



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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March 23, 2011

Senator Thomas B. Saviello, Chair
Representative James M. Hamper, Chair
Committee on Environment and Natural Resources
125th Maine State Legislature
100 State House Station
Augusta Maine 04333-0100

Dear Senator Saviello, Representative Hamper and Members of the Committee:

Enclosed please find a report on the use of flame retardants in plastic shipping pallets. The report was commissioned by the Department of Environmental Protection pursuant to *An Act to Clarify Maine's Phaseout of Polybrominated Diphenyl Ethers* (herein "the Act").¹

Section 9 of the Act authorizes the DEP to supervise a study assessing the availability of safer alternatives to the use of decabrominated diphenyl ether (decaBDE) in shipping pallets. The Act further authorized pallet manufacturers to voluntarily fund the study, which the pallet rental company iGPS agreed to do.

Upon confirming the iGPS offer, an open solicitation of bids was issued and Pure Strategies, Inc. of Gloucester, Massachusetts was chosen to conduct the study. Pure Strategies was the only bidder, but was well qualified for the job, having previously conducted an investigation of alternatives to decaBDE in electronic enclosures and textiles.² The project team assembled by Pure Strategies included:

- ToxServices, a Washington DC based firm with expertise in toxicology and comparative hazard assessment; and
- Flame Retardant Associates Inc., a Washington state consulting firm in the field of polymer additives including specifically flame retardants.

¹ PL 2009, c. 610, eff. July 12, 2010.

² Pure Strategies, Inc., *Decabromodiphenylether: An Investigation of Non-Halogen Substitutes in Electronic Enclosure and Textile Applications*, prepared for the Lowell Center for Sustainable Production, University of Massachusetts Lowell, April 2005.

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The enclosed final report on Pure Strategies' investigation demonstrates that there are safer alternatives to the use of decaBDE in pallets. To be considered safer, an alternative to decaBDE must meet the following criteria as established under section 7 of the Act:

"For the purposes of this subsection, 'safer alternative' means a substitute process, product, material, chemical, strategy or any combination of these that:

- (1) When compared to the chemical to be replaced would reduce the potential for harm to human health or the environment or has not been shown to pose the same or greater potential for harm to human health or the environment as the chemical to be replaced;
- (2) Serves a functionally equivalent purpose that enables applicable fire safety standards, approvals and tests and relevant performance standards to be met;
- (3) Is commercially available on a national basis; and
- (4) Is not cost-prohibitive."³

Pure Strategies explored three possible strategies for substituting safer alternatives for the use of decaBDE in pallets. First, the study examined whether it might be possible to meet fire safety standards using plastic pallets without flame retardants (see chapter II of the report). Next, the study examined whether other chemical retardants could be substituted for decaBDE (see chapters III through VI). Finally, the study examined whether wood pallets are a safer option (see chapters VII and VIII). Summarized below are key findings on each of these three potential alternatives, followed by the department's conclusion on whether the alternative constitutes a safer alternative as defined in the Act.

1. **ALTERNATIVE: plastic pallets without flame retardants.** The use of chemical flame retardants in plastic pallets is a relatively recent development and has been confined almost exclusively to pallets used in the rental market. This new flame retardant usage is driven by NFPA 13, a standard for warehouse sprinkler systems promulgated by the National Fire Protection Association (NFPA).⁴

The Pure Strategies investigation—which included conversations with staff from the NFPA, the National Fire Sprinkler Association and the Maine State Fire Marshal's office—determined that there are ways to meet the fire protection requirements of NFPA 13 without using plastic pallets made with flame retardants. Newer warehouses, for example, often are equipped with ESPR (early suppression fast response) sprinkler systems that provide adequate protection for non-flame retardant pallets. There is, in fact, a large market for such pallets.⁵ Their usage, however, typically is confined to captive systems in which the pallets are used internally in a fully-protected warehouse or manufacturing site or only travel between sites owned by a single company such as is the case within the Hannaford chain of grocery stores.⁶

³ PL 2009. c. 610, §7, enacting 38 MRSA §1609(14)(A).

⁴ National Fire Protection Association, *NFPA 13: Standard for the Installation of Sprinkler Systems* (2010).

⁵ Pure Strategies, Inc., *Decabromodiphenyl Ether Flame Retardant in Plastic Pallets: A Safer Alternatives Assessment*, prepared for the Maine Department of Environmental Protection, p 42.

⁶ *Id.* at 25, 42.

The situation is different in the pallet rental or “open-pool leasing” market. Leased pallets typically are not used in a captive system. Rather, they are used by manufacturers and distributors to ship products all over the county to warehouses that the manufacturer or distributor does not control. A “significant portion of these warehouses lack the required sprinkler protection systems ... and are unlikely to upgrade in the near future. These warehouses can take other steps (e.g., increased aisle width; outside storage of idle pallets) to reduce the fire hazard associated with the use of plastic pallets, but adherence to such practices alone is insufficient to offset the sprinkler system limitations for the purpose of compliance with NFPA 13.”⁷

DEP conclusion. Pallets containing decaBDE are used predominantly in the open-pool leasing market to ship goods to warehouses across the U.S. Some of these warehouses are equipped with fire safety systems that make the use of flame retardants unnecessary but many are not. Accordingly, plastic pallets that lack flame retardants are not appropriate for use in the open-pool leasing market and cannot be considered a safer alternative to pallets containing decaBDE.

2. **ALTERNATIVE: plastic pallets made with other chemical retardants.** DecaBDE is a halogenated flame retardant, meaning it contains bromine, one of five elements in the group of elements called halogens. Of the halogens, only bromine and chlorine are effective as flame retardants. Brominated and chlorinated flame retardants have come under increasing scrutiny in scientific and regulatory circles because of concerns surrounding the toxicity of these chemicals and their increasing presence in the environment.⁸ The Maine Legislature, in section 7 of the Act, explicitly prohibited the replacement of decaBDE with a brominated or chlorinated flame retardant.⁹

The Pure Strategies study identified seven non-halogenated chemical flame retardants that, if used in plastic pallets in lieu of decaBDE, would reduce the potential for harm to human health or the environment when compared to decaBDE. The seven chemicals are: aluminum trihydroxide; ammonium polyphosphate; ethylenediamine phosphate; magnesium hydroxide; magnesium stearate; melamine polyphosphate; and zinc borate.¹⁰

Two companies—Rehrig Pacific and CHEP—have developed flame retardant plastic pallets using one of these seven chemicals. Another—Orbis—has developed a pallet made with an unidentified non-halogenated flame retardant and is in the process of arranging for the required fire testing.¹¹

The Rehrig pallet, which uses a magnesium hydroxide retardant, lacks sufficient load strength for the rental market and thus cannot be considered functionally equivalent to the pallets used in that market. The CHEP pallet, on other hand, was specifically designed for use in the rental market. It uses one of the seven chemical retardants identified as safer by Pure Strategies, although CHEP has

⁷ *Id.* at 42.

⁸ Brominated flame retardants appear on the list of chemicals of high concern published by the Department of Environmental Protection under 38 MRSA §1693.

⁹ See PL 2009, c. 610, §7 enacting 38 MRSA §1696(14)(B)(2).

¹⁰ Pure Strategies *supra* n 5 at 88-90.

¹¹ *Id.* at 47.

yet to disclose the exact one, saying only that it is phosphorus based. CHEP began production of this new pallet last month.

DEP conclusion. The existence of the Rehrig and CHEP pallets demonstrates that plastic pallets can be made with non-halogen flame retardants that, compared to decaBDE, reduce the potential for harm to human health or the environment. Neither of these pallets, however, qualifies as a “safer alternative” under the Maine law. The Rehrig pallet falls short because it lacks sufficient load strength to serve as a functionally equivalent alternative to pallets made with decaBDE. The CHEP pallet falls short because it is brand-new to the marketplace and thus has not been demonstrated to be commercially available on a national basis or affordable to users. Given CHEP’s market position as the largest pallet rental company, this new plastic pallet may become a viable alternative to decaBDE pallets in the near future assuming CHEP commits itself to production and promotion.¹²

3. **ALTERNATIVE: wood pallets.** At least two companies—CHEP and PECO—offer wood pallets for use in the open-pool leasing market, the market in which plastic pallets containing decaBDE are used. The CHEP wood pallet, in fact, is the most widely used pallet in that market;¹³ wood pallet companies collectively dominate the market.¹⁴

Wood pallets, in contrast to plastic pallets, are not treated with chemical flame retardants for the purpose of compliance with NFPA 13.¹⁵ This is because, under NFPA 13, different materials are assigned different commodity classifications reflecting their fire hazard and the amount of protection required. Plastic commodities, including plastic pallets, are assigned to a higher fire hazard class than wood because plastics typically produce higher-challenge fires and therefore require sprinklers that deliver more water.

Flame retardants are added to plastic pallets to put them on a par with wood pallets for the purpose of NFPA 13. If a manufacturer can furnish fire test data showing that its plastic pallet has a fire hazard equal to or less than wood, then no additional sprinkler protection is needed by warehouses to accommodate the use of the plastic pallet. The addition of chemical flame retardants allows manufacturers to produce pallets that pass the tests for equivalence to wood.¹⁶

DEP conclusion. Wood pallets are a safer alternative to the use of pallets containing decaBDE. They do not require the use of chemical retardants, yet are equivalent to flame-retardant plastic pallets for the purposes of applicable fire safety standards. The fact that wood pallets are widely used in the open-pool leasing market to ship the same types of goods as are shipped on plastic pallets containing decaBDE demonstrates that they are functionally equivalent, commercially available and affordable to users.

¹² *Id.* at 101-2.

¹³ *Id.* at 92.

¹⁴ *Id.* at 101.

¹⁵ In a 2007 report examining alternatives to decaBDE, the DEP and the Maine Center for Disease Control observed that alternatives which allow flammability standards to be met without using a chemical flame are presumptively safer. See Maine Department of Environmental Protection and Maine Center of Disease Control, *Brominated Flame Retardants: Third annual report to the Maine Legislature* (January 2007), p 29.

¹⁶ Pure Strategies *supra* n 5 at 32.

As already mentioned, section 7 of the Act explicitly prohibited the replacement of decaBDE with a brominated or chlorinated flame retardant. Section 11 requires the DEP to study the issues related to this prohibition.

The Pure Strategies report shows that the main issue in developing a safer alternative is the technological challenge of designing a pallet to meet flammability standards while maintaining the necessary physical properties for the pallet to serve its intended purpose. Developing a plastic pallet with an alternative, non-halogen flame retardant requires a significant testing and evaluation investment. Finding the right mix may involve a lengthy testing process with many uncertainties and no guarantee of success.¹⁷

“To summarize, five interactive design parameters are usually of importance in designing a pallet: strength, stiffness, durability, functionality and cost. These are interactive and the trick is balancing these properties. Maximizing just one will have an impact on the others. The key to a successful flame retardant plastic pallet is to design a pallet meeting all the necessary physical properties and required flammability performance by using the proper choice of polymer resin, flame retardant system, and other additives (colorants, impact modifiers, etc.).”¹⁸

Notwithstanding this daunting challenge, two different non-halogen flame retardant pallets (the Rehrig and CHEP pallets mentioned above) already have been developed and pallet manufacturer Orbis is ready to begin flammability testing of another non-halogen system.¹⁹

In the past, the effectiveness and relatively low cost of using decaBDE to meet flammability standards for plastics has served as a disincentive to the investigation of non-halogen alternatives.²⁰ The changing regulatory climate, including Maine’s ban on replacement of decaBDE with a brominated or chlorinated flame retardant, has shifted those incentives. We recommend the ban remain in place.

Please feel to contact us if you have any questions.

Sincerely,



Darryl Brown, Commissioner
Department of Environmental Protection

¹⁷ *Id.* at 64.

¹⁸ *Id.* at 53, see also *id.* Appendix V (Polymer Range for Flame Retardant Plastic Pallets) and Appendix VI (The Cost Factor and Flame Retardant Plastic Pallets).

¹⁹ *Id.* at 68.

²⁰ *Id.* at 73.

