Pest Management Regulatory Agency
Agence de réglementation de la lutte antiparasitaire

Special Review Decision SRD2002-01

Tributyltin Antifouling Paints for Ship Hulls

The purpose of this document is to notify registrants, pesticide regulatory officials, and other interested parties of the regulatory decision following the special review of tributyltin antifouling paint products for use on ship hulls—SRA2000-01, *Special Review of Organotin Antifouling Paints for Ship Hulls*. While "organotin anti-fouling systems" is the term used by the International Maritime Organization (IMO), this document will refer to tributyltin (TBT) antifouling paints, as these are the ones currently registered in Canada. The decisions and actions outlined in this Decision Document conclude the special review of TBT antifouling paints by the Pest Management Regulatory Agency (PMRA).

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In May 2000, the PMRA announced[1] that a Special Review would be initiated in response to evidence that TBT antifouling paints were causing harm to the marine environment. As part of this announcement, the PMRA indicated that the Marine Environmental Protection Committee (MEPC) of the IMO had adopted a resolution to develop a legally binding global Convention to address the harmful effects of antifouling paints. The resolution further indicated that organotin antifouling systems would be the first to be controlled by the Convention and would be targeted for phase-out by January 1, 2003. The Canadian and U.S.A. MEPC delegations collaborated on their contributions to the development of the final text of the IMO Convention[2].

In this Decision Document, the PMRA is announcing that, due to risks to the Canadian environment and to be consistent with the IMO Convention, the registrations of TBT antifouling paints will end October 31, 2002, which is the end of the 2002 use season. As an additional step to ensure an orderly phase-out of use, the sale and distribution of affected products will end September 1, 2002.

An assessment of the risk of TBT antifouling paints to the Canadian environment has been completed, as has an assessment of whether currently registered non tin alternative products will meet the needs of Canadian users. The following is a summary of the assessments, which serve as a basis for the decision.

Environmental Risk Assessment

A detailed review of the persistence, bioaccumulation, and toxicity of TBT in aquatic environments was conducted by Environment Canada[3].

TBT occurs in the Canadian environment exclusively as a result of human activity. The persistence of TBT in water is slight to moderate with half-lives of a few days to a few months. In sediments, it is significantly more persistent. Several studies from different parts of the world indicate half-lives for TBT in sediment of up to 15 years.

The octanol–water partition coefficient (K_{ow}) for TBT indicates a potential for bioaccumulation, as the log K_{ow} values range from 3.2 to 4.1. Studies with algae, aquatic invertebrates, and fish have confirmed that bioaccumulation of TBT in these organisms is substantial. The bioconcentration factor (BCF) values range up to 10 000 in periwinkles, 50 000 in fish, and 500 000 in clams. Although TBT does not appear to significantly biomagnify up the food chain

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1 Special Review Announcement SRA2000-01, *Special Review of Organotin Antifouling Paints for Ship Hulls*

2 International Convention on the Control of Harmful Antifouling Systems, October 2001. Reference: www.imo.org

3 Review of the Persistence, Bioaccumulation and Toxicity of Tributyltin in Aquatic Environments in Relation to Canada's Toxic Substances Management Policy, R. James Maguire, Water Qual. Res. J. Canada, 2000, Volume 35, No.4, 633-679

in some studies conducted to date, it is found in the tissues of marine mammals and other organisms in open ocean areas.

TBT is toxic to many aquatic organisms, including fish. Acute toxicity, to some fish, occurs at a few milligrams per litre, while chronic toxicity can be found at concentrations in the order of micrograms per litre. It is highly toxic to molluscs, with chronic toxicity in oysters and clams occurring at fractional micrograms per litre concentrations. Evidence of the disruption of the endocrine system, e.g., the induction of imposex (the imposition of male sexual characteristics on females) is seen at 0.5 ng Sn/L in dogwhelks. Some marine benthic invertebrates are also very sensitive to TBT in sediments. Populations of benthic invertebrates such as polychaetes and amphipods have been shown to be reduced as a result of exposure to TBT in sediments.

Because of concerns regarding the impact of TBT on the aquatic environment, Canada and many other countries limited application of TBT antifouling paints to vessels greater than 25 m in length and to vessels (of any length) with aluminum hulls, the latter because many non-tin alternatives contain forms of copper which can cause corrosion of aluminum hulls. A maximum daily tin release rate was imposed for these applications.

In Canada, these regulatory controls have been only partially effective in reducing concentrations of TBT in the aquatic environment. In some locations, TBT was found in fresh water much less frequently in 1994 than in 1982–1985, and at much lower concentrations than a decade earlier. In 1994, TBT was found in fresh water sediments at similar concentrations to those found a decade earlier, but was found more frequently.

In sea water, TBT was found more frequently in 1994 compared to samples taken between 1982 and 1985. In every case, the concentrations exceeded acute and chronic toxicity endpoints, indicating a high potential for adverse effects in the particular locations. In marine sediments, TBT was found more frequently in 1994 than a decade earlier, although at greatly reduced concentrations. In about half of all marine sediments in which TBT was found, its concentration exceeded chronic toxicity thresholds, indicating a high potential for adverse effects in the particular locations.

Using the effect of imposex on molluscs to monitor recovery from TBT contamination, it was found that whelks (various species) before 1989 had high frequencies of imposex in the Juan de Fuca Strait and the Strait of Georgia, and lower frequencies on the west coast of Vancouver Island. By 1994, a reduction in imposex was evident on the west coast of Vancouver Island and in some locations in the Strait of Georgia. However, there was no clear evidence of recovery near Victoria, and Vancouver Harbour did not have whelks in any abundance. Similarly, in Atlantic Canada, imposex in *Nucella lapillus* was found in 13 of 34 sites sampled in 1995. These results indicate that the regulatory control of TBT antifouling paints in Canada had not eliminated the problem by 1995. Because of the long persistence of TBT in sediment, TBT concentrations in marine sediments in some locations may exceed chronic toxicity thresholds for years to come.

In consideration of the foregoing, the PMRA has determined that the use of TBT in antifouling paints poses an unacceptable risk to Canadian waters, based on non-target toxicity to aquatic organisms, persistence in the environment, and bioaccumulation in aquatic organisms.

In addition, the PMRA has considered TBT in antifouling paints relative to the federal Toxic Substances Management Policy and has determined that TBT would be considered persistent in sediment because its half-life in sediment is >365 days, bioaccumulative because its bioconcentration factor is greater than 5000 in several marine species, and *Canadian Environmental Protection Act*-toxic equivalent because of its toxicity to a number of marine organisms at concentrations found in Canadian aquatic environments.

Value Assessment

The PMRA has assessed the impact of phasing out TBT antifouling paints in Canada and the availability of alternative products to Canadian users.

Organotin antifouling paints are registered for a range of antifouling needs including deep sea-going ships and smaller ships which travel primarily in coastal waters (e.g., ferries, sailboats with aluminum hulls). In the past three years, the use of TBT paints has declined so that the primary use is now limited to a single product used on the west coast and only for application on smaller ships with aluminum hulls. The current registrations include three paint products (two of which have not been used in the last year), the associated three concentrates, and the active ingredient tri-*N*-butyltin methacrylate. The only TBT antifouling paint that is in current use is labelled for use on ships with aluminum hulls. Based on information obtained from International Paint Co., Canadian paint applicators are no longer applying TBT paints to vessels that travel in deep sea water. It has been confirmed that past users of TBT paints, such as the Department of National Defence, are no longer applying tin products on their ships, which would indicate that adequate alternative paints are available.

Since 1989, several non-TBT antifouling paints have been evaluated and registered for use in Canada. These non-tin products contain copper active ingredients[4] that offer antifouling properties similar to those of the TBT antifouling paints. Presently there are more than 50 copper-based antifouling paints registered for use by either small ship owners or professional paint applicators. These copper antifouling paints offer protection periods ranging from 12 months to 36 months or longer. There are two copper thiocyanate products that are suitable for application on ships with aluminum hulls, since they do not cause corrosion like other copper-containing paints; therefore it has been determined that Canadian registered non-tin products provide a period of control that meets the needs of shipowners.

[4] One of: cuprous oxide, metallic copper, or copper thiocyanate

Regulatory Decision

The decision and actions outlined in this section are the conclusion of the Special Review of TBT antifouling paints by the PMRA. The PMRA has determined that the use of TBT antifouling paints represents an unacceptable risk to the marine environment. Alternative products currently registered in Canada offer an adequate period of control of fouling organisms to meet the needs of Canadian users.

As a result, the registrations of all 3 tri-*N*-butyl tin based TBT antifouling paints, and their associated registered concentrates and active ingredient, will be phased out during 2002, consistent with the IMO Convention phase-out date of January 1, 2003.

As a step to ensure the orderly phase-out of sale and distribution of affected products, the last date of all sales is September 1, 2002. Registrations will end October 31, 2002 (the end of the 2002 use season), after which date the use of these paint products will not be acceptable. After October 31, 2002, owners of unused paint will be encouraged to contact either the distributor or the manufacturer to make arrangements for product recall, or to contact their local provincial authority for proper disposal of unused product. The registrant has agreed to conduct a recall of any unsold product to ensure that there is no product in the channels of trade after January 1, 2003.

List of Affected Products

Technical Grade Active Ingredients

Tri-*N*-butyltin methacrylate	Registration No. 23282, Elf Atochem of Canada Ltd.

Manufacturing Concentrates (all containing Tri-*N*-butyltin methacrylate)

Biomet 303/60 Antifouling Agent	Registration No. 23483, Elf Atochem of Canada Ltd.
Biomet 304/60 Antifouling Agent	Registration No. 23484, Elf Atochem of Canada Ltd.
Biomet 300/60 Antifouling Agent	Registration No. 26164, Elf Atochem of Canada Ltd.

End-use Products

Intersmooth Hisol BFA253 SPC	Registration No. 21316, International Paint Co.
Interswift BKA007	Registration No. 21368, International Paint Co.
Tri-Lux IIT Copolymer Antifouling Paint	Registration No. 23281, International Paint Co.