Toxics Use Reduction in Massachusetts

A Progress Report for FY 2011

Prepared for:

The Governor of the Commonwealth of Massachusetts
The Commonwealth of Massachusetts House of Representatives
The Commonwealth of Massachusetts Senate

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ADMINISTRATIVE COUNCIL ON TOXIC USE REDUCTION
FISCAL YEAR 2011 ANNUAL REPORT

Executive Summary

Overview

In 1989, the Toxics Use Reduction Act (TURA), passed unanimously by the legislature, was the first comprehensive state pollution prevention law in the United States. TURA launched a new way of addressing pollution by ending the state's reliance on traditional "end-of-the pipe" command and control rules. Instead, manufacturing facilities that use large quantities of listed toxic chemicals have to report on their use and the wastes generated, and are required to develop toxics use reduction (TUR) plans. Because careful tracking of chemical use helps increase efficiency, and TUR planning reveals opportunities to improve manufacturing processes, companies often benefit from engaging in TUR planning and reporting. To increase the effectiveness of the preventive approach, the program provides substantial assistance and education, including training of third-party certifiers of TUR plans. When toxic chemical use is reduced, toxic releases, wastes, exposures, and transportation and storage risks are also reduced, leading to safer neighborhoods, workplaces, and products.

Since TURA's inception, Massachusetts companies have reduced toxics use by hundreds of millions of pounds. This FY11 report, containing the most recent company-reported data (from 2009), reveals that this is the 19th consecutive year in which companies have reduced toxics use. Companies used 75 million pounds less in 2009, 8 percent less than in 2008, and reduced their resulting waste by 7 percent. Adjusting for changes in production, companies covered under TURA have reduced the use of toxic substances by 21 percent since 2000.

In addition to toxic use reduction, since 2008, qualifying companies have been given the option to develop a Resource Conservation Plan that focuses on energy or water conservation, or the reduction of solid wastes. Of the companies that elected to prepare these plans:

- *50 million kilowatt hours per year in energy reductions, enough energy to power nearly 7,000 Massachusetts homes for a year, will be realized* by 23 facilities that submitted plans to reduce energy use,
- *38 million gallons of water use per year will be eliminated* by eight facilities that submitted water conservation plans,
- *860,000 pounds of solid waste will be eliminated* by five facilities that submitted waste reduction plans.

TURA has prompted these reductions through a mix of required reporting, planning (a documented process of examining alternatives that includes third-party certification of the plan), and extensive education and one-on-one assistance. Hundreds of businesses and toxics users attended TUR program conferences, workshops, networking forums and trainings; received educational materials, on-site assistance, publications or guidance; or benefited from community outreach programs that took place throughout the Commonwealth.

The Administrative Council on Toxics Use Reduction, chaired by the Secretary of Energy and Environmental Affairs, oversees TURA policy and coordination of toxics regulation among state agencies. Representatives on the Council include the Executive Offices of Public Safety, Labor and Workforce Development, and Housing and Economic Development; and the Departments of Environmental Protection and Public Health. Under the Council's direction, the following three agencies are responsible for operational implementation of the Act:

- The Massachusetts Department of Environmental Protection (MassDEP) enforces the law's planning and reporting requirements and produces annual reports on toxic chemical use in the Commonwealth.
- The Office of Technical Assistance and Technology (OTA) within the Executive Office of Energy and Environmental Affairs, provides no-cost, on-site, one-on-one, confidential help to toxics users. OTA also produces workshops, fact sheets, case studies, and other guidance on TUR, energy and water conservation, and relevant compliance matters.
- The Toxics Use Reduction Institute (TURI) at UMass Lowell supports research on cleaner materials and processes and trains TUR Planners, (third-party reviewers of TURA plans). TURI also provides grants to businesses, municipalities, community groups, and researchers, as well as laboratory testing and information services.

Fiscal Year FY11 Highlights

- During FY 11, Massachusetts businesses reduced toxics use by 8 percent, along with the corresponding reductions in environmental releases, wastes, and worker and public exposures.
- In addition, the TURA program agencies have:
  - Provided on-site assistance to more than 50 facilities and no-cost laboratory services to help companies evaluate safer cleaners,
  - Collected, reviewed, and assessed reports from 500 large quantity toxics users and reviewed TURA compliance at 67 facilities,
  - Provided training for over 200 company officials and consultants on complying with TURA and related regulations,
  - Maintained current educational presence with newsletters, websites, and the "Greenlist" Bulletin, and educated hundreds of attendees with presentations on recent advances in TUR policy and practice,
  - Funded innovative research on alternatives to toxics in common use, such as substitutes for Bis-phenol A in plastics, naturally derived substitutes for persistent, bioaccumulating toxic flame retardants, and substitutes for toxics in common cleaners,
  - Guest edited a special issue of the *International Journal of Cleaner Production* featuring what has been learned from two decades of implementing TURA in Massachusetts,

- Assisted dry cleaners subject to reporting requirements in 2011 with special training, streamlined guidance, and a model report, and held technology demonstrations at facilities that have successfully replaced dry cleaning with wet cleaning operations,
- Performed outreach to small users of trichloroethylene, designated a higher hazard substance in 2007, working on chemical list modernization and priority user designation,
- Founded a Business Environmental Network (BEN) for North Central Massachusetts and the Massachusetts School Sustainability Coordinators Roundtable,
- Provided information to assist companies in developing nanotechnology safely and organizing an international conference on environmental, health and safety in nanotechnology;
- Funded community projects for transitioning from toxic pesticide use to organic land care, and using safer chemicals in auto repair, janitorial cleaning, and personal care.

Hazard Designations Since the Passage of the 2006 Amendments to TURA

The Administrative Council, with recommendations from the Science Advisory Board and the Advisory Committee and with the support of program agencies, designated two additional chemicals (hexavalent chromium compounds and formaldehyde) as higher hazard, bringing the total to six. Ten chemicals have now been designated as lower hazard substances and seven chemicals have been dropped from the list because of their relatively low toxicity. The Council also chose, in an effort to most efficiently utilize TURA's resources, not to adopt a priority user segment for the Higher Hazard Substance trichloroethylene (TCE), and to coordinate efforts with other state agencies to continue the reduction in use of persistent, bioaccumulative, and toxic (PBT) chemicals. The list of reportable substances and reporting requirements for all chemicals were also streamlined.

Future Direction

A number of themes have emerged from recent chemical policy and planning work, presenting potential opportunities to enhance and streamline toxics use reduction efforts in the Commonwealth.

Four themes of these planning activities are:

- Investigating ways to maintain and enhance TURA's toxic chemical list,
- Coordinating Council member agency actions on toxics,
- Reducing toxics used by businesses and individuals who are not reached by conventional TURA reporting and planning because the user has fewer than 10 employees or is outside of TURA's domain,
- Increasing the use of TURA data analysis to guide program activities

INTRODUCTION

The 1989 Toxics Use Reduction Act (TURA), passed unanimously by the legislature, was the first comprehensive state pollution prevention law. Resulting from intensive negotiations between industry, environmentalists and government, TURA launched a new way of regulating pollution, ending the state's reliance on traditional "end-of-the pipe" command and control rules.

A cornerstone principle of the law is that the best way to reduce pollution is to address its root cause: the decision to use toxics in the first place. Firms in industrial categories that use large quantities of listed toxics have to report on their use and the wastes generated, and are also required to develop toxics use reduction (TUR) plans that identify and evaluate cost effective opportunities to reduce the use of toxics and the generation of toxic byproducts (or wastes). This approach reduces toxic releases and toxic wastes, decreases the risks of major transportation and storage accidents, protects workers from dangerous workplace exposures and creates safer products for consumer use. It also saves money for many companies. This report provides the most recent information about how well the law is accomplishing these aims.

TURA's Core Strategy

TURA does not require toxics users to stop using a chemical, but instead requires them to examine how they use it and what their alternatives might be. When toxics users are required to evaluate how they use chemicals and to identify alternatives, they often find ways to improve manufacturing and develop safer products and more efficient operations, boosting the competitiveness of Massachusetts firms. For example, Polartec, the fabric maker, identified a less toxic cleaning chemical that cleaned better and reduced production time. The company's president, Andrew Vecchione, said "We appreciate the TURA program as it encourages employers like Polartec to seek alternatives that are environmentally friendly and that make economic sense. TURA can help businesses gain an edge from continuous improvements.[1]"

Program Components

TURA is implemented collaboratively by three state entities:

- The Massachusetts Department of Environmental Protection (MassDEP) is charged with enforcing the law's annual reporting and biennial planning mandates, and promoting TUR as

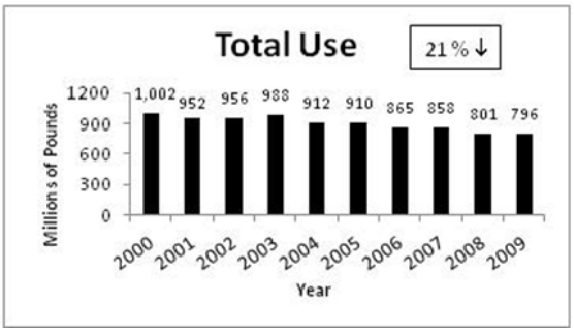
1.http://www.mass.gov/Eoeea/docs/eea/ota/case_studies/polartec.pdf.

the preferred way to bring facilities into compliance with environmental regulations, licensing toxics use reduction planners, and preparing an annual "data release" -- a public report on toxic chemical use in the Commonwealth.

- The Office of Technical Assistance and Technology (OTA) provides no-cost confidential help to toxics users. OTA also produces fact sheets, case studies, and guidance on TURA, energy and water conservation, and compliance, and provides workshops and other educational opportunities. OTA is available to make on-site visits, as well as to answer questions over the phone or by email.
- The Toxics Use Reduction Institute (TURI) at UMass Lowell supports research on cleaner materials and processes and trains TUR Planners, (third-party reviewers of TURA plans and plan updates), who certify that companies covered by the law's requirements have completed adequate TUR plans. TURI also provides grants to businesses, municipalities, community groups, and researchers, as well as laboratory testing and information services.

Three other bodies are key to TURA's functioning:

- An Administrative Council, with public agency seats for public health, public safety, occupational safety, economic development, and environmental protection, and overseen by the Secretary of Energy and Environmental Affairs, determines TURA policy and coordinates toxics prevention state-wide,
- An Advisory Committee, which gathers the perspectives of a range of stakeholders, and provides comments to the Administrative Council before it renders decisions, and a
- Science Advisory Board, which ensures that the program bases its decision making on the best available information concerning toxic chemicals.



2006 Amendments

Five years ago the TURA law was amended so that firms that had already performed TUR planning for several years may elect to develop a resource conservation plan for energy, water or materials, or incorporate TUR into an existing environmental management system. It is now possible to examine the results of this change (see below). The amendments also gave new authority for the program to categorize chemicals as Higher Hazard or Lower Hazard substances, and focus in on substances of higher concern. This occupied a great deal of program resources during FY11. Appendix A of this report is a review of implementation of these changes over the past five years.

Results

Companies continue to reduce the use of toxic chemicals and the wastes generated from use. In 2009, the most recent year data is available, 500 facilities reported the use of 148 listed toxic

substances to the MassDEP. These facilities fell within certain industry sectors, had ten or more full-time employee equivalents, and used listed toxic substances at or above reporting thresholds.

Changes in toxics use in the Commonwealth can be looked at two ways: absolute changes and production-adjusted changes. For example, companies used 881 million pounds in 2009, down from 956 million on 2008. But these are absolute numbers and such changes could be due to companies closing up shop or downsizing. However, the TURA program also measures progress by normalizing the reported data for changes in production, and then comparing the normalized data for a consistent set of chemicals and industries that have been subject to reporting over a given period of time (referred to as the "Core Group"[2]). From 2000 to 2009, the Core Group reported a 23 percent decrease in production. Adjusting the data to account for production changes over that nine-year period shows that the 2000 Core Group facilities had reductions that go well beyond what would have resulted solely from decreases in production.

Unadjusted Changes: 2008 - 2009	**Production-Adjusted Changes: 2000 - 2009**
• 881 million lbs of toxic substances **used** (down from 956 million in 2008), • 71 million lbs of toxic **byproduct** (waste) generated (down from 78 million in 2008), • 324 million lbs of toxics **shipped in or as products** (up from 322 million in 2008), • Five million lbs of toxics **released** to the environment (the same as five million in 2008), and • 30 million lbs of toxics **transferred** off-site for further waste management (the same as 30 million lbs in 2008).	• Toxic chemical **use** down by 21percent, • Toxic **byproducts** down by 38 percent, • Toxics **shipped in product** down by 21 percent, • On-site **releases** of toxics to the environment down by 56 percent, and • **Transfers** of toxics off-site for further waste management down by 23 percent.

Massachusetts reductions compare well with national averages. The Toxics Release Inventory, a compilation of data from all states, includes two measures that provide relevant performance comparison. One is on-site releases of toxic chemicals (by large quantity users), and the other is production-related waste, which is roughly equivalent to Massachusetts' toxic byproduct. Nationally, on-site releases were reduced 41 percent by all sources combined, over the last ten years. In Massachusetts the percentage reduction was 66 percent. The amount of production-related waste reported nationally under the Toxics Release Inventory was reduced by an average of 26 percent in each state, from 2001 - 2009[3]. The reduction in toxic byproduct in Massachusetts was 52 percent, twice the national rate[4].

2. Because chemicals may be added or removed from the list, quantity thresholds change, and exemptions and qualifications change who and what is covered by the law, TURA progress is best measured using a set of chemicals and industries that doesn't change over time. A Core Group was used to measure TURA progress during the 1990's, but has come to represent too small a fraction of the population now covered. A new core group was defined in 2000.

In addition to the results of conventional TUR planning, the 2006 Amendments allowed companies that have done a plan and two updates to elect to do Resource Conservation Planning, which focuses on energy or water conservation, or the reduction of wastes or toxics not covered under TURA (or toxics used below threshold amounts). There have now been two rounds of resource conservation plans, in 2008 and 2010. MassDEP's analysis of the plans produced the following summary, and the observation that many companies are exceeding their projections:

- *Fifty million kilowatt hours per year in energy reductions are projected to be reduced* by the 23 facilities that submitted plans to reduce energy use,
- *Thirty-eight million gallons of water use per year will be eliminated* by eight facilities that submitted water conservation plans,
- *Eight hundred and sixty thousand pounds of solid waste will be eliminated* by five facilities that submitted waste reduction plans, and
- Ten facilities submitted plans to reduce toxics that are not covered by TURA, either because they are not on the list, or are used in amounts below threshold.

The 2006 Amendments also allowed companies that have done three TUR plans to choose to incorporate TUR planning into established environmental management systems, and 20 companies have done so.

3. Total production-related waste under the TRI is the sum of all non-accidental chemical waste generated at a facility, prior to any form of on-site or off-site waste management. It is the sum of on-site environmental releases (minus quantities from non-routine, one-time events), on-site waste management (recycling, treatment, and combustion for energy recovery), and off-site transfers for disposal, treatment, recycling or energy recovery. This is equivalent to the TURA definition used for measuring toxic byproduct.

4. U.S. EPA *2009 TRI National Analysis (*http://www.epa.gov/tri/tridata/tri09/nationalanalysis/) and MassMASSDEP *2009 TUR Information Release (*http://www.mass.gov/MassDEP/toxics/priorities/09relfin.pdf*)*. The EPA report uses 2001-2009, the MASSDEP report uses 2000-2009.

HIGHLIGHTS OF FISCAL YEAR 2011

In FY11, (July 2010 – June 2011), over 1,000 representatives of companies and other facilities attended public events organized by the TURA program on toxics use reduction, energy efficiency, and other resource conservation topics. The program also:

- Made on-site visits to more than 50 facilities and helped many more by email, phone, website, and through workshops, and distributed fact sheets,
- Provided free laboratory services to help companies evaluate safer cleaners,
- Collected and reviewed reports from 500 large quantity toxics users and reviewed TURA compliance at 67 facilities,
- Provided training for hundreds of company officials and consultants on complying with TURA and related regulations,
- Educated thousands of readers of newsletters, websites, and the "Greenlist" Bulletin, and hundreds of attendees of presentations on recent advances in TUR policy and practice,
- Made two designations of chemicals as "higher hazard" substances (formaldehyde and hexavalent chromium compounds)[5],
- Assisted dry cleaners subject to reporting requirements in 2011 with special training, streamlined guidance, and a model report, and held demonstrations at facilities that have successfully replaced dry cleaning with wet cleaning operations,
- Performed outreach to small users of trichloroethylene, designated a higher hazard substance in 2007,

- Worked on chemical list modernization and priority user designation[6],
- Funded innovative research on alternatives to toxics in common use, such as substitutes for Bis-phenol A in plastics, naturally derived substitutes for persistent, bioaccumulating toxic flame retardants, and substitutes for toxics in common cleaners,
- Hosted a special issue of the *International Journal of Cleaner Production* featuring what has been learned from two decades of implementing TURA in Massachusetts,
- Founded a Business Environmental Network (BEN) for North Central Massachusetts,

5. Thresholds drop to 1,000 pounds for chemicals designated as Higher Hazard.

6. Particular industrial processes using a higher hazard substance may be designated as a "priority user segment", which changes the reporting thresholds to include facilities with less than 10 full-time equivalent employees.

- Founded a Massachusetts School Sustainability Coordinators Roundtable,
- Produced ground-breaking information to assist companies in developing nanotechnology safely and organized an international conference on environmental, health and safety in nanotechnology,
- Funded community projects for transitioning from toxic pesticide use to organic land care, and using safer chemicals in auto repair, janitorial cleaning, and personal care.

TURA Program FY11 Spending	
MassDEP	$726,329.51
TURI	$1,406,039.16
OTA	$589,531.55
Total	**$2,721,900.22**

The TURA Administrative Council and the TURA Advisory Committee

TURA Administrative Council

Key to the implementation of TURA is the fact that the Act established a multi-agency governing body (the Council), and an Advisory Committee that advises the Council and the program offices. In FY11, after considering Committee and program office recommendations, including reports from the Science Advisory Board (SAB) and comments submitted by various private parties, the Council designated formaldehyde and hexavalent chromium compounds as higher hazard substances, (simultaneously decoupling trivalent chromium from hexavalent chromium). A formal recommendation to designate had been received several months earlier from TURI (consistent with an SAB report), but the Council postponed a decision on the matter until the National Academy of Sciences could review EPA's formaldehyde risk assessment. Although the NAS panel included numerous criticisms of EPA's work, it confirmed several key findings of harm from formaldehyde exposures, including irritation to the eyes, nose, and throat; lesions in the respiratory tract; genetic mutations at high concentrations, and causation of nasopharyngeal cancer. The Council and Committee members performed extensive and detailed review in making the decisions to designate.

TURA Advisory Committee

Both the Advisory Committee and the Council engaged in extensive discussion of toxics use by small users, as part of the deliberations concerning Priority User Segment designation and a continued response to earlier presentations on asthmagens by representatives of the Lowell Center for Sustainable Production[7]. Topics discussed included communications with the Board of Cosmetology regarding the unique requirement in the state for using formaldehyde in disinfecting tools, assistance to the Department of Fish and Game regarding reducing use of lead sinkers, and research pertaining to isocyanates in spray foam insulation and chlorine in pools. These discussions led to closer working relationships between the member agencies. OTA and the Fire Marshal's office are now working together on preventing accidents from the use of hazardous materials; a working group including OTA, the Department of Public Health, and TURI are focusing on reducing the use of asthmagens; and TURI, OTA and the Division of Occupational Safety (of the Department of Labor Standards) are working together on nanosafety. The Committee and the Council have provided continuous support for this greater coordination of agencies on TUR.

The Council and the Advisory Committee have also shown a continuous interest in ensuring that the program sets priorities and compares chemicals (when grading for hazard, or determining whether they should be listed or delisted) in a systematic, consistent and optimal manner. The many suggestions and insights provided by Council and Committee members (as well as program staff) were incorporated in a report detailing *Decision-Making under TURA: Process Overview and Reference Guide*[8]*,* finalized by TURI in FY11 but intended as a living document to be updated consistent with progress in the art.

The Department of Environmental Protection (MassDEP)

MassDEP administers the regulatory components of the TURA program. Every July 1, large-quantity toxics users submit an annual report to the Department on each chemical listed in TURA that they used in above-threshold amounts during the previous calendar year. These reports supplement the Toxics Release Inventory (TRI) report that must be submitted to the United States Environmental Protection Agency on the same date. Every other year, large quantity toxics users must also develop a TUR plan or plan update, which must be signed by a MassDEP certified TUR Planner. A summary of the plans must be submitted with the TUR report. Because 2010 was a planning year, plan summaries as well as CY 2009 toxics use reports were due on July 1, 2010.

7. See: Asthma-Related Chemicals in Massachusetts: an Analysis of Toxics Use Reduction Act Data, http://sustainableproduction.org/downloads/AsthmaandTURAdatareportJuly2009.pdf.

8. http://www.mass.gov/Eoeea/docs/eea/ota/tur_prog/decision-making-framework-nov-15-2010-final-print.pdf.

In FY11, MassDEP processed TUR reports from more than 500 filers, checking for accuracy and compliance; followed up on report anomalies and conducted inspections; took enforcement actions; provided assistance to hundreds of callers; processed fees and fee waivers; qualified and certified TUR Planner applicants; and worked with OTA and TURI on all aspects of TURA policy development and program planning.

Data The most recent data available at this writing derives from the 2009 Toxics Use Reduction Information Release, which summarizes the information received from the TUR reports that were submitted on July 1, 2010[9]. The Department received:

- 1,455 Form Ss with an equal number of Form Rs (from the federal Toxics Release Inventory, also required to be submitted)
  - From 500 large-quantity toxics users,
  - Using a total of 881 million pounds,
  - Reporting 148 individual toxic chemicals.

Outreach MassDEP provides direct assistance as well, including:

- Updated guidance on how to report and sent out notifications of requirements,
- An updated TURA list,
- Reporting training sessions (with EPA and OTA, on both TURA and federal TRI reports) in five locations,
- Extensive telephone support to filers from April through July.
- After conducting a data quality assurance process, MassDEP:
  - Contacted firms that should have filed and did not,
  - Contacted firms that did not submit required information,
  - Contacted firms that submitted anomalous data and requested explanations or corrections.

Enforcement During FY11 the Boston office conducted 13 enforcement actions for missing or incomplete TUR reports or plans, including:

- 12 notices of non-compliance,
- One administrative consent order with a penalty.

Regional offices conducted 67 inspections for TURA compliance, resulting in four enforcement actions:

- Two notices of noncompliance,
- Two administrative consent orders with penalties.

9. See http://www.mass.gov/MassDEP/toxics/priorities/09relfin.pdf .

Fee Revenue TURA-regulated facilities must pay annual fees, unless they have obtained a financial hardship waiver. In FY11 MassDEP:

- Issued 10 fee waivers and denied seven, (pertaining to requests over two reporting years),
- Collected $3,020,300 in annual fees and $25,000 in late fees from firms that failed to file reports on-time,
- Collected $12,750 in fees from TUR planners who applied for the Department's certification.

TURA Planner Certifications Toxics Use Reduction Planners (TURPs), independent parties who review and approve annual toxics use reduction plans, must be certified by MassDEP. In FY11, MassDEP:

- Certified four new TURPs,
- Recertified 60 TURPs whose two-year certification was due to expire.

Of these certifications and recertifications:

- 18 were for "Limited Practice" TUR planners who are only authorized to sign plans from their own company,
- 17 were for "General Practice" TUR planners who are allowed to sign the plans of any toxic user,
- 10 were certified as eligible to sign TUR plans and Resource Conservation plans,
- 11 were certified as eligible to sign TUR plans and Environmental Management System plans,
- 8 were certified as eligible to sign TUR plans, Environmental Management System plans and Resource Conservation Plans.[10]

Six applicants for general practice TURP certification passed the exam administered by MassDEP, and MassDEP reviewed and approved approximately 490 courses submitted by TURPs for continuing education credits, for maintaining TUR, RCP and EMS certifications. MassDEP also reviewed the work experience in applications for limited practice TURPs for relevance to TUR.

Resource Conservation Plan Review MassDEP also reviewed the experience of companies undertaking Resource Conservation planning, finding that results generally exceeded company projections (see INTRODUCTION above).

- ***Water*** Philips Lightolier in Fall River, a manufacturer in architectural specification grade lighting products, projected that it would save 27 million gallons (30 percent) by installing programmable controlled pumps to reduce water flow plantwide, increasing the re-use of cooling water, reducing irrigation water, and reducing flush volume for all sanitary uses. The

10. Companies that have gone through three TUR planning cycles can elect to do a Resource Conservation Plan (RCP) every other planning cycle, or incorporate TUR planning into an existing, qualified Environmental Management System (EMS). These alternative plans must be signed by MassMASSDEP certified TURPs that also have been approved as Environmental Management System or Resource Conservation Planners.

actual savings was more than 45 million gallons, (50 percent). Annual savings are more than five times the $50,000 investment.

- ***Energy*** Millipore in Bedford, which provides tools and services for bioscience research and biopharmaceutical manufacturing, estimated that it would cut its energy use by 5 percent by installing solar panels, changing lighting, improving their air compression and boiler systems, and using efficient motors. The projects resulted in a 21 percent reduction, (more than 6 million KwH/year), with a payback of 2.3 years.

The Toxics Use Reduction Institute (TURI)

The Toxics Use Reduction Institute (TURI) at University of Massachusetts Lowell (UML) provides resources and tools to help Massachusetts businesses and communities make the Commonwealth a safer place to live and work. TURI provides research, training, technical support, laboratory services and grant programs to reduce the use of toxic chemicals while enhancing the economic competitiveness of local businesses. The Institute collaborates with diverse groups such as communities, businesses, institutions, and government and public entities to develop innovative ideas and share best practices.

In FY11, TURI reached hundreds of participants from industry, community group, small businesses, and government at events that it sponsored or helped organize. It sent regular bulletins on TUR to 440 subscribers; organized a ground-breaking international conference on environmental, health and safety in nanotechnology; produced policy analyses of four toxic chemicals; assisted 24 companies in testing safer cleaning chemicals; funded five communities to carry out TUR projects; and held six public demonstrations of TUR in practice in industry

Assistance to Industry In FY 11, TURI services to industry included the following:

- Two demonstration site events at Ophir Optics, in conjunction with OTA, giving industry a chance to view the operations and hear about their use of lean manufacturing techniques to reduce volatile organic chemical use and hazardous waste generation, and increase energy efficiency,
- A research symposium entitled "Greener Materials Research Symposium" at UMass Lowell, where currently funded and past researchers presented their research to other faculty, students and Massachusetts businesses,
- Leadership of the New England Lead-Free Electronics Consortium, which completed Phase IV testing program, (focusing on long-term reliability issues associated with transitioning to lead-free electronics manufacturing), and presentations at meetings of the Surface Mount Technology Association and the Institute of Electronics and Electrical Engineers, and the International Microelectronics and Packaging Society,

- Four wet cleaning demonstration events at Ace Cleaners in North Andover, where perchloroethylene use has been eliminated, following a $17,000 industry matching grant. More than 30 dry cleaners learned how to switch to a water-based system.

Assistance to Communities In FY11 TURI provided community grants for the following projects:

- The Boston Public Health Commission, for helping autobody and repair shops try replacing products containing toxics such as toluene and perchloroethylene with non-toxic, water-based alternatives,
- The Brazilian Women's Group, Allston, for educating the Brazilian community concerning toxic cleaners and safer substitutes, including producing a radio talk show and an advertisement shown on Globo International Network,
- Frank Newhall Look Memorial Park, Florence, for transitioning 35,000 square feet of lawn to organic management and educating the community about it,
- Groundwork Lawrence, for educating hundreds of community members on toxics found in household cleaners and personal care products and safer products, and
- Northeast Organic Farming Association, Barre, for presenting organic lawn care workshops in 10 towns and cities across the state to teach homeowners how to care for lawns without pesticides.

University Research TURI funded research at UMass Lowell on the performance of lead-free electronics, ozone sterilization for bioreactors (to replace chlorine), and alternatives to nonlyphenol ethoxylates (widely used surfactants highly toxic to aquatic organisms). At TURI's annual Champions of Toxics Use Reduction event, Assistant Professor Ramaswamy Nagarajan of Plastics Engineering at UMass Lowell was recognized for his extensive green chemistry work, researching and developing safer alternative materials, including flame retardants and surfactants.
See Appendix B for more details.

Alternatives Assessment Activities The Toxics Use Reduction Institute has been a national and international leader in promoting understanding of alternatives assessments as a way of promoting a shift towards safer chemicals in industrial processes and products. In FY11 TURI:

- Performed a comprehensive alternatives assessment for dry cleaners covered by TURA because of their use of perchloroethylene,
- Led development and dissemination of alternatives assessment guidance through the Interstate Chemicals Clearinghouse (IC2) Safer Alternatives Wiki (www.ic2saferalternatives.org), a forum for collaboration and information sharing,

- Collaborated with the Lowell Center for Sustainable Production to develop a white paper on the application and promotion of alternatives assessments, which was the foundation for a two-day seminar on alternatives assessments attended by representatives of 14 federal agencies and seven state agencies, hosted in Washington DC by EPA and coordinated by TURI and the Lowell Center,
- Participated in the "primary prevention" subgroup of the Center for Disease Control National Conversation on Public Health and Chemical Exposures. In this process TURA and TURI's work in alternatives assessment has emerged as a model as part of the National Conversation Action Agenda,[11]
- Partnered with the Green Chemistry in Commerce Council (GC3), an industry association, and the Lowell Center, on a pilot project to conduct an alternatives assessment of plasticizers (both phthalates and non-phthalates) using the "Green Screen"[12] tool for the initial chemical evaluations.

Education and Training Every year, the Institute develops and hosts a seven-week course for new toxics use reduction planners and offers continuing education conferences in both the fall and spring. More than 270 health and safety managers and environmental consultants attended the trainings in FY11. (See Appendix C for a list of major courses offered). TURI's education opportunities are posted on its website, and described in a monthly TURI newsletter.

TURI Laboratory In FY11 TURI's Green Cleaning Laboratory assisted 12 Massachusetts companies in the metal-working, biomedical, coating and cleaning chemicals sectors in finding evaluating alternatives to toxic cleaners. In addition, the lab provided fee for service product performance testing to a dozen chemical cleaner manufacturers that were applying for green labeling certifications and is researching disinfection practices.

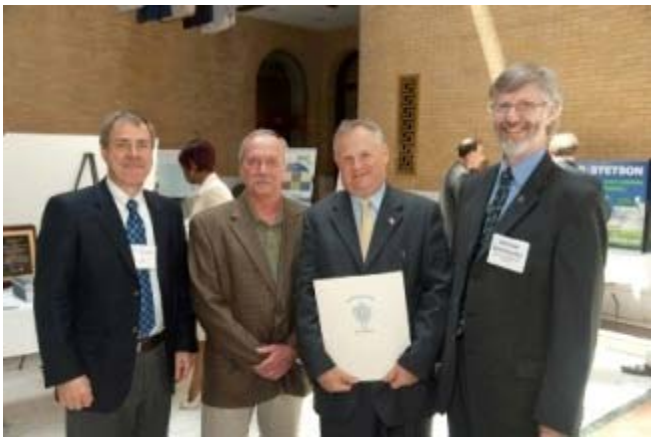
The Science Advisory Board TURI organized five meetings of the TURA Science Advisory Board (SAB), a board of experts who make scientific recommendations to the TURA Program. The SAB assessed the hazards of volatile methyl siloxanes and d-limonene, because they are potential substitutes for trichloroethylene and perchloroethylene, recently designated as Higher Hazard Substances. In addition, the SAB reviewed new federal agency and review committee reports on formaldehyde, as well as information provided by formaldehyde manufacturers, to inform the Council's deliberations on designating formaldehyde as a Higher Hazard Substance.

Policy Recommendations In FY11, TURI developed the following recommendations for the Administrative Council on TUR:

- A policy recommendation to designate formaldehyde as a Higher Hazard Substance,
- A policy analysis recommending the separation of hexavalent chromium compounds from the general chromium compounds category, and the designation of hexavalent chromium compounds as a Higher Hazard Substance.

11. http://www.nationalconservation.us/?source=govdelivery.
12. http://WWW.cleanproduction.org/greenscreen.php

In order to serve as a guide for the program offices, the SAB, the Advisory Committee and the Administrative Council, with extensive input from all of these bodies, TURI developed the document *Decision-Making under TURA: Process Overview and Reference Guide*. The document provides an overview of the decision-making process concerning listing, delisting, and designation of higher or lower hazard rankings.



TUR Champions In June, TURI held its annual State House event to recognize Massachusetts companies, community organizations and researchers for outstanding environmental accomplishments. The projects developed new information or shared information on safer alternatives, for such purposes as cleaning, lawn care, auto repair, and flame retardants.

Nanotechnology TURI has been very active in this important new industrial sector in two areas, i.e., assessing the health and safety impacts of engineered nanoparticles, and evaluating the use of nanomaterials, e.g., nanoclays, as substitutes for toxic chemicals used in manufacturing. In FY11, TURI, along with the University of Massachusetts Lowell and the Center for High-rate Nanomanufacturing (CHN), organized the Fifth International Symposium on Nanotechnology, Occupational and Environmental Health, which was held in August 2011. This important international meeting was co-chaired by Dr. Michael Ellenbecker, TURI Director, and attracted more than 300 attendees from almost 30 countries to discuss the latest issues in nanotechnology health and safety.

TURI Library The TURI Library provided resources and research services to numerous students and faculty, businesses, communities, government agencies and individuals, and issued weekly electronic Greenlist news bulletin's to more than 400 recipients.

The Office of Technical Assistance and Technology (OTA)

OTA provides one-on-one confidential assistance to companies and other entities on toxics use reduction, energy efficiency, water conservation, and other waste reduction, as well as on compliance with any related requirements. OTA also provides assistance through email, phone, fact sheets, guidance, presentations, and workshops. OTA has provided policy assistance to regulatory agencies and other governmental bodies on the incorporation of preventive strategies and methods of direct assistance to the regulated community. OTA has been invited to provide on-site assistance at more than 1,500 facilities. The TUR performance of companies visited by OTA has been markedly higher than those not visited.

In FY11, the Massachusetts Office of Technical Assistance provided assistance directly to more than 750 individuals responsible for operations and/or compliance at their facilities, through workshops, phone, email, or onsite visits. The office reached thousands more through broadcast emailings and web postings.

Onsite Assistance Fifty-two facilities, including those from the chemicals, fabricated metals, electrical, food processing, plastics, machinery, textiles, and paper industries, made use of OTA's full scale onsite assistance service. About half of the facilities were receiving assistance from OTA for the first time. Slightly less than half of the companies were large quantity toxics users, filing TURA reports.

Recommendations provided OTA provides many recommendations during visits, and in email and phone communications, but primarily tracks results by following up on formal, written recommendations. Over the period FY09-FY11, these have concerned:

- Energy, 46 percent
- Regulatory, 34 percent
- Pollution Prevention, 13 percent
- Water, 7 percent

To the extent that OTA has been able to determine through follow-up, companies have reported implementing:

- More than 33 percent of nearly 300 energy recommendations provided,
- About 50 percent of the 40 water conservation recommendations, with several more in the planning stage,
- More than 80 percent of the 200 recommendations concerning regulatory compliance provided,
- About 50 percent of the 80 recommendations provided on pollution prevention.

The regulatory recommendations concerned:

- Air, 32 percent
- Hazardous waste, 28 percent
- OSHA, 26 percent
- TURA, 6 percent
- Water, 3 percent
- Tier 2 (EPCRA), 3 percent
- Toxics Release Inventory, 2 percent

Case Examples of Toxics Use Reduction Achievements by Companies Working with OTA OTA's work with companies is confidential. Some companies are willing to share what they have accomplished, and, in FY11, OTA published four company stories. Ophir Optics opened its doors to the public in demonstration site events hosted by TURI. (See Appendix C for summaries of ITW Devcon/Plexus, Polartec, and A.W. Chesterton).

- ***Ophir Optics*** OTA recommended that Ophir, a maker of infrared lenses, investigate strategies for reducing VOC emissions from a coolant used in cutting operations. Because Ophir had recently received training on the lean production methodology known as Six Sigma, a systematic approach to identifying the causes of defects in manufacturing and eliminating

variability in the manufacturing process, the company decided to apply the approach to the implementation of OTA's suggestions. OTA had pointed out that the company might be able to reduce the amount of coolant it used by determining the minimum amount that still produced quality results. Six Sigma techniques turned out to be ideally suited to the task, and Ophir was able to reduce use, and thus volatile emissions, by 70 percent. In addition to this effort, which improved operations as well as reducing emissions, Ophir implemented OTA's suggestion to segregate its wastes to reduce its hazardous waste and waste management costs, and reduced shipped hazardous waste by two -thirds. TURI helped produce a demonstration site event and case study[13].

Environmentally Preferable Purchasing In coordination with staff from the Operational Services Division (OSD) OTA also chaired the Governor's Toxic's Reduction Task Force, charged with implementing Executive Order 515, which requires state agencies to procure Environmentally Preferable Products and services (EPPs) "whenever such products and services are readily available, perform to satisfactory standards, and represent best value to the Commonwealth." The Task Force began the process of analyzing existing purchasing information in order to establish measurement of progress in E.O. implementation[14].

Digital Printing on Textiles Technology inspired by an OTA engineer is being developed under a Cooperative Research and Development Agreement (CRADA) by the Advanced Technology & Manufacturing Center (ATMC) UMass Dartmouth in Fall River and the U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC). The project grew out of successful pilot demonstrations developed and managed by OTA involving the application of digital printing, long developed for printing on paper, to textiles. Digital printing on textiles has the potential for huge reductions in chemical, water and energy use.

Water Conservation OTA published four case studies on water conservation, three of which were drawn from the EPA - and MassDEP-funded project it conducted in the city of Marlboro[15].

13. See http://www.mass.gov/Eoeea/docs/eea/ota/case_studies/ophir-optics-case-study.pdf.
14. http://www.mass.gov/Eoeea/docs/eea/ota/tur_prog/epp-eo515-annual-report-2010.pdf.
15. http://www.mass.gov/Eoeea/docs/eea/ota/resource_conservation/water_conserv_case_study_final.pdf. and http://www.mass.gov/Eoeea/docs/eea/ota/resource_conservation/marlboro_water_final_report.pdf.

Energy Workshops OTA hosted two energy efficiency events in June, with more than 60 attendees. In Tewksbury, the focus was industrial process heat recovery, solar energy, and financial assistance for energy efficiency improvements, followed by a site tour of the process heat recovery in place at Delaware Valley Corporation[16] and its new solar array. In Holyoke, the focus was tools and techniques to achieve energy cost savings, including understanding your energy bill, energy profiling software, utility incentives and "green" loans, and the technology of building and process equipment energy management, followed by a visit to Smith College's Cogeneration facility and LEED Gold Science and Engineering Building.

Email alerts and training In addition, OTA issued regulatory and energy efficiency alerts by email to hundreds of subscribers, and provided training on water and energy conservation as part of TURI's continuing education conferences for TUR planners, including rainwater harvesting, and training on how to establish an environmentally preferable purchasing program. (See details in Appendix C).

New Organizations In FY11, with the North Central Massachusetts Chamber of Commerce in Fitchburg, OTA founded the North Central Business Environmental Network (NCBEN). This is the third business environmental network that OTA has created. The Central Massachusetts Business Environmental Network has been meeting regularly for 15 years.

Taking advantage of the trend at universities and colleges to designate specific staff as responsible for sustainability initiatives, with the sustainability coordinator of Suffolk University, OTA formed the Massachusetts School Sustainability Coordinators Roundtable (MSSCOR), using the same model it has used for business environmental networks. MSSCOR currently has over 70 members, and its webpage is hosted by Second Nature, the organization that founded and oversees the American College & University Presidents' Climate Commitment.

Safe Nanotechnology In 2007, OTA began investigating the concerns raised by the use of nanomaterials – particles engineered on the scale of a billionth of a meter – and determined that companies required guidance on how to use these particles safely. In FY11, OTA released the first state guidance on this topic in the nation, *Considerations for the Safe Development of Nanotechnology.*[17] The premier trade group for businesses using nanotechnology, the NanoBusiness Alliance, posted the guidance on its website.

Intern Program Beginning in FY10, OTA has employed graduate students using funds from an EPA grant, to assist with on-site visits, research on Priority User Segment designation, and data processing and analysis. As part of the grant, intern presented on Toxics Use Reduction and OTA's work, and their experiences, at the educational institutions where they were obtaining their degrees. During FY11, OTA expanded its intern program, and has had six additional interns in unfunded positions,

16. http://www.mass.gov/Eoeea/docs/eea/ota/case_studies/delaware_valley_corp.pdf.
17. http://www.mass.gov/Eoeea/docs/eea/ota/tech_reports/ota_nanotech_guidance.pdf.

primarily assisting in data analysis and research, on a range of topics, including: asthmagens, energy opportunities, environmentally preferable purchasing, and the economic benefits of reducing toxics use.

Future Direction

A number of themes have emerged from the recent chemical policy work performed by the program. The following does not represent formal decision-making of the Council or program offices, but describes the focus of planning activities at this time.

Chemical List Categorization and Maintenance The program and its advisory bodies are examining the approaches to keeping the TURA chemical list up-to-date, including looking at groups of chemicals with similar health or environmental concerns (e.g., carcinogens) or the lists of high priority substances from other jurisdictions (e.g., European Union Substances of Very High Concern). There is a considerable body of evidence about health and environmental concerns that is relatively new, and most of these substances are not on the TURA list.

The 2006 Amendments charged the program with categorizing the list, so that the Commonwealth might focus on the substances and uses of highest concern. Currently, the pace of designation of Higher Hazard Substances and Lower Hazard Substances is quite slow. The advisory bodies are looking into whether the current approach is appropriate, or whether a more streamlined approach would better meet the goals of the Act.

Coordinating Council Member Action on Toxics The members of the Council have increasingly taken action together to fulfill TURA's general mission of toxics use reduction, using tools such as education and coordination, and other regulatory programs. Examples include the Council agencies' assistance to the Fire Marshal in developing rules pertaining to safe processing of hazardous chemicals; Council agencies working together on asthmagen use reduction; and agencies working together to research uses of PBTs by entities not covered under TURA.

Reducing Toxics Use Not Reached by Conventional TURA Reporting and Planning There is significant toxics use outside of the population that is covered by TURA reporting and planning. Each time the program has examined specific chemicals as priorities (PBTs, trichloroethylene, toxics in product, asthmagens), entities in unregulated categories and specific uses not included in TURA, have turned out to merit additional attention to reduce worker exposure risk and releases of the chemical to the environment. This presents opportunities for continued coordination at the Council level.

Increasing Use of TURA Data Analysis to Guide Program Activities The program agencies are working together to advance the analytical understanding of TURA data. MassDEP has been analyzing past TURA plans and reports, to identify key trends or patterns in TUR progress. OTA is analyzing the new Section Four data (of TURA reporting form S), which details changes in chemical use on the production unit level. TURI is analyzing the chemical data by health or environmental effect (e.g., report on carcinogens). TURI and OTA are also mining the TUR plan summary descriptions to identify successful TUR options and common barriers.

APPENDIX A

Review of Implementation of 2006 Amendments

In 2006 TURA was amended to build on the successes of the program. The Amendments embodied several strategies:

- To expand the focus of the law beyond reduction of the chemicals on the list, to include the goals of reductions in energy, water and materials use as well,
- To increase focus on higher hazard substances,
- To improve and streamline reporting requirements.

The results of establishing the Resource Conservation Plans are noted above, in the introductory section. The following discusses the other results of the 2006 Amendments.

Changes to and Categorization of the Chemical List The 2006 Amendments automatically designated all Persistent, Bioaccumulative and Toxic chemicals as Higher Hazard Substances (PBTs: those of concern in Massachusetts are primarily lead, mercury, and dioxins). Since then, the Administrative Council, consistent with the recommendations of the Science Advisory Board, the Advisory Committee, and the program agencies, designated six additional substances[18] as higher hazard:

- Trichloroethylene
- Cadmium
- Cadmium compounds
- Perchloroethylene
- Hexavalent chromium compounds[19]
- Formaldehyde

The program also considered whether to retain chemicals listed under the national Superfund cleanup program (CERCLA, the Comprehensive Environmental Compensation and Liability Act) on the TURA list. In order to simplify the list, 186 chemicals that were listed specifically on CERCLA, but also belonged to chemical categories listed under EPCRA (the Emergency Planning and Community Right to Know Act) are now no longer listed individually. Seven CERCLA chemicals were dropped from the list:

- Adipic acid
- Ammonium bicarbonate
- Ammonium chloride
- Ammonium sulfamate
- Amyl acetate

18 The Council voted to designate hexavalent chromium compounds and formaldehyde as Higher Hazard Substances in FY11; final regulations are expected to be promulgated by the end of Dec. 2011.

19 The Council distinguished hexavalent chromium from the less toxic tri-valent chromium.

- Fumaric acid
- Maleic acid

The Council engaged in extensive deliberations concerning the makeup of the chemical list, prompting the program to develop a "decision document"[20] outlining how hazard is assessed by the Science Advisory Board and priorities are selected by the program.

Several other chemicals were recommended as candidates for lower hazard designation. As of this writing, the Council has designated the following chemicals as lower hazard substances:

- Isobutyl alcohol
- sec-butyl alcohol
- n-butyl alcohol
- Ferric chloride
- Ferrous chloride
- Ferric sulfate
- Ferrous sulfate (including the hydrated form)
- Butyl acetate
- Iso-butyl acetate.

Priority User Segments The 2006 Amendments created a four-year window, after a higher hazard substance is designated, within which a segment of toxics users of that substance can be designated as a priority for the program. The impacts of prioritization of user segments are:

- The ten-employee threshold is eliminated, extending TURA's reporting and planning requirements to smaller businesses,
- Additional reporting may be required on toxic use and byproduct,
- Performance standards can be set, shifting the burden to segment members to show why they cannot meet the standard for efficient use,
- Small quantity toxics users (using below 1,000 pounds) can be required to do all or part of toxics use reduction reporting and/or planning.

<u>Persistent, Bioaccumulative, and Toxic (PBTs)</u> In 2010, OTA recommended the Council not designate any Priority User Segments (PrUS) for PBTs, as OTA's research showed that the use of lead and mercury by TURA-covered entities was in substantial decline, and other PBTs, such as dioxins, are best addressed not through TURA but through other programs, such as MassDEP's regulations for waste incinerators. However, OTA found that significant uses of PBTs do persist in areas that cannot be reached by TURA, as they are not used in facilities (services using or removing lead paint), or are not in covered industrial categories (such as lead in aviation or boat fuels, or shooting ranges, or polycyclic aromatic compounds, in asphalt repair). For these uses, the primary strategy will be to perform outreach and education, and to increase awareness of the problem and the need to develop solutions.

20. http://www.turi.org/Our_Work/Chemicals_Policy/Decision-Making_Under_TURA

Trichloroethylene (TCE). In 2011 the Council voted not to designate users of trichloroethylene for cleaning as a priority user segment for achieving TUR. Prior to the vote, the executive director reported that the Advisory Committee members in attendance at the most recent meeting had expressed support of the PRU designation. The Council took notice of current economic conditions, and out of concern for the burden of TUR reporting and planning on companies with less than ten employees, and the impact on scarce program resources at the state, decided not to designate in light of the relatively small number of facilities that would be brought in. Members commented that in other respects the recommendation to designate was reasonable, and regretted that the four-year provision in TURA prevented the Council from considering designation at a later time.

APPENDIX B

Major TURI Educational Events

- **TUR Planner Course – Marlborough** *14 future planners attended*
- **TURA Environmental Management Systems Training – Lowell** *15 TUR Planners attended*
- **2010 Fall Continuing Education Conference – Norwood** *114 attendees, including 72 TUR planners.* Sessions included solvent substitution, energy conservation, Analog Devices case study, water conservation, options assessment tools and regulatory updates.
- **Community Conference: Sharing Successes and Networking** *113 attendees, including 23 TUR Planners*
- **Cleaner Technology Demonstration Site: Incorporating TUR into Lean Manufacturing and Six Sigma at Ophir Optics** *28 attendees, including 13 TUR Planners*
- **Spring Continuing Education Conference- Lowell** *85 attendees, including 56 TUR planners.* Sessions included chemical process safety, energy efficiency, renewable energy, TUR in pharmaceutical manufacturing and metal finishing, and Environmental Management Systems.

Research Funded by TURI

- *Reflow and Wetting Property of Lead-Free Nanosolders on Reactive Substrates and Printed Circuit Boards* , *Dr. Zhiyong Gu and Dr. Sammy Shina.* Tin-based nanowires were fabricated and analyzed to evaluate their performance as an alternative to traditional lead-based soldering techniques currently used in the manufacture of electronics. The research was conducted in collaboration with industry partners, including EMC of Hopkinton.
- *Ozone-Based Steam-In-Place Sterilization of Bioreactors, Dr. Seongkyu Yoon.* This project investigated the use of ozone to provide a safer and energy efficient alternative to traditional chlorine-based steam sterilization techniques commonly used in the biopharmaceutical industry. The research used an ozone-generating system designed and manufactured by Massachusetts-based MKS Instruments.
- *Polysaccharide-Based Emulsifiers for the Replacement of Nonylphenol Ethoxylates (NPEs), Dr. Ramaswamy Nagarajan and Dr. Ryan Bouldin.* Bio-based surfactants were synthesized from sources such as polysaccharides and pectin, potential safer substitutes for NPEs, emulsifiers used in cleaning products that have been identified as chemicals of concern by the EPA. Researchers compared the efficacy of these alternative emulsifiers in the Institute's Surface Cleaning Laboratory. The research led to the 2011 American Chemical Society Best Poster Award to graduate student Farhana Zaris for her submission entitled "Surface Active Polymers Derived from Naturally Occurring Polysaccharides."

APPENDIX C

OTA Case Examples

***ITW Devcon/Plexus*.** Devcon, a maker of epoxies and structural adhesives, used OTA's assistance to find an alternative to acetone which has several preferable environmental aspects, including that it is derived from renewable resources. The company was able to save about 10,000 pounds of acetone annually, resulting in a savings of about $ 5,000 (after accounting for the cost of the alternative cleaner).

Polartec. Polartec, a manufacturer of fabrics that are used in the outdoor apparel and military industries, has worked with OTA since the 1990's. The company found an alternative to caustic soda, used for removing knitting lubricating oils, which worked well at low temperatures (saving on energy). After changing to the new cleaning alternative, Polartec was able to significantly reduce the time required for processing without compromising product quality. Reduced dye cycle times allowed the company to improve manufacturing efficiency by 16 percent, reduce chemical use by 10 percent, and lower utility costs by 12 percent.

A.W. Chesterton. Chesterton, which manufactures and distributes industrial maintenance products, packing and gasketing materials, and sealing devices, worked with OTA to identify and implement several energy efficiency and energy conservation projects. The company purchased an ultrasonic leak detector and a computer program to identify and address air leaks in its extensive compressed air system, and implemented a new procedure to scan the compressed air system on a rotating basis. Over a period of five months staff located and repaired compressed air leaks that represented $33,242 in electricity cost savings. Other recommendations made by OTA that were implemented by the company include new procedures preventive maintenance on hot water heaters and steam boilers; fabrication and installation of energy efficient covers on process tanks; replacement of rooftop HVAC units that had electric heating with higher efficiency, natural gas fired units; and replacement of T12 lamp fixtures with more energy efficient T8 lighting.

INFORMATION PROVIDED IN OTA OUTREACH

Regulatory Alerts and Training. OTA continued its practice of keeping the regulated community up to date (in addition to regulatory updates at workshops described elsewhere) by sending out regulatory alerts to more than recipients on:

- The addition of chemicals to the EPA's Toxics Release Inventory (which affects TURA reporting),
- Changes in Tier II reporting,
- The availability of regulatory training provided by EPA and MassDEP,
- The designations of hexavalent chromium compounds and formaldehyde as higher hazard substances,

- Federal Clean Air Act requirements pertaining to boilers and greenhouse gases,
- New cadmium, chromium, lead, manganese, and nickel hazardous air pollutant requirements,
- Producing and distributing a fact sheet on new requirements pertaining to facilities using methylene chloride in paint stripping.

In addition, OTA provided the following training on regulatory requirements:

- With EPA and MassDEP, on filing toxics use reports and TUR planning reports, and EPA's Toxics Release Inventory, and its green chemistry initiative. Four events were held, in Burlington, Chicopee, Plum Island, and Fall River;
- To facilities participating in the Eco-Star program at Devens, covering a range of regulatory programs including OSHA, TRI, Clean Air Act, TURA, and hazardous waste; and
- To attendees of Mass Biotech Council's Environmental, Health and Safety Committee on tracking volatile organic chemicals.

Efficiency Alerts and Training. OTA also kept recipients of its electronic messages up to date on:

- New utility incentives for energy efficiency,
- Opportunities to utilize the Industrial Assessment Center's free onsite audits for process and facility energy efficiency,
- TURI demonstration site events, including wet cleaning for dry cleaners, and
- The Department of Energy's DOE's Process Heating Assessment and Survey Tool (PHAST) software.

NCBEN Meetings. The Attendees of NCBEN's meetings learned about:

- MassDEP's new requirements for low-volatility solvents in cold cleaning operations,
- The TURI Surface Cleaning Lab about alternatives that are likely to be compliant and to work for many applications, as well as the Lab's free services for assisting in evaluating alternatives,
- The MassSAVE incentive program for energy efficiency,
- The "matrix" of regulatory requirements created by CMBEN, and
- Opportunities for grant funding for toxics use reduction projects.

Central Massachusetts Business Environmental Network. This long-running organization, informally hosted by OTA and the Worcester Chamber of Commerce, held four meetings during FY11, on:

- Proposed state hazardous materials process or processing regulations,
- Mandatory greenhouse gas reporting and permitting, (MassDEP and EPA programs),
- Sustainability trends and local companies seriously pursing green initiatives, new OSHA enforcement practices, and the nexus between OSHA's and EPA's air emissions standards.

MSSCOR meetings In FY11, MSSCOR held four meetings:

- Smith College, tour of cogeneration and adsorption chiller that uses summer heat load from gas furnace for air conditioning, LEED building, green roof, discussion of optimizing recycling,
- Worcester Polytechnic Institute, tour of Gold-certified LEED building, presentations on "Saving Energy with Building Management Systems" by BCM Controls Corporation and "Demand Response and Advance Metering for the Education Sector" by EnerNOC Inc.,
- Northeastern University, new state air regulations, including greenhouse gas accounting,
- Suffolk University, roundtable discussion on university sustainability programs, available resources, topics of interest for future meetings, and how MSSCOR should be organized.