1990 List of Hazardous Air Pollutants," available at http://www.epa.gov/ttn/atw/orig189.html.

[9] 40 CFR 261.33, summarized in Hazardous Substances Data Bank (HSDB), a database of the National Library of Medicine's TOXNET system, http://toxnet.nlm.nih.gov.

[10] `40 CFR 302.4,` summarized in Hazardous Substances Data Bank (HSDB), http://toxnet.nlm.nih.gov.

[11] US EPA, "Drinking Water Contaminants: Organic Chemicals," available at http://www.epa.gov/safewater/contaminants/index.html#organic, viewed January 2008.
[12] 21 CFR 172.515, summarized in Hazardous Substances Data Bank (HSDB), http://toxnet.nlm.nih.gov.
[13] CEPA Environmental Registry: Substances Lists, available at http://www.ec.gc.ca/CEPARegistry/subs_list/dsl/dslsearch.cfm, viewed January 2008. For information on the categorization criteria, see Environment Canada, "Human Health and the Canadian Environmental Protection Act, 1999," available at http://www.ec.gc.ca/CEPARegistry/gene_info/factsheets/fs_fi-health-sante.cfm. Chemicals that meet the categorization criteria pose a concern on at least one of the following metrics: persistence, bioaccumulation, inherent toxicity, or high potential for exposure.