

Alternatives Report - Draft Outline
(12/11/03)

Title: Alternatives to the Use of Pentabromodiphenyl Ether as a Flame Retardant for Flexible Polyurethane Foam

Purpose: State-of-knowledge report designed to help AFMA, BIFMA, and EPA come to a common understanding while developing a partnership

Audience: Furniture Manufacturers, AFMA, BIFMA, and EPA

- I. Executive Summary <2 -3 pages>
<The Executive Summary will summarize the need to address alternatives for Pentabromodiphenyl Ether (pentaBDE) used in flexible polyurethane foam. It will briefly describe the different types of alternatives including: drop-in chemical substitutions, chemical substitutions with process change requirements, physical barriers, alternative formulation of foams (European foam), and foam-free furniture.>
 - A. Primary purpose of the document is to identify potential alternatives to pentaBDE
 1. Describe why there is a need to find alternatives
 - a. pentaBDE is currently used in almost all fire-retarded flexible polyurethane foam
 - b. There are considerable environmental concerns with pentaBDE <Introduce PBT issues - state some examples of rising levels in the environment and mother's milk around the world. Relate these levels to known and suspected releases of pentaBDE.>
 - c. Existing and pending regulations to restrict pentaBDE use
 2. Identification and evaluation of known alternatives including drop-in chemical substitutions, chemical substitutions with process change requirements, physical barriers, alternative formulation of foams (e.g., European foam), and foam-free furniture <list best alternatives if possible, or state that there seem to be some promising candidates>
 3. Encourage industry to search for (and use) alternatives <encourage pilot testing of existing alternatives as well as continuing to develop new alternatives that are even more environmentally friendly.>

- B. Secondary purpose is to provide background <state that another purpose is to educate readers on the issues associated with pentaBDE, as well as potential chemical alternatives. This will inform readers as to the performance, and environmental concerns they should consider when evaluating alternatives (or attempting to develop new alternatives)>
 - 1. Flame retardants in general
 - 2. BFRs, PBDEs, pentaBDE
 - 3. Industrial uses and life-cycle of pentaBDE

II. INTRODUCTION

- A. Why is there a need for flame retardant chemicals? <2 pages>
 - 1. Brief introduction on need for fire prevention and some statistics
 - 2. Which consumer products are affected (plastics, textiles, foam, etc.) <state here that pentaBDE is the primary topic for this report and it is used almost exclusively in low-density, flexible polyurethane foam for furniture; therefore, the remainder of this report focuses on pentaBDE and alternatives for its use in this product>
 - 3. Regulations <brief introduction/acknowledgment that they exist and are performance-based, not chemical specific, and depend upon the product; more detailed description of regs comes later>
- B. How Do Flame Retardant Chemicals Suppress Fires? <5 pages>
 - 1. Mechanisms of Flame Retardancy (how do flame retardants work)
 - 2. Synergists (why use synergists)
 - 3. Additive vs. Reactive flame Retardants
- C. Why is there a concern over existing flame retardants? <5 pages for entire section>
 - 1. Halogenated/brominated FRs in general <2 pages>
 - a. PBT issues/concerns
 - b. Incineration byproduct concerns/issues (e.g., dioxins)
 - 2. PentaBDE <2-4 pages, including a brief overview of toxicity studies and plots/graphs showing increasing levels in environment, mother's milk>
 - a. Chemistry of PBDEs (short overview)
 - b. Specific PBT concerns over pentaBDE
- D. Flame Retardant Standards and Chemical-Specific Regulations <5 pages>

<The discussion will explain the difference between various chemical-specific regulations for pentaBDE (domestic and foreign) vs. flame retardant standards that are not chemical-specific. This is an important distinction because it helps explain incentives for the need to find alternatives. The discussion will then include the primary regulations and standards that need to be considered.>

1. Domestic
 - a. California Technical Bulletin 117
 - b. California Ban of PentaBDE in 2008
 - c. VCCEP
 - d. PMN Program Review of New Chemicals
 - e. Proposed CPSC Rule and SNUR
2. Foreign
 - a. EU bans/restrictions
 - b. UK standard
 - c. Other European flammability standards
 - d. Ecolabels

III. PentaBDE (where and why is it used) <6 - 7 pages total>

A. Industrial Sectors Using pentaBDE <1 page>

<This section will reiterate that domestic use is almost exclusively for flexible polyurethane foam with minor use in autos; Europe uses much less than the United States and is completely phasing out pentaBDE; mention CA TB117 is the driving force to use pentaBDE in the U.S., but California legislation will outlaw it by 2008; also mention that a primary industry supplier recently agreed to a voluntary phase-out by December 31, 2004 ... these are all reasons to vigorously investigate alternatives>

B. PentaBDE Use in Flexible Polyurethane Foam

1. Manufacturing operations and process descriptions <discuss the unit operations to manufacture flexible polyurethane foam, highlighting pentaBDE use, release, and exposure points; the next section will highlight specific reasons pentaBDE is preferred over other flame retardants (advantages of pentaBDE that need to be considered when evaluating potential alternatives)>
2. Effects of pentaBDE and potential alternatives on product quality

C. PentaBDE life cycle <1 - 2 pages>

1. Chemical Manufacturing
2. Foam Manufacturing (low-density, flexible, polyurethane foam)
3. Furniture Manufacturing

4. Carpet Cushion (rebond) Manufacturing
5. Automobiles
6. Consumer Use
7. Product Disposal/Recycle
8. Fate and Transport in the Environment

IV. Alternatives to PentaBDE <20 pages>

< introduce EPA's suggested/desired characteristics of a chemical flame retardant (whether it currently exists or is a new chemical)>

A. Chemical Substitutes <Aim to find many and will include a subsection on each that highlights: current uses (if applicable); performance issues/feasibility; environmental issues; cost; other pros/cons as identified. This section may include a summary table that allows a comparison of the alternatives on several of these key issues (e.g., persistence, bioaccumulation, toxicity, performance, cost, etc.)>

1. FireMaster 550 (Great Lakes Chemical Corporation)
2. AC003 (Akzo Nobel)
3. TDCPP - Tris(1,3-dichloropropyl-2) phosphate (Akzo Nobel)
4. TBNPA - Tribromoneiopentyl alcohol (Dead Sea Bromine Group; Ameribrom Division)
5. SAYTEX RX 8500 (Albemarle)
6. OTHERS

B. Alternative Technologies

1. Barrier technologies (interliners)
2. Inherently flame resistant foams (e.g., Graphite Impregnated Foam)
3. Process technologies (Woodbridge Group)
4. Use of higher-density foam
5. Foam-Free Furniture

V. Miscellaneous, Related Issues <5 pages>

A. Consumer Product Safety Commission Proposed Rule (as applicable to residential upholstered furniture - fabric)

B. Significant New Use Rule (SNUR) based on FRs affected by CPSC Rule specifically for fabric.

VI. Case Studies <5 pages each>