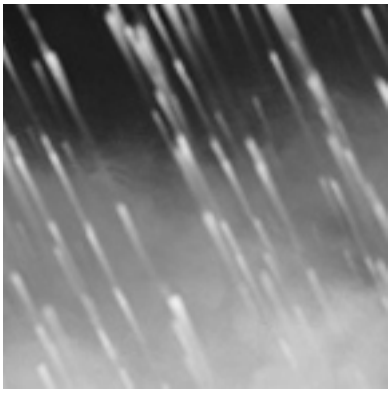
2002 Toxics Use Reduction Information Release

June 2004





Commonwealth of Massachusetts
Department of Environmental Protection

Developed in collaboration with:
Office of Technical Assistance for Toxics Use Reduction
Toxics Use Reduction Institute
Executive Office of Environmental Affairs

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Executive Summary

The Toxics Use Reduction Act (TURA) Program now has 13 years of toxics use information in Massachusetts. This information shows that manufacturers and other businesses statewide have reduced their reliance on toxic chemicals dramatically, making Massachusetts the national leader in demonstrable reductions in toxic chemical use and providing clear evidence that the state has made tremendous progress in pollution prevention. Through toxics use reduction, Massachusetts businesses have reduced chemical transportation risks, workplace hazards, reduced toxics in products, reduced waste, and saved money.

In 2002, 653 facilities reported the use of 191 listed toxic substances. These facilities fell within certain standard industrial classification (SIC) codes, had ten or more full-time employees, and used listed toxic substances at or above reporting thresholds. In total, these facilities reported:

- nearly 1.2 billion pounds of toxic substances used (down from 1.3 billion pounds in 2001) ,
- 106.1 million pounds of toxic byproduct (or waste) generated (down from 112.8 million pounds in 2001),
- 343.3 million pounds of toxics shipped in or as products (down from 376.8 million pounds in 2001),
- 7.8 million pounds of toxics released to the environment (down from 8.9 million pounds in 2001), and
- 34.3 million pounds of toxics transferred off-site for further waste management (down from 35.5 million pounds in 2001).

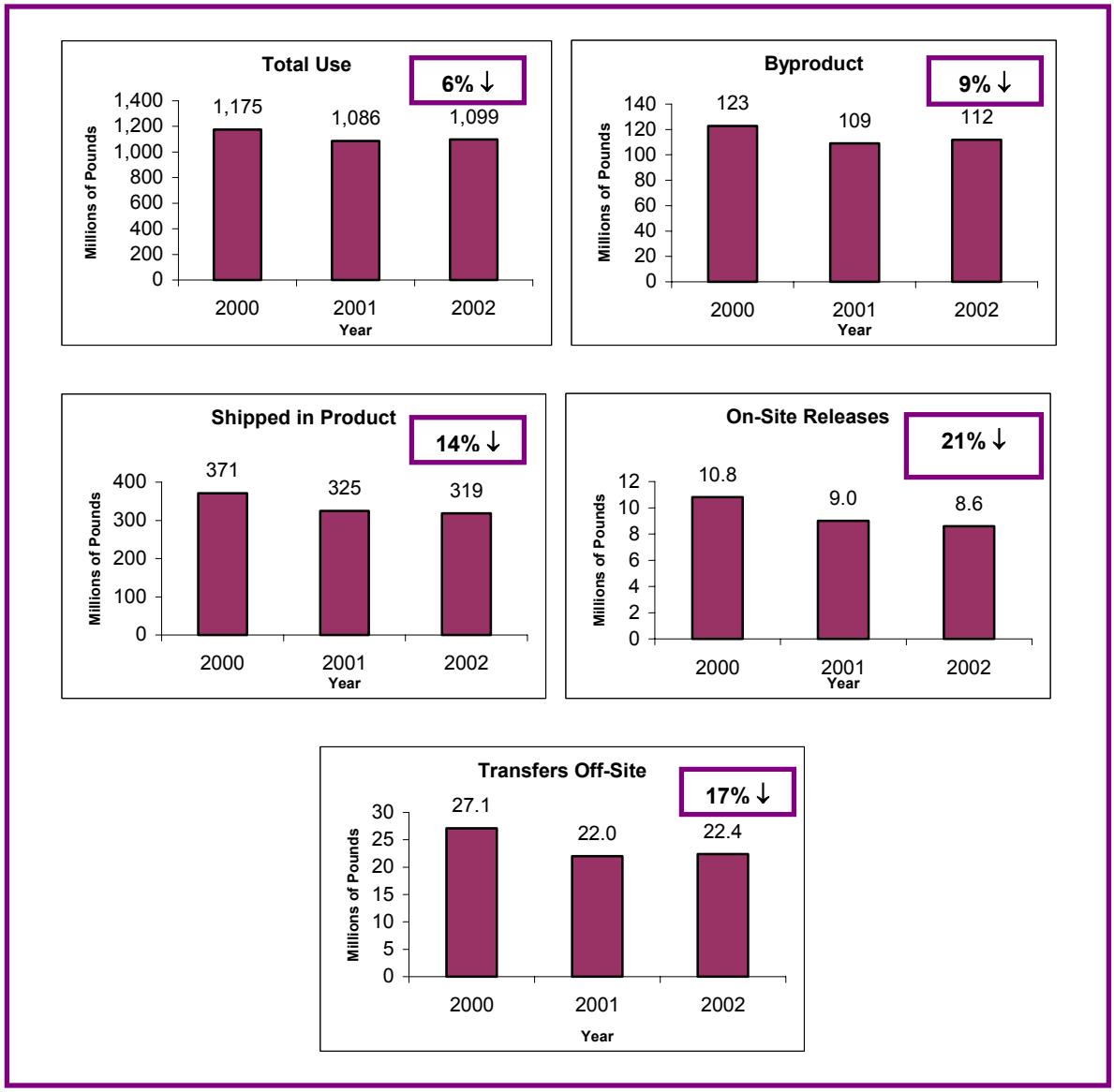
The overall progress of the TURA program is best reflected by toxics use reduction progress within a Core Group of TURA filers. In order to allow for a consistent picture of TURA progress, a 1990 Core Group was defined, consisting of industries and chemicals that were subject to reporting in 1990 and that remained subject to reporting in 2002. However, the original 1990 Core Group represents only about half of the 2002 toxics use because it does not include certain chemicals and industry groups that were added to the TURA program after 1990.

For the 2002 Toxics Use Reduction Information Release, a new 2000 Core Group has been created to more accurately represent progress within the current TURA reporting universe. The 2000 Core Group represents facility categories and chemicals that were subject to reporting in 2000. All currently reportable listed chemicals (with the exception of respirable crystalline silica) and SIC codes are part of the 2000 Core Group. The only current chemical use that is not included in the 2000 Core Group (and will not be included in the future) is use of respirable crystalline silica (which was first reportable in 2001), use of lead and lead compounds due only to the lower 100 pound thresholds for lead and lead compounds that took effect in 2001, and use of any chemical covered by a trade secret claim. These chemical uses are not included in the 2000 Core Group because they either were not reported in 2000 or are trade secret data.

In 2002, the **2000 Core Group** used 99% of the total toxic chemicals reported (excluding trade secret data). Adjusting the data to account for a 10% decrease in production from 2000 to 2002, over that two year period (see Figure 1), the 2000 Core Group facilities reduced:

- toxic chemical use by 6%,
- toxic byproducts by 9%,
- quantities of toxics shipped in product by 14%,
- on-site releases of toxics to the environment by 21%, and
- transfers of toxics off-site for further waste management by 17%.

Figure 1 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2002 (Production Adjusted)



When data are not adjusted for changes in production from 2000 to 2002, the **2000 Core Group** filers reduced:

- toxic chemical use by 16% (from 1,174.6 million pounds in 2000 to 988.9 million pounds in 2002),
- toxic byproducts by 18% (from 122.7 million pounds in 2000 to 100.6 million pounds in 2002)
- toxics shipped in product by 23% (from 371.2 million pounds in 2000 to 286.7 million pounds in 2002),
- on-site releases of toxics to the environment by 29% (from 10.8 million pounds in 2000 to 7.7 million pounds in 2002), and
- transfers of toxics off-site for further waste management by 25% (from 27.1 million pounds in 2000 to 20.2 million pounds in 2002).

In 2002, the **1990 Core Group** used 531.7 million pounds, or 53% of the total toxic chemicals reported (i.e., 1.0 billion pounds excluding trade secret data). Adjusting the data to account for a 22% increase in production from 1990 to 2002, over that twelve- year period the 1990 Core Group facilities reduced:

- toxic chemical use by 42%,
- toxic byproducts by 67%,
- quantities of toxics shipped in product by 58%,
- on-site releases of toxics to the environment by 92%, and
- transfers of toxics off-site for further waste management by 54%.

When 1990 Core Group data are not adjusted for changes in production from 1990 to 2002, the **1990 Core Group** filers reduced:

- toxic chemical use by 30% (from 759.0 million pounds in 1990 to 531.7 million pounds in 2002),
- toxic byproducts by 60% (from 99.8 million pounds in 1990 to 39.9 million pounds in 2002),
- toxics shipped in product by 49% (from 163.6 million pounds in 1990 to 83.5 million pounds in 2002),
- on-site releases of toxics to the environment by 90% (from 20.5 million pounds in 1990 to 2.1 million pounds in 2002), and
- transfers of toxics off-site for further waste management by 43% (from 20.4 million pounds in 1991 to 11.6 million pounds in 2002).

2002 was the third year TURA facilities reported on chemicals now classified as persistent bioaccumulative toxic (PBT) chemicals by the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) Program (see Table 1). The use and release of PBTs and other highly hazardous substances have received increasing attention in recent years. PBT chemicals are of special concern because they are highly toxic, remain in the environment for long periods of time, are not readily destroyed, and build up in the food chain.

Table 1 2002 PBT Summary (in pounds unless otherwise noted)							
PBT Chemical/ Chemical Category	**Reporting Threshold**	**Number of Facilities**	**Total Use**	**Generated as Byproduct**	**Shipped in Product**	**On-Site Releases**	**Transfers Off-Site**
Polycyclic Aromatic Compounds (PACs)	100 lbs.	143	86,615,687	356,347	222,806	101	6,765
Benzo(g,h,i)-Perylene	10 lbs.	115	7,679,923	3,901	3,607	8	72
Mercury	10 lbs.	14	5,933	997	4,667	3	1,251
Mercury Compounds	10 lbs.	5	1,765	506	140	194	309
Poly-Chlorinated Biphenyls (PCBs)	10 lbs.	2	64,981	64,963	18	0	64,963
Tetrabromo-Bisphenol A	100 lbs.	1	19,057	532	18,526	15	517
Dioxin and Dioxin-like Compounds	0.1 Grams	8	12.78 Grams	12.78 Grams	0 Grams	10.61 Grams	0.48 Grams
Lead	100 lbs.	136	862,906	119,136	701,270	734	346,916
Lead Compounds	100 lbs.	106	4,893,976	271,243	3,517,118	5,359	273,578

The TURA program has achieved its dramatic success through the efforts of Massachusetts industry working with state government to implement the goals of the TURA program. Massachusetts facilities have reduced significant amounts of waste by implementing toxics use reduction techniques, including input substitution, production unit modernization, production unit redesign, improved operation and maintenance, and recycling and reuse of chemicals in their production processes. They have demonstrated that toxics use reduction not only reduces toxic chemical use and waste, but also saves businesses money over the long term.

The first decade of TURA was considered a success when TURA filers met the goal of reducing toxic byproduct generation by 50% in 1998. The continued progress of the 2000 Core Group shows that new toxics use reduction challenges and opportunities continue to emerge for Massachusetts companies.

I. Introduction

The Toxics Use Reduction Act (TURA) requires Massachusetts facilities that fall within certain standard industrial classification (SIC) codes, have ten or more full-time employees, and use listed toxic substances at or above reporting thresholds to report their chemical use annually to the Department of Environmental Protection (DEP) and pay an annual toxics use fee. TURA also requires reporting facilities to develop toxics use reduction plans that identify and evaluate opportunities to reduce the use of toxics and the generation of toxic byproducts. These plans must be updated every two years and approved by a DEP-certified toxics use reduction planner.

In addition to DEP's administration of reporting and planning requirements, the TURA program is supported by the Office of Technical Assistance and the Toxics Use Reduction Institute (TURI). OTA provides non-regulatory technical assistance to facilities seeking to reduce the use of toxics, develops fact sheets and other technical guidance documents, supports the development of technology solutions by leveraging state and federal funding, and creates market-based incentives to reduce toxics use for qualifying TURA filers. TURI provides toxics use reduction education, training, and library services; supports research on cleaner materials and processes; and operates a laboratory for testing non-toxic or less-toxic cleaning alternatives. TURI also makes TURA data available on its website in a user-friendly way that is searchable by community, chemical or company. See www.turi.org/turadata.

This 2002 Toxics Use Reduction Information Release contains important chemical information that is useful to the public, government, and industry. However, it is important to note that because the data in this report is collected only from facilities within certain industrial sectors that have ten or more full-time employees and that use chemicals above established reporting thresholds, this report does not provide a complete picture of the use and release of all chemicals. In addition, this report does not contain information about exposures of the public to reported chemicals.

For more information about the TURA program, please visit the following web sites:

Department of Environmental Protection, Toxics Use Reduction Program: www.mass.gov/dep/bwp/dhm/tura/turhome.htm

Office of Technical Assistance for Toxcis Use Reduction: www.mass.gov/ota

Toxics Use Reduction Institute: www.turi.org

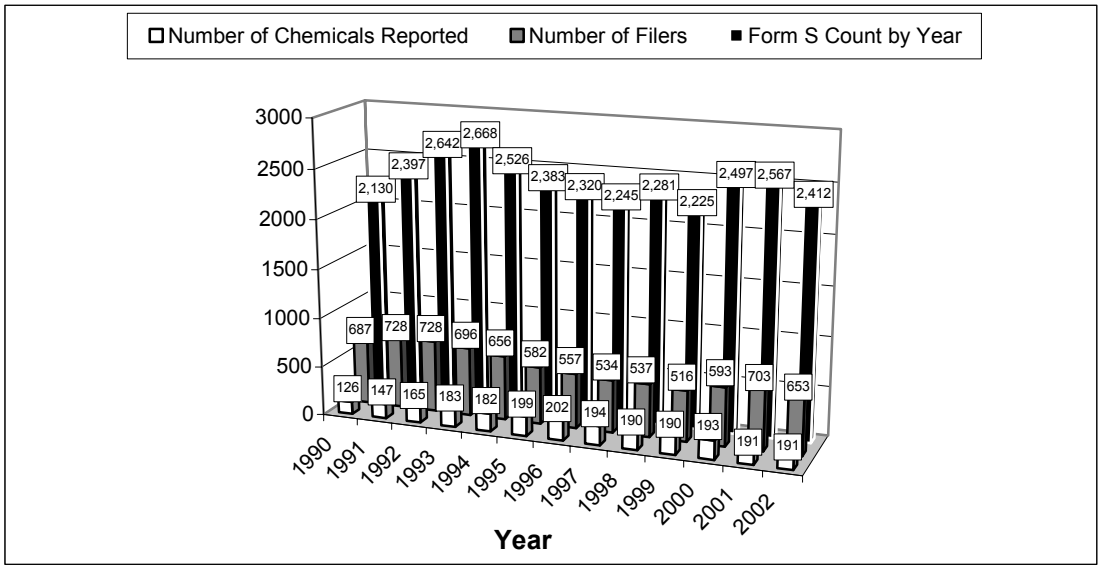
II. TURA Progress 1990-2002

Since 1990, when the TURA program began, Massachusetts TURA filers have made substantial progress in reducing their use of toxic substances and their generation of toxic byproducts. In measuring this progress, a number of changes in the TURA reporting universe must be taken into account.

In 1990, only manufacturing firms were required to report to the TURA program. Then, in accordance with TURA's phase-in schedule, the reporting universe was expanded to include industries beyond the manufacturing sector. The list of chemicals subject to reporting also was expanded in reporting years 1991, 1992, 1993, 2000, and 2001, further enlarging the universe of companies reporting. In addition, over the years, certain chemicals have been delisted. For example, effective reporting year 1999, the Administrative Council on Toxics Use Reduction delisted pure copper in solid or molten metal form.

Figure 2 illustrates TURA filing trends over the past thirteen years. Out of 1,422 chemicals listed under TURA, only 191 were reported in 2002. The number of facilities reporting under TURA generally declined during the 1990s, from a high of 728 facilities in 1991 and 1992, to 516 in 1999. The number of reporting facilities increased to 593 in 2000 due in part to the new requirement to report PBTs at lower thresholds, and further increased to 703 in 2001 due to the new requirement to report lead and lead compounds (both PBTs) at lower 100 pound thresholds. The number of filers decreased to 653 in 2002.[1] This may be due in part to facilities closing or reducing production due to the economic slowdown. The number of individual Form Ss[2] declined from a high of 2,668 in 1993, to 2,225 in 1999, increased to 2,497 in 2000, again due partly to the reporting of PBTs, and increased to 2,567 in 2001 due to the new reporting requirement for lead and lead compounds. The number of Form Ss decreased to 2,412 in 2002.

Figure 2 - TURA Filer Trends 1990 –2002



[1] DEP expects this number to increase due to ongoing enforcement actions against facilities that failed to report for 2002.

[2] A separate Form S is required for each chemical reported by a facility; the Form S is the form used to report chemical information.

2000 Core Group Progress – Without Adjusting for Production

Creating the 2000 Core Group

The overall progress of the TURA program is best reflected by toxics use reduction progress within a Core Group of TURA filers. In order to allow for a consistent picture of TURA progress, a 1990 Core Group was defined, consisting of industries and chemicals that were subject to reporting in 1990 and that remained subject to reporting in subsequent years. However, the original 1990 Core Group represents only about half of the 2002 toxics use because it does not include certain chemicals and industry groups that were added to the TURA program after 1990.

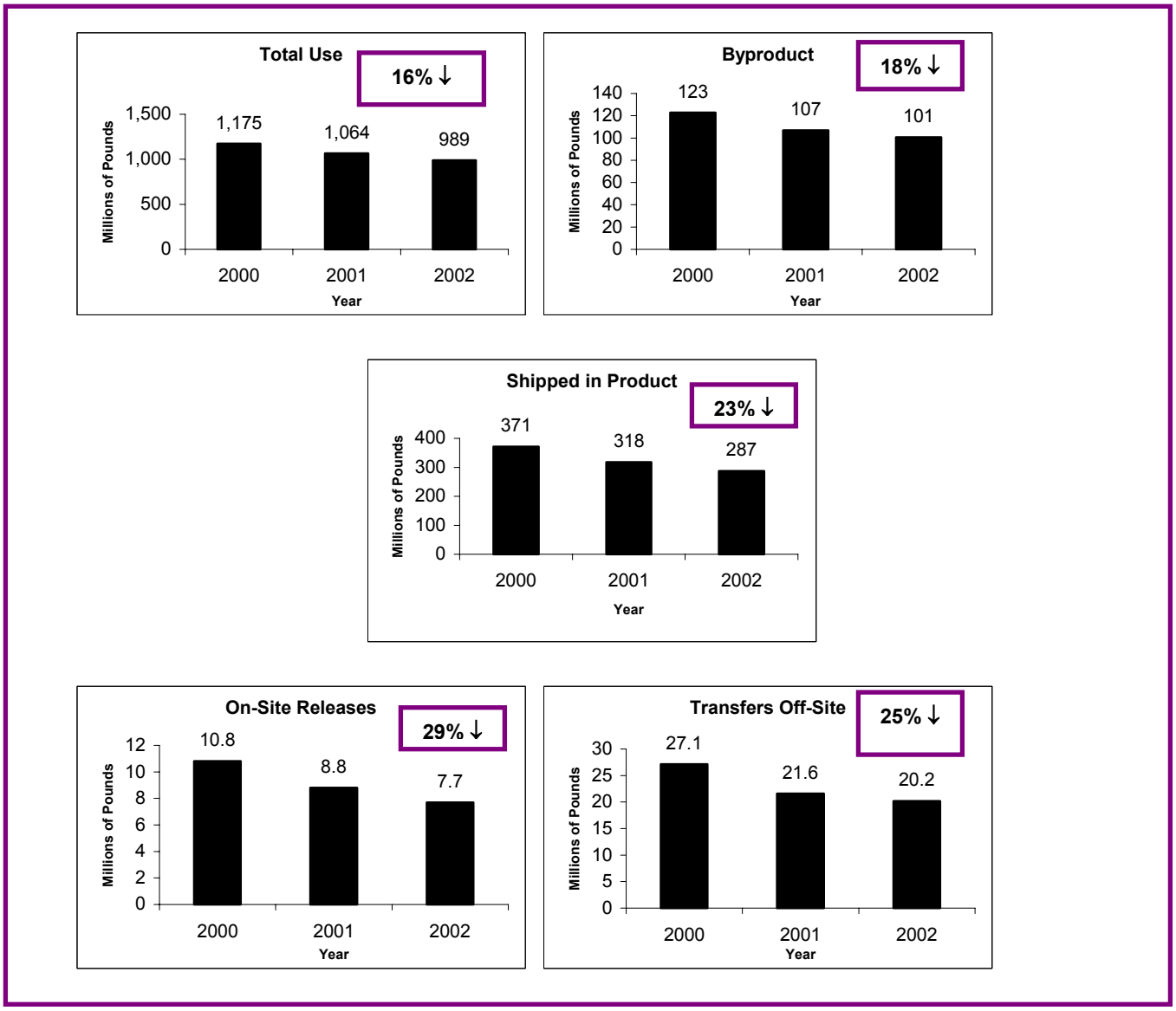
Therefore, a new 2000 Core Group has been created to more accurately represent progress within the TURA reporting universe. The 2000 Core Group represents facility categories and chemicals that were subject to reporting in 2000. In 2002, the 2000 Core Group used 988.9 million pounds, or 99% of the total toxic chemicals reported (i.e., 1.0 billion pounds excluding trade secret data). All currently reportable listed chemicals (with the exception of respirable crystalline silica) and SIC codes are part of the 2000 Core Group. The only current chemical use that is not included in the 2000 Core Group (and will not be included in the future) is use of respirable crystalline silica (which was first reportable in 2001), use of lead and lead compounds due only to the lower 100 pound thresholds for lead and lead compounds that took effect in 2001, and use of any chemical covered by a trade secret claim. These chemical uses are not included in the 2000 Core Group because they either were not reported in 2000 or are trade secret data.

The changes in total reported Core Group quantities over the period 2000 to 2002 are shown in Figure 3. These quantities have not been adjusted for changes in production.

From 2000 to 2002, Core Group filers decreased their total chemical use by 16% (from 1,174.6 million pounds in 2000 to 988.9 million pounds in 2002), reduced their byproduct generation by 18% (from 122.7 million pounds in 2000 to 100.6 million pounds in 2002), and reduced the quantity of chemicals shipped in product by 23% (from 371.2 million pounds in 2000 to 286.7 million pounds in 2002).

2000 Core Group filers reduced on-site releases, as defined by the federal Toxics Release Inventory (TRI) program, by 29% (from 10.8 million pounds in 2000 to 7.7 million pounds in 2002), and reduced their transfers off-site for further waste management (i.e., byproducts transferred off-site for energy recovery, recycling, treatment or disposal) by 25% (from 27.1 million pounds in 2000 to 20.2 million pounds in 2002).

Figure 3 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2002 (Not Production Adjusted)



2000 Core Group Progress – Production Adjusted Data

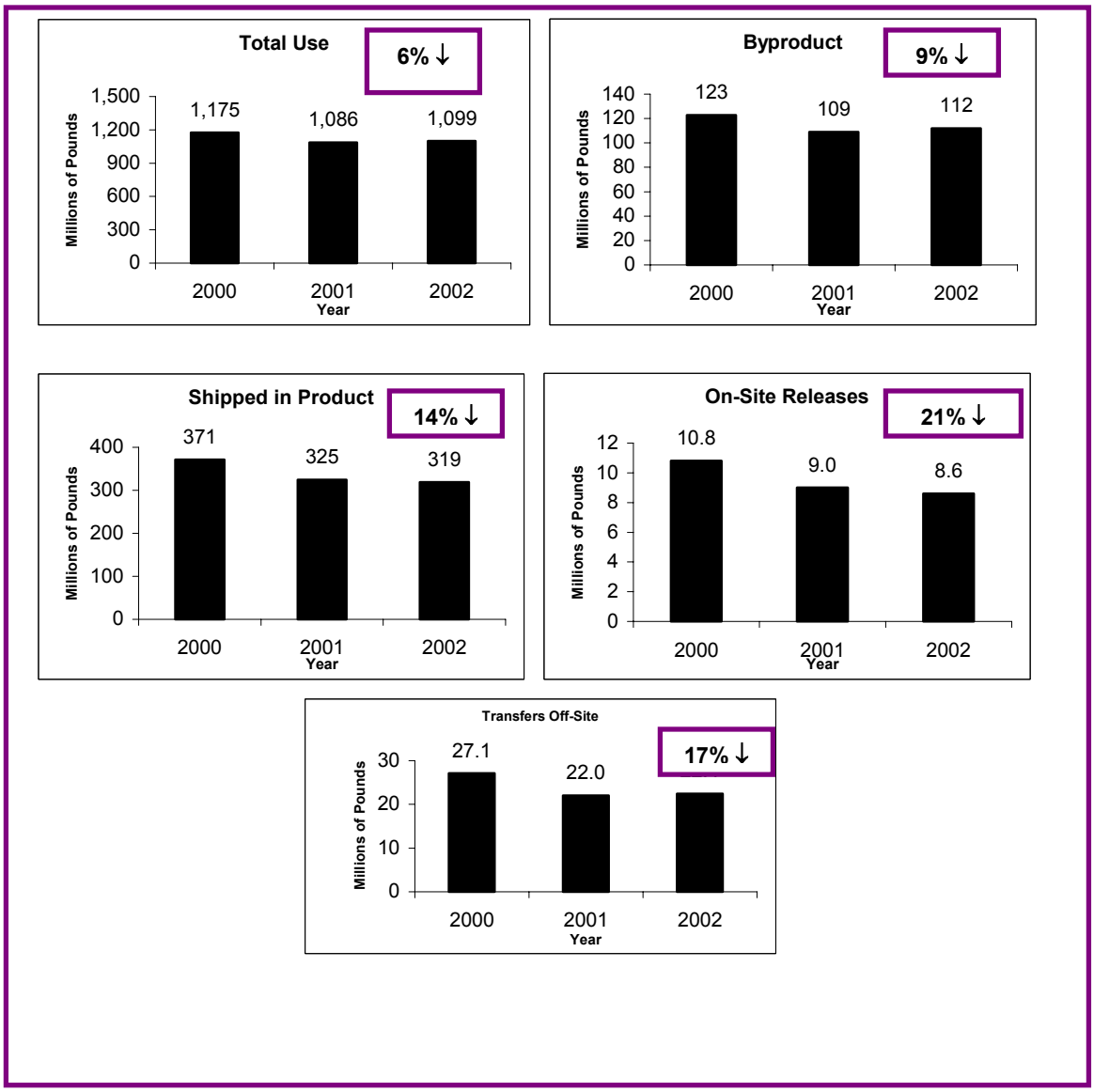
From 2000 to 2002, Core Group filers reported a 10% decrease in production. In order to more accurately measure progress, the TURA data are adjusted or normalized to eliminate the effects of changes in production using production ratios reported by the Core Group facilities.

The following example illustrates how data are adjusted to reflect changes in production:

- In year 1, a facility produces 1,000 machine parts, and generates 100 lbs. of byproduct.
- In year 2, the facility produces 10% less machine parts (900). Therefore, the production ratio is .90. However, the facility only generates 80 lbs. of byproduct.
- The production adjusted byproduct for year 2 is 80 lbs./.90 = 89 lbs.
- The production adjusted percent change from year 1 to year 2 is [100-89]/100 = .11, or an 11% reduction, while its actual byproduct reduction is 20%.

When the 2000 Core Group data are adjusted to account for changes in production, from 2000 to 2002, the 2000 Core Group filers reduced their chemical use by 6%, generated 9% less byproduct, shipped 14% fewer chemicals in product, reduced their on-site releases by 21%, and reduced their transfers off-site by 17% (see Figure 4).

Figure 4 – 2000 Core Group Toxics Use Reduction Progress From 2000 to 2002 (Production Adjusted)



1990 Core Group Progress – Without Adjusting for Production

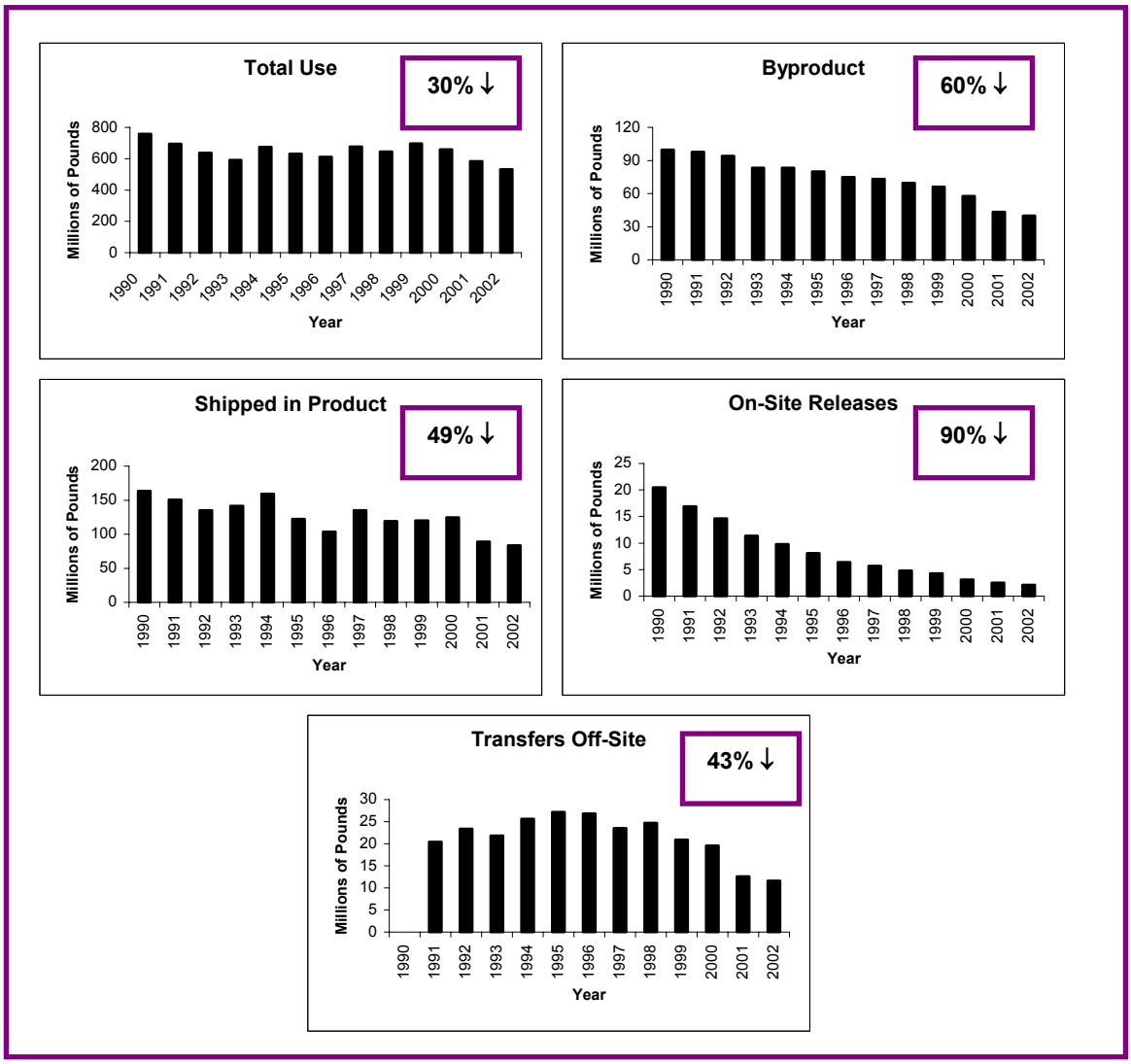
The 1990 Core Group that was used to measure TURA progress during the program's first decade currently represents only about half of the total toxics use. In 2002, the 1990 Core Group used 531.7 million pounds, or 53% of the total toxic chemicals reported (i.e., 1.0 billion pounds excluding trade secret data).

The changes in total reported 1990 Core Group quantities over the period 1990 to 2002 are shown in Figure 5. These quantities have not been adjusted for changes in production.

From 1990 to 2002, 1990 Core Group filers decreased their total chemical use by 30% (from 759.0 million pounds in 1990 to 531.7 million pounds in 2002), reduced their byproduct generation by 60% (from 99.8 million pounds in 1990 to 39.9 million pounds in 2002), reduced the quantity of chemicals shipped in product by 49% (from 163.6 million pounds in 1990 to 83.5 million pounds in 2002), reduced on-site releases by 90% (from 20.5 million pounds in 1990 to 2.1 million pounds in 2002), and reduced transfers off-site (i.e., byproducts that are transferred off-site for energy recovery, recycling, treatment or disposal) by 43% (from 20.4 million pounds in 1991[3] to 11.6 million pounds in 2002).

[3] Trends are measured from 1991 due to a change in the definition of Transfers Off-Site that year.

Figure 5 – 1990 Core Group Toxics Use Reduction Progress From 1990 to 2002 (Not Production Adjusted)



1990 Core Group Progress - Production Adjusted Data

From 1990 and 2002, 1990 Core Group filers reported a 22% increase in production. When the Core Group data are adjusted to account for changes in production since 1990, Core Group filers reduced their chemical use by 42%, generated 67% less byproduct, shipped 58% fewer chemicals in product, reduced their on-site releases by 92%, and reduced their transfers off-site by 54% (see Figure 6).

Figure 6 – 1990 Core Group Toxics Use Reduction Progress From 1990 to 2002 (Production Adjusted)

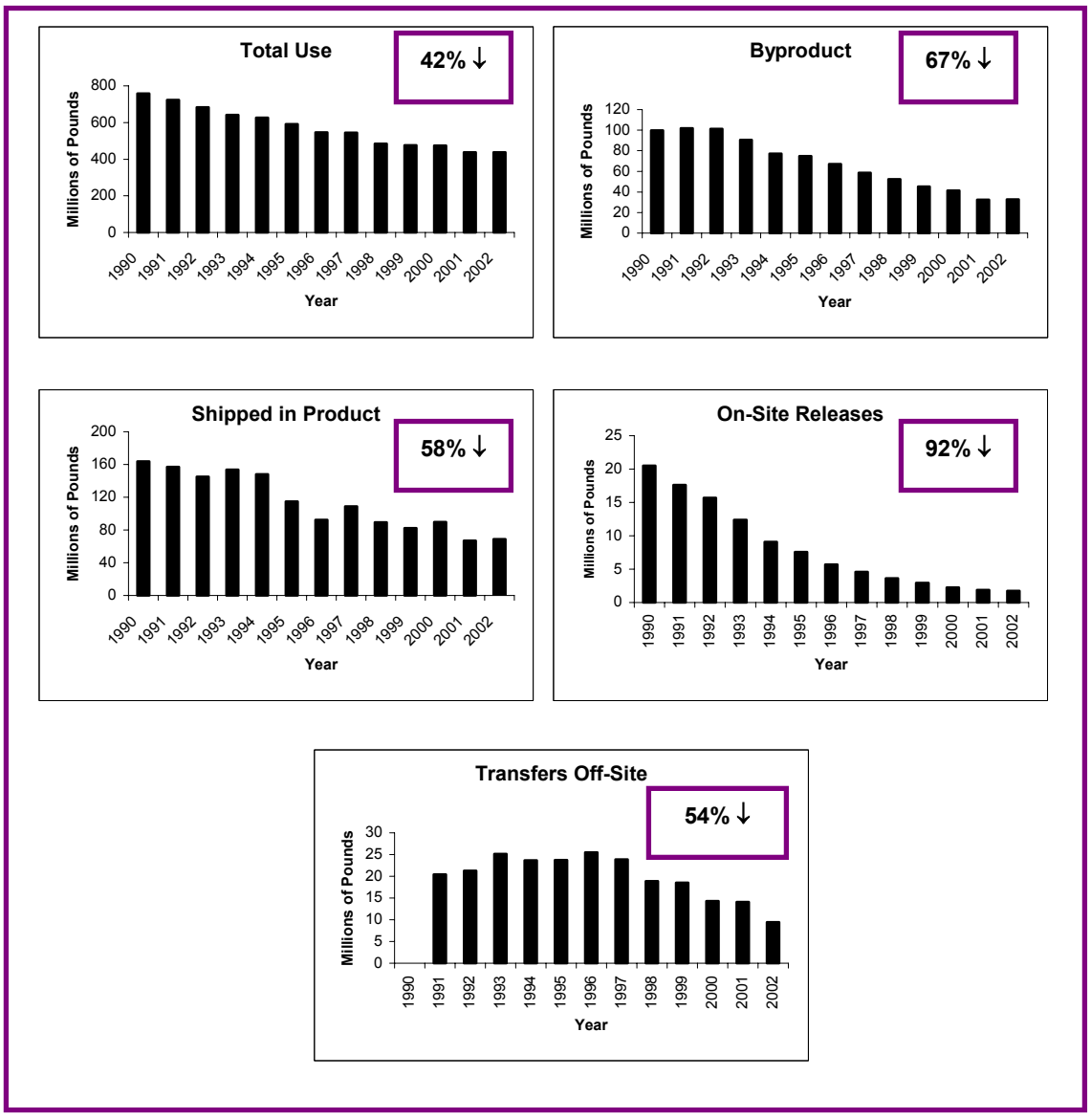


Table 2 and Table 3 summarize TURA data from 2000 to 2002, and from 1990 to 2002, respectively, showing both **reported** and **production adjusted** quantities. For each category, each year's production adjusted quantity is normalized to the base year production level, thus providing a comparison of production-adjusted quantities to base year quantities.

Quantities in shaded boxes are indexed for changes in manufacturing activity (level of production) using the facility-reported TRI Production Ratio/Activity Index.

Table 2
2000 CORE GROUP DATA: 2000 - 2002 TREND SUMMARY
(Does Not Include Trade Secret Quantities)
Quantities are in Millions of Pounds

	TOTAL USE		BYPRODUCT		SHIPPED IN PRODUCT		ON-SITE RELEASES		TRANSFERS OFF-SITE		ACTIVITY INDEX
2000	1,174.6	1,174.6	122.7	122.7	371.2	371.2	10.8	10.8	27.1	27.1	NA
2001	1,064.3	1,086.0	106.8	109.0	318.0	324.5	8.8	9.0	21.6	22.0	0.98
2002	988.9	1,098.8	100.6	111.8	286.7	318.6	7.7	8.6	20.2	22.4	0.92
Percent Change 2000-2002	16% Reduction	6% Reduction	18% Reduction	9% Reduction	23% Reduction	14% Reduction	29% Reduction	21% Reduction	25% Reduction	17% Reduction	10% Decrease

Table 3
1990 CORE GROUP DATA: 1990 - 2002 TREND SUMMARY
(Does Not Include Trade Secret Quantities)
Quantities are in Millions of Pounds

	TOTAL USE		BYPRODUCT		SHIPPED IN PRODUCT		ON-SITE RELEASES		TRANSFERS OFF-SITE[4]		ACTIVITY INDEX
1990	759.0	759.0	99.8	99.8	163.6	163.6	20.5	20.5			NA
1991	694.1	723.0	97.7	101.8	150.6	156.9	16.9	17.6	20.4	20.4	0.96
1992	636.3	683.3	94.2	101.2	135.0	145.0	14.6	15.9	23.4	21.3	0.97
1993	591.2	641.3	83.5	90.6	141.7	153.7	11.4	12.4	21.8	25.1	0.99
1994	675.0	625.8	83.3	77.2	159.5	147.9	9.8	9.1	25.6	23.7	1.17
1995	631.1	591.0	79.9	74.8	122.4	114.6	8.1	7.6	27.2	23.7	0.99
1996	611.8	545.7	75.0	66.9	103.7	92.5	6.4	5.7	26.8	25.5	1.05
1997	677.0	544.0	73.1	58.7	135.2	108.6	5.7	4.6	23.5	23.9	1.11
1998	645.1	484.4	69.7	52.3	119.2	89.5	4.8	3.6	24.7	18.9	1.07
1999	697.6	476.2	66.1	45.1	120.3	82.1	4.3	2.9	20.9	18.6	1.10
2000	659.6	474.0	57.8	41.5	124.7	89.6	3.1	2.2	19.6	14.3	0.95
2001	584.1	437.2	43.3	32.4	89.2	66.8	2.5	1.9	12.6	14.1	0.96
2002	531.7	437.4	39.9	32.8	83.5	68.7	2.1	1.7	11.6	9.4	0.91
Percent Change 1990-2002	30% Reduction	42% Reduction	60% Reduction	67% Reduction	49% Reduction	58% Reduction	90% Reduction	92% Reduction	43% Reduction	54% Reduction	22% Increase

[4] Trends are measured from 1991 due to a change in the definition of Transfers Off-Site that year.

III. 2002 TURA Chemical Data

Table 4 summarizes the 2002 data for all TURA filers. These companies reported using almost 1.2 billion pounds of chemicals and generating 106 million pounds of byproduct.

Table 4 - 2002 Data for All TURA Filers (in Pounds)	
Total Use	1,188,000,000
Generated as Byproduct	106,000,000
Shipped in Product	343,000,000
On-Site Releases	8,000,000
Transfers Off-Site	34,000,000

The 1.2 billion pounds of chemical use occurred in three categories: manufactured, processed, or otherwise used. In TURA these terms are defined as follows:

Manufacture – "to produce, prepare, import or compound a toxic or hazardous substance" (e.g., intentional manufacture of a metal compound or the unintentional manufacture of acid gases during combustion of fossil fuels).

Process – "the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce" (e.g., in the formulation of paints or coatings, any listed toxics are "processed;" in the manufacture of polystyrene, the styrene monomer is "processed").

Otherwise Use – "any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product" (e.g., chemicals used to clean parts, chemicals contained in fuels that are combusted).

Manufactured Chemicals

Figure 7 shows that relatively little manufacturing of TURA chemicals occurs in Massachusetts. Chemicals reported as "manufactured" accounted for 6% of the total use statewide (or 65 million pounds). A significant amount of the chemicals reported as manufactured are not manufactured intentionally, but are coincidentally manufactured as a result of some other activity. Examples include the creation of acid gases from fuel combustion for power generation and the production of nitrate compounds as a result of wastewater treatment.

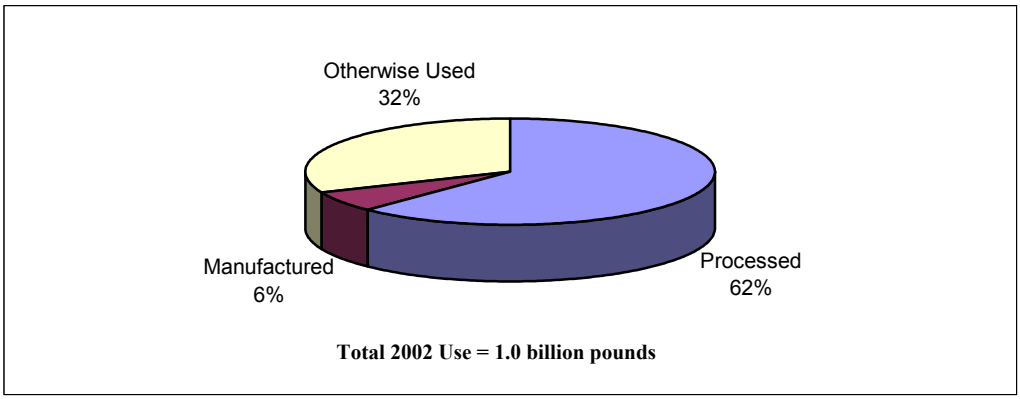
Processed Chemicals

In Massachusetts, the predominant chemical use is "processing," which includes incorporating a listed chemical into a product. Processing of chemicals accounted for 62% of total use (or 656 million pounds). Styrene, which is used in the production of plastics, accounted for 45% (or 296 million pounds) of total chemicals processed.

Otherwise Used Chemicals

Chemicals "otherwise used" accounted for 32% of total use (or 332 million pounds). Chemicals otherwise used include activities such as parts cleaning, waste treatment, and the combustion of fuel oil containing listed chemicals such as polycyclic aromatic compounds and benzo(g,h,i)perylene.

Figure 7 – 2002 Chemical Use (does not include trade secret data) *



* In this Report, when total use is broken down by type of use (i.e., manufactured, processed, or otherwise used), trade secret data are not included. Thus, the total use in Figure 7 is 1.0 billion pounds, rather than 1.2 billion pounds (which includes trade secret data).

Top 20 Chemicals

In 2002, 191 chemicals were reported out of 1,422 TURA-listed chemicals. Of the 191, 20 chemicals accounted for 82%, or 813 million pounds (not including trade secret information) of the total use reported statewide (see Table 5). Styrene monomer was the chemical with the largest quantity reported in 2002, accounting for 30% of total use reported (or 296 million pounds). Styrene monomer is the building block for various plastics.

Since the reporting thresholds for persistent bioaccumulative toxic (PBT) chemicals were lowered effective reporting year 2000, polycyclic aromatic compounds (PACs) was the chemical category with the second largest quantity of chemical use in 2002, accounting for 9% of total reported use. PACs are otherwise used during the combustion of fossil fuels. Of the 653 facilities that reported, 143 (or 22%) reported PACs.

Sodium hydroxide was the third highest used chemical with 193 facilities (or 30%) reporting its use, representing 8% of total reported use.

Table 5 - 2002 Top 20 Chemicals: Total Use

Total Use ***These quantities do not include Trade Secret***	
Chemical Name (CAS #)	**Total Use (Lbs.)**
Styrene Monomer (100425)	296,523,857
Polycyclic Aromatic Compounds (1040)	86,615,687
Sodium Hydroxide (1310732)	84,393,738
Hydrochloric Acid (7647010)	45,760,567
Sulfuric Acid (7664939)	40,539,562
Methanol (67561)	39,049,607
Copper (7440508)	26,031,812
Nitrate Compounds (1090)	26,031,696
Toluene (108883)	25,837,204
Ammonia (7664417)	20,250,619
Zinc Compounds (1039)	17,446,985
Potassium Hydroxide (1310583)	16,111,342
Sodium Hypochlorite (7681529)	15,027,565
Methyl Ethyl Ketone (78933)	14,171,665
Methyl Methacrylate (80626)	12,524,242
Ethyl Acetate (141786)	11,165,412
Acetone (67641)	10,049,481
Phosphoric Acid (7664382)	9,406,381
Phthalic Anhydride (85449)	8,281,870
Toluene Diisocyanate (26471625)	7,989,958
The following four chemicals would appear in the Top 20 Chemicals Total Use list if trade secret quantities were included: Butyl Acrylate, Butyraldehyde, Formaldehyde, Vinyl Acetate.	

Table 6 shows the top 20 chemicals generated as byproduct in 2002, which accounted for 85% of the total byproduct generated statewide (or 90 million pounds). Table 6 also shows the top 20 chemicals shipped in product in 2002, which accounted for 77% of the total shipped in product (or 220 million pounds).

Table 6 - 2002 Top 20 Chemicals: Byproduct Generation and Shipped in Product

Byproduct Generation *These quantities include Trade Secret*		**Shipped in Product** *These quantities do not include Trade Secret*	
Chemical Name (CAS #)	**Byproduct Generation (Lbs.)**	**Chemical Name (CAS #)**	**Shipped in Product (Lbs.)**
Nitrate Compounds (1090)	11,825,394	Sodium Hydroxide (1310732)	42,983,218
Sodium Hydroxide (1310732)	11,793,069	Methanol (67561)	34,198,592
Sulfuric Acid (7664939)	10,759,105	Copper (7440508)	25,928,950
Toluene (108883)	9,440,351	Toluene (108883)	15,738,488
Ethyl Acetate (141786)	9,166,353	Potassium Hydroxide 1310583)	13,346,584
Hydrochloric Acid (7647010)	4,803,043	Sulfuric Acid (7664939)	9,585,168
Methyl Ethyl Ketone (78933)	4,659,228	Methyl Ethyl Ketone (78933)	9,072,889
Methanol (67561)	4,620,504	Zinc Compounds (1039)	9,069,406
Ammonia (7664417)	4,062,239	Acetone (67641)	6,847,700
Acetone (67641)	3,576,407	Ammonia (7664417)	6,123,892
Formaldehyde (50000)	2,522,853	Glycol Ethers (1022)	5,730,663
Nitric Acid (7697372)	2,157,877	1-Methyl-2-Pyrrolidone (872504)	5,706,112
Dimethyl Formamide (68122)	1,881,661	Dichloromethane (75092)	4,979,701
Copper Compounds (1015)	1,651,518	Copper Compounds (1015)	4,693,789
Furan, tetrahydro- (109999)	1,591,292	Formaldehyde (50000)	4,656,807
Ethylene Glycol (107211)	1,428,519	Ethylene Glycol (107211)	4,596,417
Phosphoric Acid (7664382)	1,360,733	Phosphoric Acid (7664382)	4,510,983
1-Methyl-2-Pyrrolidone (872504)	991,732	Sodium Hypochlorite (7681529)	4,319,613
Dichloromethane (75092)	937,852	Xylene Mixed Isomer (1330207)	3,888,340
Acetic Acid (64197)	892,659	Antimony Compounds (1000)	3,721,602
		The following chemicals would appear in the Top 20 Chemicals Shipped in Product list if trade secret quantities were included: Ethyl Acetate, Vinyl Acetate.	

Table 7 shows the top 20 chemicals reported as on-site releases in 2002, which totaled 92% of the total on-site releases (or 7 million pounds). Hydrochloric acid had the highest amount of on-site releases reported statewide, accounting for 33% of total on-site releases. Over 2.5 million pounds of hydrochloric acid, or 52% of total on-site releases of hydrochloric acid, was attributed to power plants.

Table 7 also shows the top 20 chemicals reported as transfers off-site in 2002, which totaled 81%, or 28 million pounds, of the total transfers off-site. Nitrate compounds had the highest transfers off-site reported statewide, accounting for 16% of total transfers off-site. Nitrate compounds were primarily coincidentally manufactured during neutralization of nitric acid in wastewater treatment.

Table 7 - 2002 Top 20 Chemicals: On-Site Releases and Transfers Off-site

On-Site Releases *These quantities include Trade Secret*		**Transfers Off-Site** *These quantities include Trade Secret*	
Chemical Name (CAS #)	**On-Site Releases (Lbs.)**	**Chemical Name (CAS #)**	**Transfers Off-Site (Lbs.)**
Hydrochloric Acid (7647010)	2,585,369	Nitrate Compounds (1090)	5,343,274
Ammonia (7664417)	938,135	Formaldehyde (50000)	2,410,230
Sulfuric Acid (7664939)	568,394	Toluene (108883)	1,934,227
Toluene (108883)	475,899	Methanol (67561)	1,908,706
Acetone (67641)	437,917	Sodium Hydroxide (1310732)	1,816,183
Ethyl Acetate (141786)	348,680	Ethyl Acetate (141786)	1,812,963
Glycol Ethers (1022)	343,555	Copper Compounds (1015)	1,798,642
Butyl Alcohol (71363)	252,924	Acetone (67641)	1,688,748
Methanol (67561)	226,585	Dichloromethane (75092)	1,519,799
Hydrogen Fluoride (7664393)	199,995	Zinc Compounds (1039)	1,189,090
Methyl Ethyl Ketone (78933)	170,505	Ethylene Glycol (107211)	1,069,110
Trichloroethylene (79016)	90,196	Methyl Ethyl Ketone (78933)	1,007,797
Vanadium Compounds (1065)	88,886	Nickel Compounds (1029)	880,384
Methyl Isobutyl Ketone (108101)	85,017	Chromium Compounds (1012)	758,353
Hexane (N-Hexane) (110543)	84,364	1-Methyl-2-Pyrrolidone (872504)	630,519
Xylene Mixed Isomer (1330207)	83,096	Acetonitrile (75058)	505,942
Dimethyl Formamide (68122)	62,134	Vanadium Compounds (1065)	428,108
Butyl Acetate (123864)	60,223	Barium Compounds (1002)	414,203
Tetrachloroethylene (127184)	49,713	Sulfuric Acid (7664939)	401,767
Nickel Compounds (1029)	42,304	Sodium Fluoride (7681494)	366,357

Persistent Bioaccumulative Toxic (PBT) Chemicals

2002 was the third year TURA facilities reported on chemicals classified as persistent bioaccumulative toxic (PBT) chemicals by the U.S. Environmental Protection Agency (EPA) under the Toxics Release Inventory (TRI) Program.

PBT chemicals are of particular concern because they are highly toxic, remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue. Relatively small releases of PBT chemicals can pose human and environmental health threats and, therefore, the use and release of these chemicals, even in relatively small amounts, warrant public reporting as well as efforts to reduce their use and release.

For 2002, Massachusetts facilities reported the use of nine PBT chemicals/chemical categories (see Table 8). It should be noted that TURA data are collected only from facilities within certain industrial sectors that have 10 or more full-time employees, and therefore it does not provide a complete picture of the use and emissions of chemicals, whether PBT or non-PBT chemicals. For instance, TURA data does not include emissions from cars and trucks, or emissions from the majority of releases of pesticides, volatile organic compounds, fertilizers, and many other non-industrial sources. It also does not capture the use of toxic chemicals in consumer products that are not manufactured in Massachusetts.

Table 8
2002 PBT Summary
(in pounds unless otherwise noted)

PBT Chemical/ Chemical Category	Reporting Threshold	Number of Facilities	Total Use	Generated as Byproduct	Shipped in Product	On-Site Releases	Transfers Off-Site
Polycyclic Aromatic Compounds (PACs)	100 lbs.	143	86,615,687	356,347	222,806	101	6,765
Benzo(g,h,i)-Perylene	10 lbs.	115	7,679,923	3,901	3,607	8	72
Mercury	10 lbs.	14	5,933	997	4,667	3	1,251
Mercury Compounds	10 lbs.	5	1,765	506	140	194	309
Poly-Chlorinated Biphenyls (PCBs)	10 lbs.	2	64,981	64,963	18	0	64,963
Tetrabromo-Bisphenol A	100 lbs.	1	19,057	532	18,526	15	517
Dioxin and Dioxin-like Compounds	0.1 Grams	8	12.78 Grams	12.78 Grams	0 Grams	10.61 Grams	0.48 Grams
Lead	100 lbs.	136	862,906	119,136	701,270	734	346,916
Lead Compounds	100 lbs.	106	4,893,976	271,243	3,517,118	5,359	273,578

Polycyclic Aromatic Compounds (PACs) and Benzo(g,h,i)perylene

In 2002, polycyclic aromatic compounds (PACs) and benzo(g,h,i)perylene were the two largest PBT chemical use categories. A total of 143 facilities reported on PACs and 115 reported on benzo(g,h,i)perylene. The primary activity that triggered reporting of these chemicals was combustion of #6 and #4 fuel oils, and to a lesser extent #2 fuel oil. These fuel oils contain PACs and benzo(g,h,i)perylene (i.e., they are already in the fuel that enters a facility's boiler to be combusted to generate heat or steam). Benzo(g,h,i)perylene is an especially toxic polycyclic aromatic compound, and therefore is reported separately from the PACs category and has a lower reporting threshold of 10 pounds (versus a 100 pound reporting threshold for the PACs category). Table 9 shows a breakdown of PACs use and Table 10 shows a breakdown of benzo(g,h,i)perylene use. **Note:** The numbers in all the PBT tables have been rounded to the nearest pound (to the nearest 0.01 gram for dioxin). As a consequence, the sum of the numbers in the columns may be slightly greater or lesser than the totals.

Table 9
2002 PACs Summary
(in pounds)
(Data in parantheses are subtotals.)

Activity / Facility Type	Number of Facilities	Total Use	Byproduct	Shipped in Product	On-site Releases	Transfers Off-site
Fuel Combustion	125[5]	86,518,023	336,880	136,993	76	3,023
(Power plants)	(11)	(84,856,637)	(273,378)	(0)	(14)	(639)
(Other Facilities)	(114)	(1,654,389)	(63,321)	(136,993)	(62)	(2,383)
Waste Oil Processing	1	28,000	3,503	25,297	0	3,503
Asphalt Manufacturers	17	76,661	16,144	60,516	25	239
Total	143	86,615,687	356,347	222,806	101	6,765

[5] The majority of reporting facilities included information identifying fuel combustion as the reason for reporting PACs; however, some facilities lacked this information but are assumed to be reporting due to fuel combustion. The fuel combustion facilities have been sub-categorized into power plants and other facilities. The numbers shown in parentheses reflect this sub-categorization and should not be added to the totals.

Table 10 2002 Benzo(g,h,i)perylene Summary (in pounds) (Data in parantheses are subtotals.)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-site**
Fuel Combustion	99[1]	7,677,521	3,633	1,474	3	9
(Power Plants)	(11)	(7,660,164)	(2,943)	(0)	(1)	(7)
(Other Facilities)	(88)	(17,357)	(689)	(1,474)	(2)	(2)
Waste Oil Processing	1	308	37	271	0	37
Asphalt Manufacturers	15	2,094	232	1,862	5	26
Total	115	7,679,923	3,901	3,607	8	72

The 11 power plants that reported PACs and benzo(g,h,i)perylene accounted for 98% of total PACs use and over 99% of benzo(g,h,i)perylene use (84,856,637 pounds and 7,660,164 pounds, respectively). The other facilities that reported due to fuel combustion accounted for only 2% (1,654,389 pounds) of PAC use and 0.2% (17,357 pounds) of benzo(g,h,i)perylene use. The majority of facilities reported zero byproduct generation, on-site releases, and transfers off-site for these chemicals. This is because most PACs and benzo(g,h,i)perylene are destroyed in the combustion process.

Asphalt manufacturers reported 60,516 pounds of PACs and 1,862 pounds of benzo(g,h,i)perylene shipped in product as a result of incorporating petroleum products into the asphalt products. Seventeen asphalt manufacturers reported PACs; 15 reported benzo(g,h,i)perylene. A waste oil processor reported 25,297 pounds of PACs and 271 pounds of benzo(g,h,i)perylene shipped in product as a result of the collection and transfer of waste oil.

Mercury and Mercury Compounds

Fourteen facilities reported the use of mercury, and five facilities reported the use of mercury compounds. Table 11 shows a breakdown of mercury use by activity. 76% of total mercury use was due to the recycling of fluorescent lamps by a single facility.

Table 11 2002 Mercury Summary (in pounds)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-site**
Lamp / ballast recycler	1	4,484	6	4,479	3	3
Manufacturer: incorporated mercury into products	3	1,271	937	64	0	1,194
Concrete manufacturers & Sand and gravel companies: mercury occurs naturally in Portland cement, and is also in coal combustion fly ash that is mixed with concrete.	9	124	0	124	0	0
Manufacturer: used mercury in analytical lab	1	54	54	0	0	54
Total	14	5,933	997	4,667	3	1,251

Table 12 shows a breakdown of mercury compounds use. The total use of mercury compounds in reporting year 2002 was 1,765 pounds. All of the use was due to fuel combustion at power plants. Mercury compounds are found in fuel which is otherwise used to produce power. Mercury compounds are also coincidentally manufactured during combustion. The 140 pounds of mercury compounds shipped in product represents the amount contained in fly ash sold by one utility.

Table 12 2002 Mercury Compounds Summary (in pounds)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-Site**
Power plants: mercury coincidentally generated via combustion	5	1,765	506	140	194	309

Polychlorinated Biphenyls (PCBs)

For 2002, 2 facilities reported the use of polychlorinated biphenyls (PCBs). Table 13 shows the breakdown of PCB use. Nearly 100% of total use of PCBs was attributed to one facility that recycled fluorescent light fixture ballasts and other equipment. This facility also accounted for 100% of byproduct and 100% of transfers off-site of PCBs. The other facility reported the coincidental generation of PCBs in the manufacture of organic pigments, in accordance with EPA's guidance for reporting PCBs.

Table 13 2002 PCBs Summary (in pounds)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-site**
Recycler: Lamp / ballast recycling	1	64,963	64,963	0	0	64,963
Manufacturer: coincidentally generates PCBs in manufacture of organic pigments	1	18	0	18	0	0
Total	2	64,981	64,963	18	0	64,963

Tetrabromobisphenol A

One facility reported the use of tetrabromobisphenol A. This facility incorporated tetrabromobisphenol A into their products, which are flame-retardant compounds. The facility's total use was 19,057 pounds; byproduct was 532 pounds; shipped in product was 18,526 pounds; on-site releases were 15 pounds; and off-site transfers were 517 pounds.

In 2001, a different facility reported the use of tetrabromobisphenol A but in much smaller quantities (total use of 332 pounds). That facility did not report this chemical in 2002.

Dioxin and Dioxin-like Compounds

Dioxins are byproducts of chemical and combustion processes, often involving chlorine. Dioxins have poor solubility in water and thus accumulate in body fat and concentrate in the food chain. Because dioxin is considered extremely toxic, EPA established a very low reporting threshold of 0.1 gram.

For 2002, 8 facilities reported the use of dioxin and dioxin-like compounds, seven due to the coincidental manufacture of dioxin from combustion (95% of total use) and one due to the bleaching of paper. Table 14 shows the breakdown of dioxin and dioxin-like compounds use.

Table 14 2002 Dioxin and Dioxin-like Compounds Summary (in grams)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-site**
Power plants: dioxin coincidentally generated	7	12.14	12.14	0	10.44	.01
Pulp and Paper Manufacturer: dioxin coincidentally generated via paper bleaching	1	0.64	0.64	0	0 .17	0.47
Total	8	12.78	12.78	0	10.61	0.48

Lead and Lead Compounds

For 2002, 136 facilities reported the use of lead and 106 reported the use of lead compounds. The largest use of lead was in the fabricated metals sector (409,991 pounds or 48% of the total reported use), where the metal is used in a variety of applications. The second largest use was in the primary metals sector, which typically processes lead into alloys. The total use reported by this sector was 198,884 pounds or 23% of the amount reported statewide.

The electronic equipment industry (i.e., printed circuit boards, semiconductors) represented the largest number of filers (37) as a distinct group. This sector reported a total use of 121,925 pounds or 14% of the total reported. Typically, facilities in this sector use lead in soldering operations.

Since lead is naturally occurring in cement and is contained in fly ash that is used to make concrete, concrete producers also represent a significant group of filers (35 filers included in Table 15 under "Other Industries"). Fourteen of the 35 concrete producing facilities were first time filers. However, this industry sector only accounted for 14,529 pounds or 2% of the total lead use reported.

Table 15 2002 Lead Summary (in pounds)						
Activity / Facility Type	**Number of Facilities**	**Total Use**	**Byproduct**	**Shipped in Product**	**On-site Releases**	**Transfers Off-site**
Fabricated Metals Manufacturers	16	409,991	18,935	347,988	23	40,650
Primary Metals Manufacturers	11	198,884	14,180	184,660	274	13,934
Electronic Equipment Manufacturers	37	121,925	31,705	88,324	247	31,721
Other Industries	72	132,105	54,317	80,298	190	260,611
Total	136	862,906	119,136	701,270	734	346,916

The largest reported use of lead compounds was in the rubber and plastics sector (2,448,440 pounds or 50% of total lead compounds use), where they are mostly compounded into resins and used as heat stabilizers to protect plastic and rubber polymers from degrading during heat processing. The second largest use was by facilities in the wire and cable industry, where lead compounds are mostly used as heat stabilizers in the wire insulation (1,808,849 pounds or 37% of total lead compounds use). Together, the 26 facilities in the rubber and plastics and the wire and cable sectors accounted for 87% (or 4,257,289 pounds) of the total lead compounds use. Several of the facilities - especially in rubber, plastics, and resins - that report for lead compounds also use lead in amounts above the 100 pound threshold. They report the combined use under the lead compounds category. The third largest use was the chemical and allied products sector (217,769 pounds or 4% of total lead compounds use).

Table 16
2002 Lead Compounds Summary
(in pounds)

Activity / Facility Type	Number of Facilities	Total Use	Byproduct	Shipped in Product	On-site Releases	Transfers Off-site
Rubber and Plastics Manufacturers	12	2,448,440	14,421	2,174,124	275	11,222
Wire & Cable Manufacturers	14	1,808,849	124,788	898,614	12	135,522
Chemicals & Allied Products	11	217,769	3,577	181,967	566	3090
Other Industries	69	418,918	128,457	262,412	4,507	123,744
Total	106	4,893,976	271,243	3,517,118	5,359	273,578

IV. 2002 Significant Industrial Sectors

Under TURA, facilities in the Manufacturing Standard Industrial Classification (SIC) codes (20-39 inclusive) and those in SIC codes 10-14, 40, 44-51, 72, 73, 75 and 76, must report their chemical use if they exceed certain thresholds.

Figure 8 shows the number of TURA reporting facilities in each industry sector. The Chemical and Allied Products sector represents approximately 16% (102 facilities) of the number of TURA reporting facilities, and uses approximately 70% of the reportable TURA chemicals (see Figure 9). This sector is a diverse group of industries, and includes companies that manufacture or formulate adhesives, paints, pharmaceuticals, and plastic materials and resins. Approximately 36% of the total chemical use for this sector was attributable to the use of styrene monomer, which is used in the manufacture of polystyrene and other plastics. However, this sector reduced styrene chemical use by 41 million pounds from 2001 to 2002. One facility accounted for a 35 million pound decrease in the use of styrene, due to a decline in production.

Figure 8 - 2002 Number of Facilities By Industrial Sector
Total Number of Facilities = 653

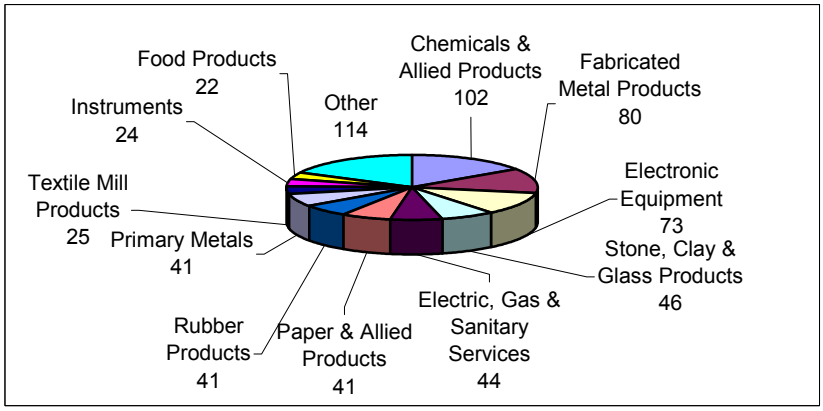
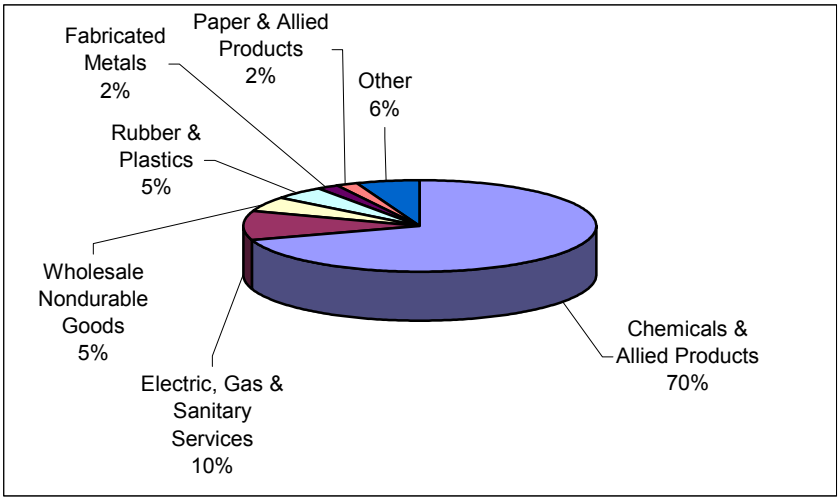


Figure 9 - 2002 Chemical Use By Industrial Sector
Total Use = 1,188,000,000 Pounds



The Electric, Gas and Sanitary Services sector was the second largest chemical user, accounting for 10% of total statewide use. The 44 facilities reporting in this sector are primarily involved in the production of electricity. In 2002, polycyclic aromatic compounds (PACs) accounted for 70% of total chemical use for this sector and benzo(g,h,i)perylene accounted for 6% of total chemical use for this sector. The vast majority of these chemicals, which are naturally occurring in fuel oil, are destroyed in the combustion process.

The Wholesale Nondurable Goods sector was the third largest chemical user, accounting for 5% of statewide use. The activities of this sector involve repackaging of chemicals for sale to other sectors. Chemical use by facilities in this sector is very efficient with byproduct generated at 0.2% of use. This translates into a chemical use efficiency of 99.8%.

The Rubber and Plastics sector also accounted for 5% of chemical use. The Fabricated Metals and the Paper and Allied Products sectors each accounted for 2% of chemical use, leaving the balance of statewide use (6%) to a variety of sectors.

Figure 10 shows byproduct generation by industrial sector. While the Chemical and Allied Products sector accounted for 70% of total statewide use, this sector produced 31% of the total byproduct generated in 2002. In contrast, the Paper and Allied Products sector, which accounted for 2% of total statewide chemical use, accounted for 10% of the byproduct generated.

The Electric, Gas and Sanitary Services sector also accounted for 10% of total byproduct generated. Other major industries that generated byproduct include the Fabricated Metals, Textile Mill Products and the Rubber and Plastics sectors, each accounting for 9% of the byproduct generated. The Electronic Equipment sector accounted for 6% of the byproduct generated. The remaining 16% of byproduct was attributed to a variety of sectors.

Figure 10 - 2002 Byproduct Generation By Industrial Sector
Total Byproduct = 106,000,000 Pounds

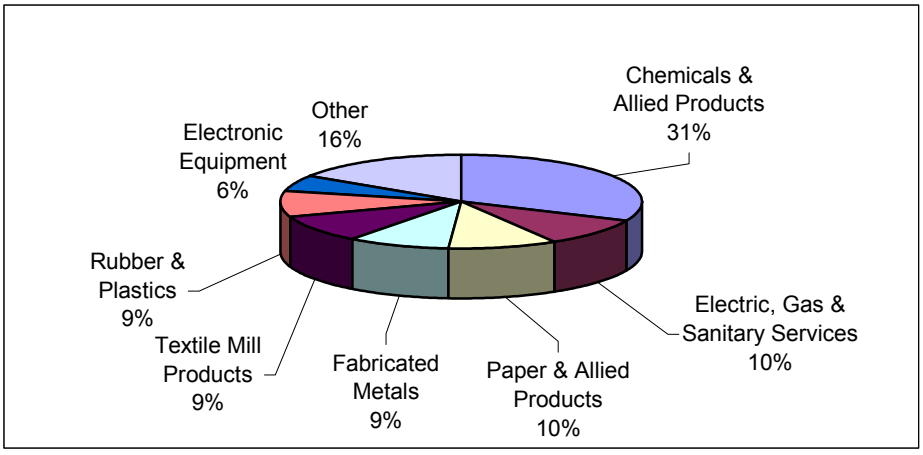


Figure 11 shows on-site releases to the environment. The Electric, Gas and Sanitary Services sector, which represented 5% of total statewide use, was the largest source of on-site releases, accounting for 54% of all on-site releases. This sector provides power for Massachusetts businesses and citizens. Sixty-eight percent of on-site releases in this sector were attributed to the coincidental manufacture of hydrochloric acid during

combustion. The Chemicals and Allied Products sector accounted for 70% of total chemical use and only 9% of total on-site releases to the environment. The other major sectors producing on-site releases were the Fabricated Metals sector (8% of total on-site releases), Paper and Allied Products sector (6% of total on-site releases) and the Textile Mill Products and the Rubber and Plastics sectors (each 5% of total on-site releases).

Figure 11 - 2002 On-Site Releases By Industrial Sector
Total On-Site Releases = 8,000,000 Pounds

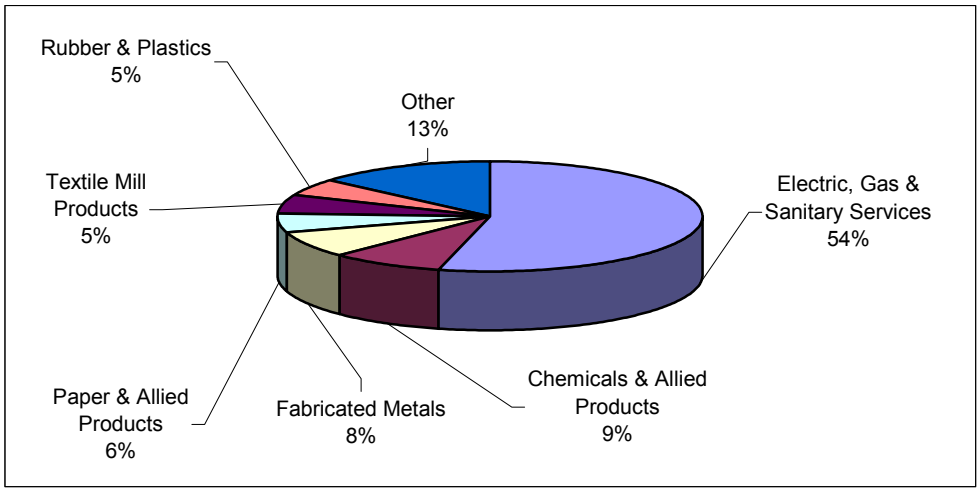
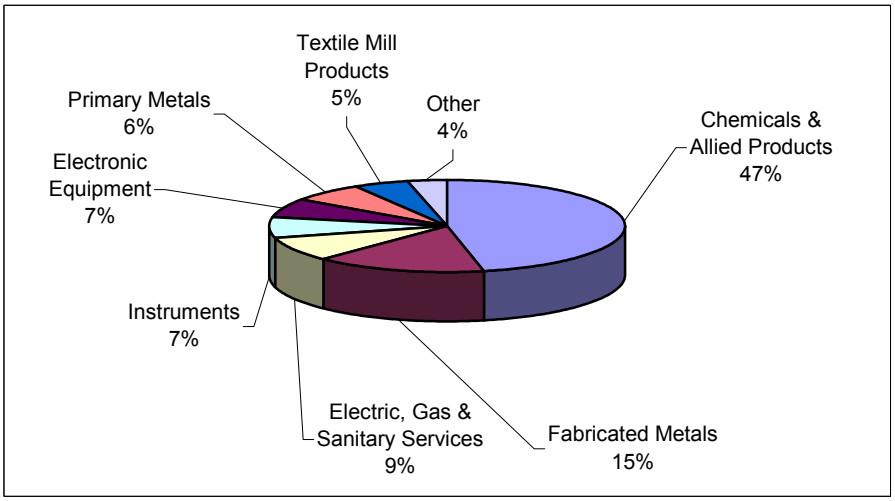


Figure 12 shows transfers off-site by industrial sector. The Chemical and Allied Products sector accounted for 47%, and the Fabricated Metals sector accounted for 15% of transfers off-site. The third largest sector in this category, the Electric, Gas and Sanitary Services sector, accounted for 9% of transfers off-site. The other major sectors accounting for transfers off-site were the Instruments and the Electronic Equipment sectors (each 7% of total transfers off-site), the Primary Metals sector (6% of total transfers off-site), and the Textile Mill Products sector (5% of total transfers off-site).

Figure 12 - Transfers Off-Site By Industrial Sector
Total Transfers Off-Site = 34,000,000 Pounds



V. 2002 Major TURA Facilities

Top 5 Facilities with the Largest Reduction in Byproduct Generation from 2001 to 2002 While Implementing Toxics Use Reduction

Table 17 lists the 5 facilities that showed the largest byproduct reductions from 2001 to 2002 attributed to toxics use reduction. While individual changes in production varied, these facilities either reported increased production or reported substantially more byproduct reduction than could be attributed to reduced manufacturing activity. Overall, this group of facilities showed an increase in production levels over 2001. Specific descriptions of toxics use reduction efforts are found below.

Table 17
Facilities with the Top Reductions in Byproduct Generation While Implementing Toxics Use Reduction (2001-2002)

Company	Reduction in Byproduct (Lbs.)	Toxics Use Reduction Techniques Used
1. Crane & Company, Inc., Pioneer Mill (Dalton)	1,335,104 (52% decrease)	Input substitution; Recycling and reuse of toxics
2. Madico Inc. (Woburn)	972,346 (43% decrease)	Improved operations management
3. Ideal Tape Company, Inc. (Lowell)	456,717 (21% decrease)	Improved operations management
4. Foilmark, Inc. (Newburyport)	309,546 (30% decrease)	Improved operations management
5. Reflek Corp. (Fall River)	175,142 (16% decrease)	Improved production practices

Crane & Company, Inc.
Founded in 1801, Crane & Company, Inc. is the oldest continuously run paper manufacturer in North America. Crane is a specialty mill that produces paper requiring highly technical specifications, mostly from cotton and other natural and synthetic fibers. It has been making currency paper for the United States government since 1879.

Crane has achieved enormous success in toxics use reduction over the past several years, and the results are shown in the amount of byproduct they generate. Since Crane last appeared in this "Top 5" list in 2000, it has continued to reduce its byproduct generation every year. Crane's most recent progress is due to widespread system automation and installation of programmable logic controllers (PLC). This technology has 1) facilitated the production of partial batches when, due to the specialty nature of their business, a full production batch is not needed, 2) reduced the occurrence of raw material contamination, and 3) enabled the reuse of caustic where possible.

Madico, Inc.
Madico, Inc. is a leader in the production of energy saving and security window films of the highest optical clarity. It has just celebrated 100 years in business as a Massachusetts-based manufacturer.

Madico considers environmental stewardship to be a core business value and credits their byproduct reductions to an ongoing commitment to reduce the amounts of chemicals they purchase, store, and dispose of. Specifically, Madico has improved 1) product yield to

reduce the total volume of chemicals necessary to fill orders; 2) process flow planning to maximize chemical use and reduce formulation changeovers and equipment cleanups; 3) maintenance and chemical handling equipment to reduce chemical leaks and spills; and 4) product design to standardize formulations across product platforms. Madico has also reformulated products, where appropriate, seeking less toxic chemicals. Through these efforts, Madico has reduced its byproduct generation by 43%, which it believes has enhanced its global competitive advantage.

Ideal Tape Company, Inc.
Ideal Tape Company, Inc. manufactures a variety of pressure-sensitive adhesive tapes for uses ranging from thermal and electrical insulation to shoe manufacturing. Ideal Tape uses a number of solvents in its production process. As part of the company's effort to reduce solvent use and waste, it organized a toxics use reduction team and changed its production schedule to minimize equipment and feedstock changeovers. Furthermore, in 2002 Ideal Tape developed a new product using recovered solvent as a method not only to benefit the company economically, but also to reduce significantly its amount of toluene byproduct.

Foilmark, Inc.
Foilmark, Inc. manufactures hot stamp foils for printing and graphics that can mainly be found in decorative and security applications. Through materials balance audits, Foilmark has improved its operating practices to result in a more efficient use of solvents. It was able to decrease its ethyl acetate use and byproduct generation by approximately half in 2002 even though it had an increase in production.

Reflek Corporation
Reflek Corporation manufactures aluminum reflectors for the recessed lighting industry. Its products can be found in homes, stores, traffic lights, hospital operating rooms, and other lighting applications.

Reflek attributes its byproduct reduction to customer demand for products that allow for unusually low dragout from phosphoric acid dip tanks. Reflector shape has a lot to do with how much material is dragged out of the tank. In 2002 significant increases in customer demand for products which allowed less dragout affected the overall chemical used per part for the year.

Top 20 Facility Lists

Table 18 lists the 20 facilities that used the largest quantity of chemicals. These 20 facilities used 897 million pounds, or 75% of total statewide use.

Table 18 – 2002 Top 20 Facilities
(Largest Quantity of Total Use)

Total Use *These quantities include Trade Secret*		
Facility Name	**Town**	**Total Use (Lbs.)**
Nova Chemicals Inc.	Springfield	219,778,631
Solutia Inc - Indian Orchard Plant	Springfield	156,324,778
American Polymers	Oxford	75,557,541
Borden & Remington	Fall River	70,596,840
USGEN New England, Inc.	Somerset	68,117,708
Eastman Gelatine Corporation	Peabody	65,058,767
Elite Consumer Products	Ludlow	36,956,563
Holland Company Inc.	Adams	32,596,300
General Cable	Taunton	25,759,771
Astro Chemicals Inc.	Springfield	25,346,329
USGEN New England Inc.	Salem	20,430,663
Ashland Distribution Co.	Tewksbury	15,173,263
Houghton Chemical Corp.	Boston	14,847,437
Polymer Latex Inc.	Fitchburg	13,100,185
Fox Packaging Co.	Ayer	12,088,778
Mirant New England Inc.	Sandwich	9,541,901
Teknor Apex Co.	Attleboro	9,315,140
Hercules Inc.	Chicopee	9,139,844
Univar Usa Inc.	Salem	8,770,320
Bostik Findley Inc.	Middleton	8,755,077

Table 19 lists the 20 facilities that generated the largest quantity of byproduct. These facilities generated almost 60 million pounds of byproduct, or 56% of total statewide byproduct.

Table 19 also lists the 20 facilities with the largest quantity shipped in product. These facilities shipped almost 277 million pounds in product, or 80% of total shipped in product statewide.

Table 19 - 2002 Top 20 Facilities
(Largest Quantity of Byproduct Generation and Shipped in Product)

Byproduct Generation *These quantities include Trade Secret*			**Shipped in Product** *These quantities include Trade Secret*		
Facility Name	**Town**	**Byproduct Generation (Lbs.)**	**Facility Name**	**Town**	**Shipped in Product (Lbs.)**
Eastman Gelatine Corporation	Peabody	13,888,358	Borden & Remington	Fall River	70,416,155
Solutia Inc. Indian Orchard Plant	Springfield	8,070,485	Solutia Inc. Indian Orchard Plant	Springfield	38,857,860
Flexcon Co. Inc. - Plant 2	Spencer	5,924,238	General Cable	Taunton	25,670,259
Venture Tape	Rockland	3,139,879	Astro Chemicals Inc.	Springfield	24,572,952
Bostik Findley Inc.	Middleton	3,122,590	Elite Consumer Products	Ludlow	16,448,131
Intelicoat Technologies Inc	South Hadley	2,452,586	Ashland Distribution Co.	Tewksbury	15,173,263
Mirant New England Inc.	Sandwich	2,269,862	Houghton Chemical Corp.	Boston	14,842,338
Precision Lithograining Corp.	South Hadley	1,982,416	Fox Packaging Co.	Ayer	12,086,729
USGEN New England Inc. Brayton Point	Somerset	1,936,148	Univar USA Inc.	Salem	8,754,130
Allegheny Rodney Strip Division	New Bedford	1,885,451	Callahan Company	Walpole	8,185,739
Polaroid Corp.	Waltham	1,755,430	Rohm & Haas Electronic Materials LLC	Marlborough	7,504,400
Engineered Materials Solutions Inc.	Attleboro	1,734,855	Webco Chemical Corp.	Dudley	5,347,378
Intel Corp.	Hudson	1,677,247	Engineered Materials Solutions Inc.	Attleboro	4,556,620
Ideal Tape Company	Lowell	1,676,969	Surface Coatings Inc.	Wilmington	3,875,544
Bradford Industries	Lowell	1,583,380	Spalding Sports Worldwide	Chicopee	3,645,020
Cranston Print Works	Webster	1,482,656	Bostik Findley Inc.	Middleton	3,635,409
BBA Nonwovens Griswoldville Plant	Colrain	1,455,366	Stahl USA Inc.	Peabody	3,399,260
Madico Inc.	Woburn	1,298,954	Advance Coatings Co.	Westminster	3,298,848
Holyoke Water Power Co.	Holyoke	1,297,736	Savogran Company	Norwood	3,148,368
Crane & Co. Inc. Pioneer Mill	Dalton	1,229,497	AlphaGary	Leominster	2,832,872

Table 20 lists the 20 facilities that had the largest quantity of on-site releases and also lists the 20 facilities that had the largest quantity of transfers off-site. The 20 facilities with the largest quantity of on-site releases released 5 million pounds, or 69% of total releases statewide. Nine of these facilities were power plants, accounting for almost 4 million pounds, or 50% of total on-site releases. Over 2.5 million pounds, or 64% of the power plants' on-site releases was due to the coincidental manufacture of hydrochloric acid during combustion. The remainder of the power plants' on-site releases was due to the coincidental manufacture of the following chemicals during combustion: ammonia (16%), sulfuric acid (10%), hydrogen fluoride (5%), and metal compounds (5%).

The 20 facilities with the largest quantity of transfers off-site transferred almost 21 million pounds, or 61% of the total transfers off-site statewide.

Table 20 – 2002 Top 20 Facilities

(Largest Quantity of On-Site Releases and Transfers Off-Site)

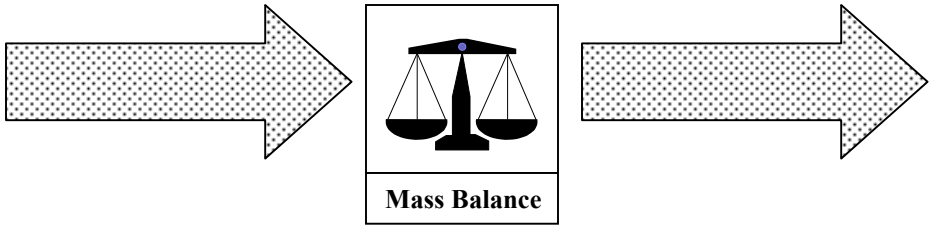
On-Site Releases *These quantities include Trade Secret*			**Transfers Off-Site** *These quantities include Trade Secret*		
Facility Name	**Town**	**On-Site Releases (Lbs.)**	**Facility Name**	**Town**	**Transfers Off-Site (Lbs.)**
USGEN New England Inc. Brayton Point	Somerset	1,256,836	Solutia Inc. Indian Orchard Plant	Springfield	6,873,727
Holyoke Water Power Co.	Holyoke	1,030,126	Engineered Materials Solutions Inc.	Attleboro	1,746,888
Mirant New England Inc.	Sandwich	458,771	Polaroid Corp.	Waltham	1,488,261
USGEN New England Inc.	Salem	405,819	Clean Harbors Environmental Services Inc.	Braintree	1,060,373
Crown Cork & Seal	Lawrence	405,500	Chemdesign Corp.	Fitchburg	1,039,487
Somerset Power LLC	Somerset	324,811	Churchill Linen Service Inc.	Brockton	776,319
Solutia Inc. Indian Orchard Plant	Springfield	258,462	USGEN New England Inc. Brayton Point	Somerset	745,765
Exelon Mystic LLC	Everett	171,402	Borregaard Synthesis Inc.	Newburyport	719,434
Ideal Tape Company	Lowell	157,377	Avecia Biotechnology Inc.	Milford	615,157
Millennium Power	Charlton	150,530	Waters Corp.	Taunton	606,907
Alliance Leather Inc.	Peabody	112,962	Duncan Galvanizing Corporation	Everett	600,082
Hollingsworth & Vose Company	West Groton	110,999	Allegheny Rodney Strip Division	New Bedford	595,687
Adden Furniture Inc.	Lowell	79,176	Sanmina Sci. Corp.	Wilmington	535,524
Flexcon Co. Inc. Plant 2	Spencer	72,615	Brittany Dyeing & Printing Corp.	New Bedford	530,774
Intelicoat Technologies Inc.	South Hadley	70,698	Genzyme Corp.	Boston	516,000
Masspower Inc.	Springfield	68,560	Eastman Gelatine Corporation	Peabody	508,054
Berkshire Power LLC	Agawam	65,010	Intelicoat Technologies Inc.	South Hadley	472,289
Proma Technologies Inc.	Franklin	64,964	Flexcon Co. Inc. Plant 2	Spencer	448,888
Venture Tape	Rockland	62,482	Texas Instruments	Attleboro	445,460
Majilite Manufacturing Inc.	Lowell	61,300	Applied Biosystems	Cambridge	439,103

VI. Key TURA Terms

This section contains definitions of key TURA terms.

TURA – Massachusetts Toxics Use Reduction Act of 1989 (MGL 21I)
TRI – federal EPA Toxics Release Inventory
TRADE SECRET – the information identified as confidential by TURA filers. To protect confidentiality claims by Trade Secret filers, all trade secret data in this information release is presented in aggregated form. Aggregated data does not include the names and amounts of chemicals subject to claims of confidentiality.
2000 CORE GROUP – includes all TURA filers and chemicals that were subject to TURA reporting in 2000 and remained subject to reporting in 2002. The 2000 Core Group was created for the first time in the 2002 Information Release to more accurately represent TURA progress from a 2000 baseline year.
1990 CORE GROUP - includes all TURA filers and chemicals that were subject to TURA reporting in 1990 and remained subject to reporting in 2002. The 1990 Core Group was used to measure progress from 1990 to 2001 and is being shown in the 2002 Information Release for comparison with previous years' data. However, because the 1990 Core Group represents just over half of the 2002 TURA chemical use, its use will be phased out in future years.

The terms and definitions below have been arranged in order of inputs and outputs. Chemicals that are used by companies are brought into the facility and are manufactured, processed or otherwise used. As a result of using these chemicals, a company has outputs that can include a product that is created for sale, or a byproduct or waste. The calculation of use and waste of chemicals is known as 'Mass Balance'. Generally the inputs equal the outputs, but there are circumstances where a chemical is used in ways that result in an imbalance between inputs and outputs. These circumstances are most often the result of: 1) chemicals are recycled on-site, 2) the product was held in inventory, 3) chemical is consumed or transformed, or 4) the chemical is a compound.



TOTAL USE – the total quantity in pounds of TURA chemicals reported as manufactured, processed and otherwise used.

MANUFACTURE – to produce, prepare, import or compound a toxic or hazardous substance.

OTHERWISE USE – any use of a toxic substance that is not covered by the terms "manufacture" or "process" and includes use of a toxic substance contained in a mixture or trade name product.

PROCESS – the preparation of a toxic or hazardous substance, including without limitation, a toxic substance contained in a mixture or trade name product, after its manufacture, for distribution in commerce: a) in the same form or physical state, or in a different form or physical state, from that in which it was received by the toxics user so preparing such substance; or b) as part of an article containing the toxic or hazardous substance.

PRODUCT – a product, a family of products, an intermediate product, family of intermediate products, or a desired result or a family of results. "Product" also means a byproduct that is used as a raw material without treatment.

SHIPPED IN PRODUCT – the quantity in pounds of the chemical that leaves the facility as product.

BYPRODUCT – all non-product outputs of reportable substances generated by a production unit prior to handling, treatment, and release.

ON-SITE RELEASES– all byproducts that are released to the air, discharged to surface waters, released to land and underground injection wells.

TRANSFERS OFF-SITE – byproducts that are transferred off-site for energy recovery, recycling, treatment and disposal.

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