Case Study: SC Johnson's Use of the EPA PBT Profiler to Screen SC Johnson's Chemical Inventory, a Joint Study Conducted by SC Johnson and Syracuse Research Corporation

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EXECUTIVE SUMMARY

SC Johnson has concluded that the use of the PBT Profiler to screen its chemical inventory has been an important, cost-effective tool to help identify P2 opportunities and attain the goal of removing all potential PBT substances from its product line. Using the PBT Profiler allowed SC Johnson to quickly screen its inventory of 2,150 materials and to efficiently and effectively prioritize resources to the assessment of only173 materials. By utilizing experimental data where available, professional expertise and judgement, and a weight-of-evidence approach, SC Johnson concluded that there are 16 chemicals that require further investigation in order to attain a PBT-free product line.

INTRODUCTION

SC Johnson has a long history of promoting environmental stewardship. For example, in 1975, SC Johnson voluntarily removed chlorofluorocarbon (CFC) propellants from aerosol products worldwide, when the threat of ozone depletion was just a hypothesis. The company's CFC-free aerosol decision was made three years before the U.S. government banned CFC use in these products. Throughout the 1990's, the company led the way in reducing pollution, cutting packaging waste by a third, eliminating solvent use by one-fourth and cutting in half the combined air, water and solid wastes from its plants worldwide. Through a partnership with Goodwill Industries over the past twelve years, SC Johnson has been able to achieve recycling of more than 90% of their solid waste at their Waxdale manufacturing plant, the company's largest production facility. SC Johnson continues to pursue progress by developing new strategies to reduce waste and increase the use of environmentally preferred materials.

While SC Johnson already meets or exceeds government regulations for raw material standards, SC Johnson chose to aim for higher standards for raw materials. SC Johnson was the first company to establish an environmental classification system for all raw materials used in their consumer products with the goal of increasing the use of environmentally preferred materials. Establishment of this environmental classification system was praised by the U.S. Environmental Protection Agency (EPA), Office of Pollution Prevention and Toxics Risk Assessment Division. SC Johnson's desire to use materials that reduce the impact of their products on the environment hopefully will, in turn, encourage their suppliers to also use and supply environmentally preferred materials.

SC Johnson was the first company to participate in a collaborative program with the EPA to screen their chemical inventory for potential PBT materials. A "PBT" is a chemical that persists (P) in the environment, has the potential to bioaccumulate (B) in the food chain to relatively high levels, and is toxic (T). Because of their potential for harm to health or the environment, the use of PBTs is being restricted worldwide through the cooperation of chemical manufacturers, formulators, and regulatory bodies. In this case study, SC Johnson, in collaboration with the EPA, used the PBT Profiler to estimate the PBT characteristics for each raw material that it currently uses as well as for those that are being considered for future use. The PBT Profiler will provide an early assessment of a material's potential environmental impact, allowing SC Johnson to make more informed decisions and choices about

materials in their products. The PBT Profiler is a free, web-based screening tool developed by the EPA to allow Pollution Prevention (P2) to be incorporated into decision-making strategies for commercial chemical substances. The PBT Profiler estimates a chemical's environmental persistence (P), bioconcentration potential (B), and aquatic toxicity (T) based on its chemical structure. At the time when SC Johnson initiated this screening study, the PBT Profiler had not been released for public access. The PBT Profiler is now publicly available, and can be accessed free of charge at http://www.pbtprofiler.net

SC Johnson's goal is to be PBT-free - the first company to achieve that standing. This case study describes the results of a collaborative project with EPA to determine how the screening of a chemical's PBT characteristics can be a cost-effective means to promote the voluntary use of P2 tools to reduce pollution and highlight the potential economic benefits of informed environmental decision making.

BACKGROUND INFORMATION

POLLUTION PREVENTION (P2) AND THE POLLUTION PREVENTION ACT

"Pollution prevention" is the common sense understanding that it is easier to prevent problems than to correct them. Congress, by enacting the Pollution Prevention Act of 1990 (42 U.S.C. 13101 and 13102, s/s/ et seq.), created a bold national objective for environmental protection by outlining a hierarchy in dealing with pollution:

- Pollution should be prevented or reduced at the source whenever feasible;
- Pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible;
- Pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and
- Disposal or other releases into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

Pollution prevention means, "source reduction", as defined under the Pollution Prevention Act. The Pollution Prevention Act defines "source reduction" to mean any practice which;

- Reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment prior to recycling, treatment, or disposal; and
- Reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

Source reduction can be achieved through equipment or technology modifications, process or procedure modification, reformulation or redesign of products, substitution of materials, etc.

SC Johnson's environmental classification system and their use of the PBT Profiler are offered as case studies in corporate implementation of the Pollution Prevention Act.

EPA's Office of Pollution Prevention and Toxics (OPPT) implements the Pollution Prevention Act and the Toxic Substances Control Act. OPPT's P2 programs and policies aim to reduce or prevent polution, whenever possible. OPPT's programs provide information on pollution prevention that can be incorporated into the daily operations of both industry and individuals. This is a change from the early work of the EPA, which focused on addressing and cleaning up critical pollution problems. While this accomplished reductions in pollution and improvement of the environment, it was costly and ultimately did not help to solve the problem of pollution. By making more informed decisions and choices early on, industry and individuals can help reduce or avoid the introduction of pollutants into the environment, rather than trying to clean up after pollution has already occurred.

While the major goal of P2 Policy is to improve the quality of the environment and public health, it also can provide important economic benefits. These can be an especially important motivating factor for industry to incorporate P2 practices. Although incorporation of P2 practices may seem costly and complicated, by introducing them early on in research and development, industry may ultimately reduce their costs of environmental clean-up, liability, and regulatory burdens. Another benefit to industry that could result from choosing P2 practices is the development of a more favorable public image for companies and their products. SC Johnson is fully committed to applying P2 procedures to all aspects of its global operations.

ABOUT PBTs

Persistent, bioaccumulative and toxic pollutants (PBTs) are long-lasting substances that can build up in the food chain to levels that are harmful to human and ecosystem health. These contaminants can be transported long distances and move readily from land to air and water.

Because of their persistence and bioaccumulative properties, they do not break down easily and are particularly difficult to clean up. Many of these substances are human-made and have only been in existence for a relatively short period of history. Other substances are natural elements, such as mercury. It is the refinement and concentrated human use of these substances that creates the problem. PBTs are associated with a range of adverse human health effects, including effects on the nervous system, reproductive and development problems, cancer, genetic impacts and a variety of impacts on the environment.

EPA is concerned not only with historical PBT problem chemicals, such as DDT and PCBs, but also with PBT chemicals currently in product and new chemicals with similar properties entering commerce today or in the future. EPA developed a Multimedia Strategy for Priority Persistent, Bioaccumulative, and Toxic (PBT) Chemicals (http://www.epa.gov/opptintr/pbt/pbtstrat.htm) as well as policy statement dealing with new chemicals entering commerce that may have PBT characteristics (http://www.epa.gov/opptintr/newchems/pbtpolcy.htm). In addition, EPA published two final rules that lowered the TRI reporting thresholds for certain persistent bioaccumulative toxic (PBT) chemicals and added certain other PBT chemicals to the TRI list of toxic chemicals (http://www.epa.gov/triinter/lawsandregs/pbt/pbtrule.htm). EPA's new chemical PBT Policy statement and the final rules lowering TRI reporting thresholds include quantitative criteria for determining which chemicals constitute PBTs.

WHICH CHEMICALS ARE PBTs?

Approximately 80,000 different chemicals are already commercially available in the United States, while an additional 1,500-2,000 new chemicals enter commerce each year. Relatively few of these chemicals have been tested, and only a fraction have sufficient information to allow a thorough evaluation of PBT characteristics. Businesses, governmental organizations and other stakeholders may not have the data necessary to identify PBTs or identify substitutes or options with environmentally preferable PBT characteristics. At times, some companies must make product and process decisions without data regarding the PBT tradeoffs.

To identify and take advantage of pollution prevention opportunities, companies need access to PBT-related information. EPA developed the PBT profiler to make screening-level PBT information and data available to chemical companies and other stakeholders.

ABOUT THE PBT PROFILER

The PBT Profiler was developed jointly by EPA, the American Chemistry Council, the Chlorine Chemistry Council, the Synthetic Organic Chemical Manufacturers Association, and with the support and contributions of Environmental Defense. The PBT Profiler is a free, web-based tool that estimates a chemical's environmental persistence, bioconcentration potential, and potential aquatic toxicity based on a chemical's structure. The structure is passed through a series of modules that estimate its chemical and physical properties. These properties relate to the chemical's toxicity and its behavior in the environment. The PBT Profiler converts these results to persistence, bioaccumulation and toxicity estimates. Results are then automatically compared to PBT criteria, discussed in the New Chemical Policy Statement and the final rules lowering TRI reporting thresholds. Subsequently, the user is given a warning if the chemical being evaluated using the PBT Profiler exceeds these PBT criteria.

PBT Profiler results that do not exceed EPA criteria in P, B, and T are displayed in green. Results that exceed EPA criteria are displayed in orange, while those that exceed EPA high concern criteria are displayed in red. Only those chemicals that exceed EPA criteria in all three categories - P, B, and T,- are considered potential PBTs. As demonstrated in this case study, the PBT Profiler should not be used to label a substance as a PBT or to initiate regulatory action. Any chemicals that are identified as potential PBTs by the Profiler, should be further characterized by other methods in a more thorough P2 evaluation.

THE PBT SCREENING EXERCISE

OBTAINING THE LIST OF CHEMICALS

The first step in the screening process was to obtain a list of chemicals used in the production of SC Johnson products. A list of chemicals was obtained from SC Johnson's computerized databases with the goal of identifying greater than 99% of the company's worldwide production volume (on a mass basis). The chemicals to be screened were limited to actual product formulations. Chemicals used in procured materials, such as printing inks used in packaging, were not included.

SC Johnson's chemical database system contains a CAS Registry number (or SC Johnson identifying number) and name for each raw material. For formulated mixtures that were in the system, the CAS Registry number, name, percent in raw material and chemical type was also provided for each component

of the mixture. In some instances, suppliers were contacted directly for the identity of their materials when the SC Johnson's system indicated that their ingredients were listed as proprietary. If suppliers didn't provide the identity of their materials (either to SC Johnson or the EPA) for this case study, their materials were given a Restricted Use Material (RUM) classification. This means that SC Johnson will continue to use them in its current formulations, but any new uses will have to be approved by upper management.

To prepare the list of chemical structures for screening in the PBT Profiler, a series of sequential steps was performed. The first step in the process was to identify the inorganic compounds in the SC Johnson inventory because the PBT Profiler will only provide estimates for organic chemicals. A total of 120 inorganic compounds were identified and removed from the list of chemicals to be screened by the PBT Profiler.

The next step in the process was to obtain the chemical structure for the remaining organic compounds because the PBT Profiler performs its estimates based on a compound's structure. Given that there were **2,030 non-inorganic substances** remaining, this exercise was initiated by electronically linking the CAS Registry number to a database containing chemical structures. Commercially available databases of chemical structures are available from a number of different sources. For this project, structures were obtained from Syracuse Research Corporation's (SRC) SMILECAS database of discrete organic compounds, the lookup database used by the PBT Profiler. **A total of 1,333 structures (or representative structures for simple mixtures) were obtained from this exercise.**

The remaining 697 materials in the screening list were reviewed manually by chemists with expertise in commercial substances. These compounds were then placed into one of five categories, as appropriate:

- Discrete organic substances whose structure could be generated.

Chemical structures for these materials were obtained directly from their name or by searching the Chemical Abstract Service Registry file.

- Chemical mixtures where a representative structure or predominate component could be obtained.

The PBT Profiler only performs estimates on discrete organic compounds. Many commercial materials (e.g., xylenes or natural extracts) are mixtures of different chemicals. For these materials, a single component can be chosen to estimate its PBT characteristics. This representative structure is typically the most predominant component of the mixture.

Some of the mixtures were commercially formulated products that contained active ingredients, stabilizers, solvents, emulsifiers, etc. For these materials, the active organic component(s) that were present at a concentration greater than 5% were selected for screening.

- Polymers that are likely to contain a representative, relatively low molecular weight component.

The estimation methods used by the PBT Profiler have a molecular weight cutoff of 1,000. Some polymers are a mixture of high and low molecular weight components. The lower weight oligomers can be represented by selecting a structure comprised of at least one of each of the feedstocks used in its manufacture (mers).

- High molecular weight polymers.

Some polymers (e.g., polyethylene) are comprised of only relatively large components with molecular weights greater than 1,000. These materials cannot be profiled; however, they are generally recognized not to be PBT chemicals (as they do not bioaccumulate).

- Materials where a chemical structure could not be determined.

This sub-class of materials included those that would generally be expected to have a molecular weight far greater than 1,000 (such as corn kibbles, bacteria, enzymes, and sawdust) and could be reasonably expected not to be PBTs. There were also some chemicals for which a chemical structure (or a representative structure) could not be identified, due to administrative errors (e.g., typographical errors for the CAS Registry number - although these materials are likely no longer used by SC Johnson) or because a representative component could not be obtained or derived for a mixture.

The number of chemicals that fell into the above categories is summarized in the following table. This exercise to determine the materials used by SC Johnson resulted in the identification of **1,903 chemicals that could be screened for their PBT characteristics.**

Table 1. Categories of the Chemicals Used by SC Johnson

Chemical Category	Number	Profiled?
Discrete organics	1,299	Yes
Mixtures with a representative component	535	Yes
Inorganics	120	No
Polymers with a representative component	69	Yes
Polymers (high molecular weight)	52	No
High molecular weight materials (e.g., sawdust) that do not require profiling	39	No
Structure not available	36	No
Total	2,150	

SCREENING THE IDENTIFIED CHEMICALS USING THE PBT PROFILER

At the time when this case study was initiated, the PBT Profiler methodology had been completed and undergone external peer review, but it was not yet available to the public. The actual screening of the 1,903 chemical substances was performed in collaboration with the Risk Assessment Division, Office of Pollution Prevention and Toxics, of the EPA. The screening exercise was performed in a special batch mode, which was only available to the developers of the PBT Profiler. The estimated results were compiled in a spreadsheet format and provided to SC Johnson for review.

PBT PROFILER RESULTS FOR THE CHEMICALS USED BY SC JOHNSON

For a chemical to be considered a PBT material, it must be persistent and bioaccumulative and toxic. The PBT Profiler output produces a low, medium, or high estimate for each of these three criteria. Those materials with a high estimate in each of these three categories were flagged for further assessment. Because of SC Johnson's long history of environmental stewardship and commitment to the use of environmentally benign materials, all chemicals that were estimated to have a medium score were also flagged for further assessment. In addition, some chemicals that were subjected to the screening estimate could not have their toxicity characteristic estimated (i.e., the Profiler returned a toxicity score of "Not Estimated"). These compounds were also flagged for further assessment because they were estimated to be both persistent and bioaccumulative and, therefore, SC Johnson was concerned about the potential long-term effects of these materials.

SC Johnson performed an assessment of the representative structures that were selected for the mixtures that exceeded the P, B, and T criteria to determine if the material profiled was indeed indicative of the commercial substance used in our products. For one of the materials on the list, a polymer, technical references indicated that there was little likelihood that there were any oligomers present with a molecular weight less than 1,000. For another material, SC Johnson derived a more technically appropriate representative structure that, when profiled, did not exceed any of the criteria.

A total of **173 (9%) of the 1,903 materials used by SC Johnson were flagged for further assessment based on the screening results of the PBT Profiler.** A summary of these results is provided in Table 2.

Table 2. PBT Profiler Screening Results for the 175 Chemicals Exceeding the P, B, and T Thresholds

P	B	T	Number of Chemicals
Medium	Medium	Not Estimated	4
Medium	Medium	Medium	23
Medium	Medium	High	66
Medium	High	Not Estimated	1
Medium	High	High	16
High	Medium	Not Estimated	9
High	Medium	High	15
High	High	High	39

ASSESSMENT OF THE PBT PROFILER RESULTS

SC Johnson already meets or exceeds government regulations for raw materials standards and was the first company to establish an environmental classification system for all raw materials used in their consumer products. The goal of this classification system recognizes the potential for human exposure products the company manufactures.

There is universal agreement that chemicals of greatest concern are those that are persistent, bioaccumulative, and toxic, and SC Johnson is committed to making its products PBT-free. The company further believes participation in this collaborative screening effort of its inventory of chemical substances using the PBT Profiler with the U.S. EPA has allowed it to take a giant step towards achieving its goal.

The PBT Profiler screening exercise allowed SC Johnson to focus its resources on the 173 chemicals flagged as deserving of further assessment. For a chemical to be considered a PBT, it must be persistent, bioaccumulative, and toxic. Therefore, if a chemical does not display a characteristic in any one of these three areas, it is not a PBT. Of these three areas, experimental data are most readily available on a compound's persistence in the environment. SC Johnson initiated the next phase of this case study by investigating the persistence of the173 chemicals flagged by the PBT Profiler.

Experimental data on the persistence of chemical substances is available from the scientific literature, although performing a complete literature search, retrieving the citations, and compiling the results for 173 chemicals is a labor-intensive process. SC Johnson utilized a free, publicly available database of abstracted biodegradation data (SRC's BIOLOG file, http://esc.syrres.com/efdb/biolog.htm). This database provides abstracts of published experimental studies that indicate whether a chemical will biodegrade in the environment. Analysis of the experimental data in BIOLOG revealed that 35 of the flagged chemicals were expected to biodegrade and would not be persistent. Since these 35 chemicals are not persistent, they would not be classified as PBTs.

One material used by SC Johnson, a pesticide, had conflicting data in the BIOLOG file. There are numerous publicly available sources that contain data on pesticides (such as the Hazardous Substances Data Bank, available through Toxnet at http://toxnet.nlm.nih.gov/). Available experimental data indicate that this pesticide would not be persistent in the environment and, therefore, would not be classified as a PBT.

Another important environmental process that results in the degradation of organic compounds is hydrolysis, the reaction of a chemical with water. Although it is difficult to obtain kinetic data on the hydrolysis of commercial chemicals, there are a number of distinct functional groups that are known to rapidly undergo this reaction. If a **chemical rapidly hydrolyzes**, it would not be persistent in the environment given that water is an ubiquitous substance. Review of the remaining list of chemicals revealed that four compounds were expected to rapidly hydrolyze because of a functional group that they contained: a Schiff's base, ketal, or alpha-chloroether. Simple esters were not considered rapidly hydrolyzable as some members of this group may be relatively stable in the environment. SC Johnson will be considering profiling the hydrolysis products as a way to further evaluate chemicals exceeding the P, B, and T thresholds.

SC Johnson uses a number of fragrances in its products, and as part of this exercise, contacted the Research Institute for Fragrance Materials (RIFM) for information. In an independent screening assessment performed in collaboration with the EPA, RIFM provided chemical structures for 2,150 materials, which were subsequently run through the PBT Profiler. Although the complete results of this exercise were not provided to SC Johnson, RIFM provided expert analysis for 25 materials that were present in SC Johnson's initial list of 173 materials flagged by the PBT Profiler. RIFM indicated that two classes of musks on the list were expected to biodegrade based on experimental data for members of the class. By analogy, all structurally related musks were also expected to biodegrade. Since the data

provided by RIFM was consistent with the experimental results obtained from BIOLOG (discussed above) for two of these compounds, an additional 14 structurally-related musks were considered not to be persistent.

A similar assessment was performed on the remaining compounds that were flagged by the PBT Profiler to **determine if experimental biodegradation data** were available on close structural analogs. Using a structure-based approach, biodegradation data were obtained for parent compounds that could be used to represent materials flagged by the PBT Profiler. By using expert opinion based on structural similarities (such as molecular backbone, substitution patterns, heterocyclic ring structures, and common functional groups), an additional 101 materials were expected to be biodegradable and not persistent in the environment. These compounds were represented by structural classes including hydrocarbons, terpenes, functionalized fatty acids, rosin derivatives, and extracts of naturally occurring materials).

The above assessments describe the procedures that SC Johnson used to evaluate the flagged chemicals using persistence data; bioaccumulation and toxicity data can also be used to determine if a chemical would or would not be considered a PBT. Although toxicity and bioaccumulation data are not as prevalent, the following examples are indicative of the methodology that SC Johnson used. Toxicity data were obtained for five chemicals from the Toxic Substance Control Act Test Submissions (TSCATS) database, available on the web or from commercial vendors. Other readily available sources, such as EPA's Integrated Risk Information System (IRIS), were also checked but no additional toxicity data were located. Of the five chemicals for which toxicity information was located, the available data indicated that three of the materials would not be toxic. Although different toxicity endpoints have different criteria, for these three chemicals, SC Johnson concluded that their toxic effects would not be expressed except at relatively high concentrations that would not be expected in the environment during the manufacturing, use, or disposal of the products they are contained in. These three materials, therefore, would not appear to be PBTs.

Of the remaining chemicals that were profiled, there were no experimental bioconcentration data available. One substance, however, was a polymeric siloxane for which a representative, lowest molecular weight structure had been derived. Further analysis indicated that if a different representative structure had been selected (one with a slightly higher molecular weight) the bioconcentration estimate may change significantly. Profiling another representative structure formed by increasing its size by one siloxane-unit resulted in a PBT Profiler estimate that the material was not a PBT (because it was not expected to significantly bioconcentrate). Technical references indicated that the chemical substance likely had an average molecular weight higher than the representative structure initially profiled. Therefore, it was concluded that this chemical was not likely to be considered a PBT.

The primary goal of this case study was to investigate the PBT characteristics of the organic chemicals in SC Johnson's inventory. During the process of screening those organic materials in its inventory, SC Johnson identified 120 inorganic materials. However, these materials cannot be run through the PBT Profiler and, therefore, the assessment of inorganic compound was not a component of this screening exercise, SC Johnson was nevertheless interested in performing an initial screen of these compounds. To rapidly assess the inorganic materials for PBT characteristics, SC Johnson compared the inorganic chemicals in its inventory to FDA's Everything Added to Foods in the United States list (EAFUS), a publicly available source (http://vm.cfsan.fda.gov/~dms/eafus.html) that includes many chemicals that are on the generally recognized as safe (GRAS) list. This exercise identified 56 inorganic chemicals used by SC Johnson that are on the EAFUS list.

Although no approach has been defined by SC Johnson or the EPA to screen inorganic materials, it should be noted that inorganics will require different procedures relative to those used for organic compounds. For example, SC Johnson's inventory included a number of well-recognized inorganic compounds that were not on the EAFUS list, such as water, bone meal, and compressed air. Substances such as these could readily be removed from further consideration based on professional judgement. Although this general, common sense approach should not replace the weight-of-evidence procedures used for discreet organic compounds, this type of analysis is instructive of the steps that can be taken when conducting a screening assessment. For example, there were some organic materials that could be clearly recognized as non-PBTs. These organic-based materials include readily recognizable compounds such as sawdust, corn meal, and honey as well as biotechnology products such as cultured enzymes.

At the completion of this P2 screening exercise, SC Johnson had reviewed all 1,903 organic materials in its inventory and determined that 16 chemicals required a more in-depth assessment of their PBT characteristics and the processes and products in which they are used.

SUMMARY AND FUTURE STEPS

The 16 chemicals identified by SC Johnson in this P2 screening exercise will require a more detailed assessment of their PBT characteristics as well as an analysis of their formulation, use, and disposal. A series of confirmatory testing would unambiguously address these compound's PBT characteristics, but it may not necessarily be the most cost-effective first step. Alternatively, an assessment of how the material is used in SC Johnson products may be the appropriate next step. For example, some chemicals may have appropriate substitutes commercially available. In this instance, reformulating a product may provide the most cost-effective solution. Similarly, it may be possible to resolve the PBT status or impacts of a material by initiating appropriate process controls for chemicals that are not physically present in SC Johnson's final products.

If testing of a chemical material is pursued, SC Johnson expects to prioritize the types of tests to be performed. Prioritization of the tests will be based on initial screening results, tests, knowledge of the chemical, and a consideration of both the costs and the amount of time tests require. Initially, either aquatic toxicity testing or routine tests of biodegradability (e.g. OECD301) may be performed. If the potential for bioconcentration is in question, then a preliminary determination of the octanol/water partition coefficient may be done. The most costly and time-consuming tests would be components of a second-tier: definitive bioconcentration tests and confirmatory biodegradation testing (water treatment plant simulation tests).

SC Johnson has concluded that the use of the PBT Profiler to screen its chemical inventory has been an important, cost-effective tool to help identify P2 opportunities and attain the goal of removing all potential PBT substances from its product line. Using the PBT Profiler allowed SC Johnson to quickly screen its inventory of 2,150 materials and to efficiently and effectively prioritize resources to the assessment of only173 materials. By utilizing experimental data where available, professional expertise and judgement, and a weight-of-evidence approach, SC Johnson concluded that there are 16 chemicals that require further investigation in order to attain a PBT-free product line.