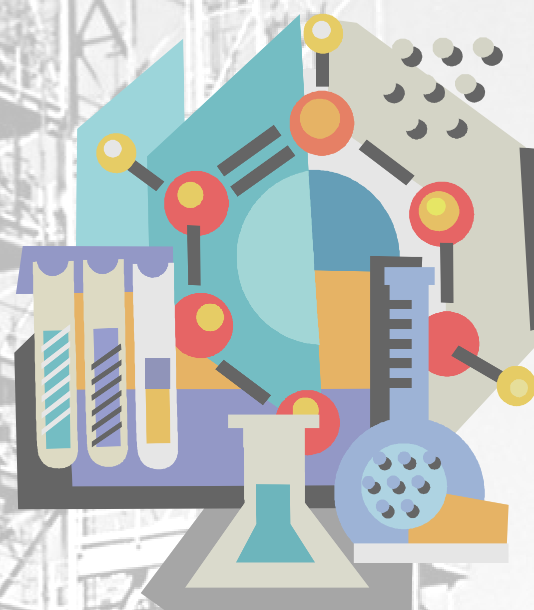
Doc. No. 545

Hazardous Waste Source Reduction Assessment of Selected Sectors of

THE CALIFORNIA CHEMICAL INDUSTRY



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DEPARTMENT OF TOXIC SUBSTANCES CONTROL

MAY 2004

HAZARDOUS WASTE SOURCE REDUCTION ASSESSMENT OF SELECTED SECTORS OF

THE CALIFORNIA CHEMICAL INDUSTRY

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May 2004

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Acknowledgements

The Department of Toxic Substances Control (DTSC) appreciates the generous time and cooperation provided by the individuals representing the companies participating in this assessment, with special thanks to the facility representatives who hosted our staff's site visits. DTSC also thanks the Chemical Industry Council of California and the Sacramento office of the American Chemistry Council for their assistance.

REPORT OVERVIEW

This report summarizes the source reduction efforts of selected companies within California's chemical industry for the purpose of sharing their source reduction approaches and assessing their compliance with the Hazardous Waste Source Reduction and Management Review Act of 1989 (commonly known as SB 14). The Department of Toxic Substances Control (DTSC) chose the companies in this report mainly from four Standard Industrial Classification (SIC) codes: 2819 (Industrial Inorganic Chemicals, Not Elsewhere Classified [NEC]); 2869 (Industrial Organic Chemicals, NEC); 2879 (Pesticides and Agricultural Chemicals, NEC); 2899 (Chemicals and Chemical Preparations, NEC); and one company in 5169 (Chemicals and Allied Products, NEC). With one exception (agricultural chemicals), we attempted to focus on broader chemical categories rather than on specialty products, such as plastics, pharmaceuticals, soaps, and paints. Listed below are the facilities and their respective SIC Codes.

1. Air Products and Chemicals, Incorporated, Los Angeles - 2899
2. Applied Biosystems, Foster City - 2869
3. Baker Petrolite Corporation, Bakersfield - 5169
4. Bio-Rad Laboratories, Hercules - 2869
5. Criterion Catalyst Company, Azusa - 2819
6. Criterion Catalysts Company, Pittsburg - 2819
7. Dow Chemical Company, Pittsburg - 2879
8. EKC Technology, Incorporated, Hayward - 2899
9. General Chemical Corporation – Bay Point Works, Pittsburg - 2819
10. General Chemical Corporation – Hollister Works, Hollister - 2899
11. General Chemical Corporation – Richmond Works, Richmond - 2819
12. Honeywell, El Segundo - 2869
13. Honeywell International, Incorporated, Santa Clara - 2819
14. IMC Chemicals, Incorporated, Trona - 2819
15. JSR Microelectronics, Incorporated, Sunnyvale - 2869
16. Monsanto Company – Avon Plant, Martinez - 2819
17. Ondeo Nalco Company, Long Beach - 2869
18. Procter & Gamble Manufacturing Company, Sacramento - 2869
19. Rhodia, Incorporated, Martinez - 2819
20. Shell Chemicals, Martinez - 2819
21. U.S. Borax, Incorporated, Wilmington - 2819
22. Wilbur-Ellis Company, Fresno - 2879

Federal Toxics Release Inventory (TRI) data for the entire California chemical industry indicated that hazardous waste generation declined steadily over a ten year period (1991 to 2001), when gauged against the gross state product. We found a similar decline in the facilities we reviewed, although we were not able to factor in production figures. In our sample of 22 facilities, the total hazardous waste generated in the reporting year (1998 for most facilities) was 42,130,466 pounds, down from 49,605,982 pounds in the baseline year (1994 for most facilities), an overall waste reduction of 7,475,516 pounds, or 18 percent. Forty-one percent of the 1998 total was generated by the six facilities producing industrial organic chemicals. Thirty-one percent of the waste was generated by the two facilities producing pesticides and agricultural chemicals. Ten facilities producing industrial inorganic chemicals generated 21 percent of the wastes. The remaining four facilities in very broad chemical manufacturing SIC codes accounted for the remaining seven percent of generated waste. Note that this discussion applies only to the SB 14-applicable wastes reported.

Most of the waste, almost 40 percent, was generated by cleaning activities (washing out bottles, glassware, tanks, containers, reactor vessels and other production equipment, and flushing lines). Another 20 percent was generated by plant washdown. Production of off-specification materials and by-products accounted for 14 percent, while distillation and reclamation activities accounted for 13 percent. Much smaller amounts were generated by onsite treatment of residuals and wastes, use of personal protective equipment, settling of sludges, housekeeping activities, abrasive blasting of equipment, and use of filter materials. Spent materials, empty containers, and waste fuel oil also contributed to the waste streams.

Once we identified the waste generating activities, we grouped the facilities' recently-implemented source reduction measures by major waste-generating categories. For example, to reduce cleaning activity wastes, some facilities had implemented the following strategies, among many others:

- substituting less toxic cleaning solvents for those previously used;
- using larger, more efficient production vessels;
- installing dedicated process vessels and lines;
- reusing solvent wastes onsite;
- scheduling and extending process runs to minimize equipment cleaning.

Most facilities could not specifically quantify the effects of their source reduction approaches on waste generation. We devoted one section of this report to highlighting the achievements of the six facilities that were able to provide that information.

For a more detailed review of the information provided by our 22 facilities' SB 14 documents, the report contains a profile of each facility, except for two, which are developed as case studies. Each profile includes:

- the name, address, and SIC code of the facility;
- business activity;
- manufacturing processes;
- major waste streams and waste-generating activities;
- source reduction and waste management activities, 1994-1998; and
- factors affecting waste generation.

We developed case studies for two facilities whose documents were outstanding in different ways. One facility provided meticulous economic analyses of both their proposed and implemented source reduction measures, while the other facility provided a well organized, thorough discussion of waste generation by production process.

In addition to the information above, the report looks at management commitment to source reduction. An overall commitment was expressed in various ways, ranging from a simple formal company statement identifying source reduction goals to complex facility systems designed to integrate source reduction into every production aspect. Some of the broad-based management measures included:

- setting a source reduction goal, normalized for production changes;
- establishing waste reduction coordinators and/or committees;
- establishing an employee award program for meeting waste reduction goals;
- using quality management systems, such as "Six Sigma" and "ISO 9001," to promote waste reduction as part of manufacturing efficiency;
- developing formalized "management of change" and "process improvement efforts," to tie in manufacturing efficiency with waste reduction;
- establishing a preventive and predictive maintenance system.

Finally, to address one of the key obstacles to source reduction cited in the SB 14 documents, corporate headquarters and customer specifications that prevent substitution of less toxic materials or product reformulation, this report looks at some government/industry/community cooperative efforts in "Green Chemistry". Green Chemistry generally means the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. First, we discuss a program that we saw mentioned only once in the facility documents we reviewed, a voluntary industry program called "Responsible Care." This program aims, among several goals, to solicit public input on products and operations and to make health, safety, the environment, and resource conservation critical considerations for all new and existing products and processes. "Responsible Care" was first introduced in Canada and has since spread globally, but has not been very apparent in California, to judge by our sample of chemical industry facilities. We also discuss several of U.S. Environmental Protection Agency (U.S. EPA's) programs, including its Green Chemistry Program, the 33/50 Voluntary Program, the High Production Volume Chemical challenge, and the Persistent Bioaccumulative and Toxic Substances (PBT) reduction and public awareness program. Finally, we looked briefly at the European Union's Community Policy for Chemicals, which includes the Registration, Evaluation and Authorization of Chemicals (REACH) program.

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1. INTRODUCTION

California law requires the Department of Toxic Substances Control (DTSC) to select and assess an industry every two years, in order to identify successful source reduction and other hazardous waste management approaches employed by generators in the industry, and to review that industry's compliance with the Hazardous Waste Source Reduction and Management Review Act of 1989 (commonly known as SB 14). The Hazardous Waste Source Reduction and Management Review Act of 1989 requires all facilities generating over 12,000 kilograms (26,400 pounds) of hazardous waste annually to prepare documents every four years, that review their source reduction and waste management efforts of the past four years (the Hazardous Waste Management Performance Report (Performance Report)) and describe source reduction and waste management approaches planned for the next four years (the Source Reduction Evaluation Review and Plan (Plan)). These facilities must also prepare *and* submit to DTSC a Summary Progress Report (SPR), which summarizes information from the first two documents.

DTSC chose to undertake an assessment of the chemical industry's SB 14 documents based partly on a review of the United States Environmental Protection Agency's (U.S. EPA) Toxics Release Inventory (TRI) and U.S. EPA's National Biennial Resource Conservation and Recovery Act (RCRA) Hazardous Waste Report, also known as the Biennial Generator Report (BGR), and partly in response to interest expressed by DTSC's Pollution Prevention Advisory Committee.[1] In reviewing TRI and BGR data, we looked for high waste producers among industries. TRI data for 1998, the reporting year of our chemical industry assessment, and 2001, the latest year for which TRI data were available, indicated that the chemical industry is one of the top three or four producers of hazardous waste in California.[2] We saw the same evidence when we looked at the 1999 BGR data.[3] Subsequently, we decided to review the 1998 SB 14 documents for the chemical industry in California.[4]

When we consider the chemical industry in California, the United States, Europe, or the world, we are not looking at an industry with clearly defined borders. Its products are as varied as industrial gases, plastics, pharmaceuticals, soaps and other cleaning agents, cosmetics, paints, fertilizers and pesticides, adhesives, and explosives, as well as acids, alkalis, solvents, reagents, etc. (see SIC code 28 and NAICS classification 325). In an effort to narrow the scope of our assessment, we decided to focus on what we considered "core" chemical manufacturing, essentially SIC codes 2819, Industrial Inorganic Chemicals, Not Elsewhere Classified; 2869, Industrial Organic Chemicals, Not

[1] The Advisory Committee includes representatives of a statewide public health advocacy group, statewide environmental advocacy groups, industry, small business, organized labor, a publicly owned treatment works, local government, and state government.
[2] U.S. EPA Office of Environmental Information, TRI Explorer
[3] National Biennial RCRA Hazardous Waste Report; Technical Directive R09802-015, Waste Generation Analysis by Manufacturing SIC Codes for 1999 Data (in Tons)
[4] A few of the facilities submitted revised documents, after our first review, based on a 2002 reporting year and a 1998 baseline year.

Elsewhere Classified; and 2899, Chemicals and Chemical Preparations, Not Elsewhere Classified. We also included agricultural chemicals, in response to staff and Pollution Prevention Advisory Committee interest. Specifically, we identified facilities in SIC code 2879, Pesticides and Agricultural Chemicals, Not Elsewhere Classified. Using the TRI and BGR reports, and California's manifest data, held in the Hazardous Waste Tracking System (HWTS), we identified approximately 40 high waste-producing facilities. We subsequently eliminated 18 facilities because they were closed or closing, did not actually manufacture chemicals, or, in one case, requested confidentiality. Thus this final assessment report addresses the documents of 22 facilities.

The purpose of our assessment of the chemical industry was to gather information on the source reduction progress and accomplishments of facilities within this industry, and to review the facilities' SB 14 documents for compliance with SB 14. We chose to display the selected facilities' progress and accomplishments through facility profiles and case studies, and through compilations of information related to common factors, such as major waste-generating activities and source reduction accomplishments by waste-generating activity. Due to the diversity of the facilities and their operations within the chosen SIC codes, this report largely consists of facility profiles that display the varied source reduction approaches of the different facilities. We addressed compliance issues through individual responses to the facilities that submitted source reduction documents, and, in this report, through a brief discussion of the most common weaknesses in the SB 14 documents we reviewed.

2. THE CALIFORNIA CHEMICAL INDUSTRY AND SB 14

2.1 The Chemical Industry in California

The chemical industry consists of many sectors, including industrial gases, pigments, plastics, pharmaceuticals, soaps, perfumes, cosmetics, paints, fertilizers, pesticides, explosives, and inks. A vast array of products we use, especially in the industrialized world, is manufactured through chemical processes. California's chemical industry employs roughly 82,600 personnel, ranking it third among states in the United States, has approximately 1,544 manufacturing facilities, and generated about 24 billion dollars worth of chemistry products in a recent year.[5] Naturally, such a large manufacturing industry produces sizable quantities of hazardous waste. In looking, however, at the chemical industry's share of California's gross state product (GSP) versus the amount of waste generated as reported to the federal TRI over a ten year period, we see that the industry as a whole has greatly reduced hazardous waste generation from 1991 to 2001. Table 1 below shows the gross state product in current dollars, between 1991 and 2001, and the total waste managed per year for the same time period. The fourth column calculates the pounds of waste generated per million dollars GSP. Figure 1a illustrates GSP versus total waste managed between 1991 and 2001. Figure 1b illustrates the trend of hazardous waste managed per million dollars between 1991 and 2001. As Table 1 and Figure 1b show, there has been a significant decline in pounds of hazardous waste generated per million dollars of the chemical industry's gross state product.

TABLE 1

California Chemical Industry Gross State Product and Total Waste Managed, 1991-2001

Year	GSP (Current Dollars in Millions)	Total Waste Managed (Pounds)	Pounds/Million Dollars
1991	5,889	51,684,630	8,776
1992	6,844	42,352,527	6,188
1993	7,704	40,933,328	5,313
1994	8,505	32,365,179	3,805
1995	8,360	35,521,124	4,249
1996	7,942	34,871,301	4,391
1997	8,468	32,991,709	3,896
1998	9,068	29,531,242	3,257
1999	11,773	27,130,723	2,304
2000	14,359	30,631,249	2,133
2001	15,064	30,290,422	2,011

Source of Current Dollars of California Gross State Product for Chemical Industry:
California Department of Finance: http://www.dof.ca.gov/html/fs_data/stat-abs/sec_D.htm
Source of Total Waste Managed: U.S. EPA, Toxics Release Inventory:
http://www.epa.gov/triexplorer/trends.htm

[5] "The Business of Chemistry in California", American Chemistry Council, http://www.bipac.net/page.asp?g=ACC&content=CA_issues, 11/25/2003

Figure 1a
California Chemical Industry: Total Hazardous Waste Managed versus GSP, 1991-2001

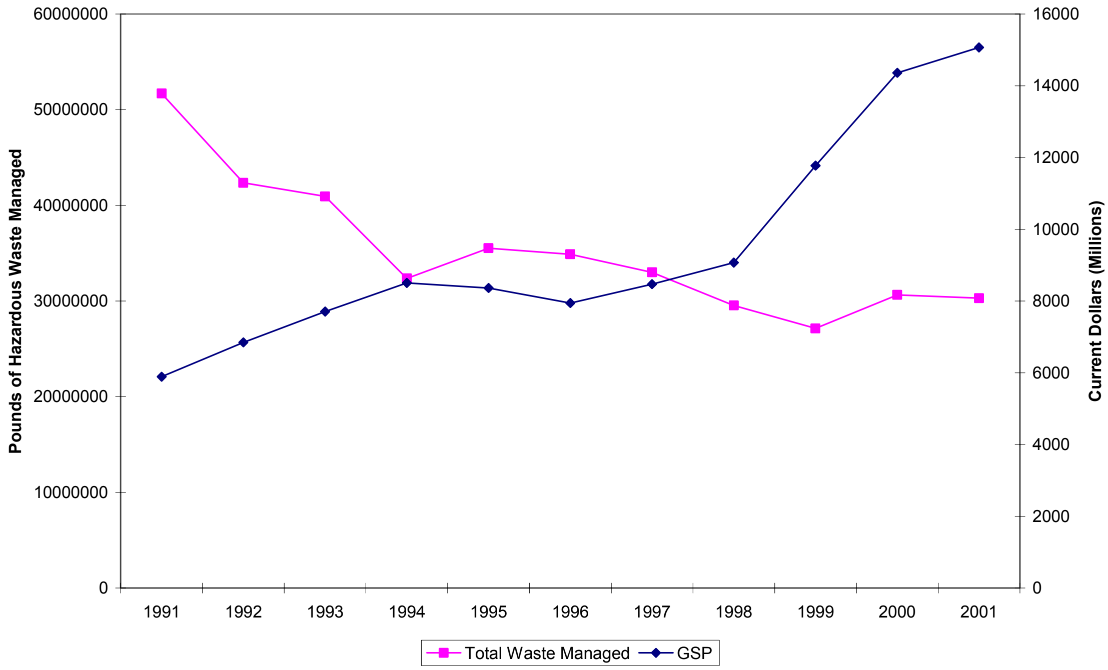
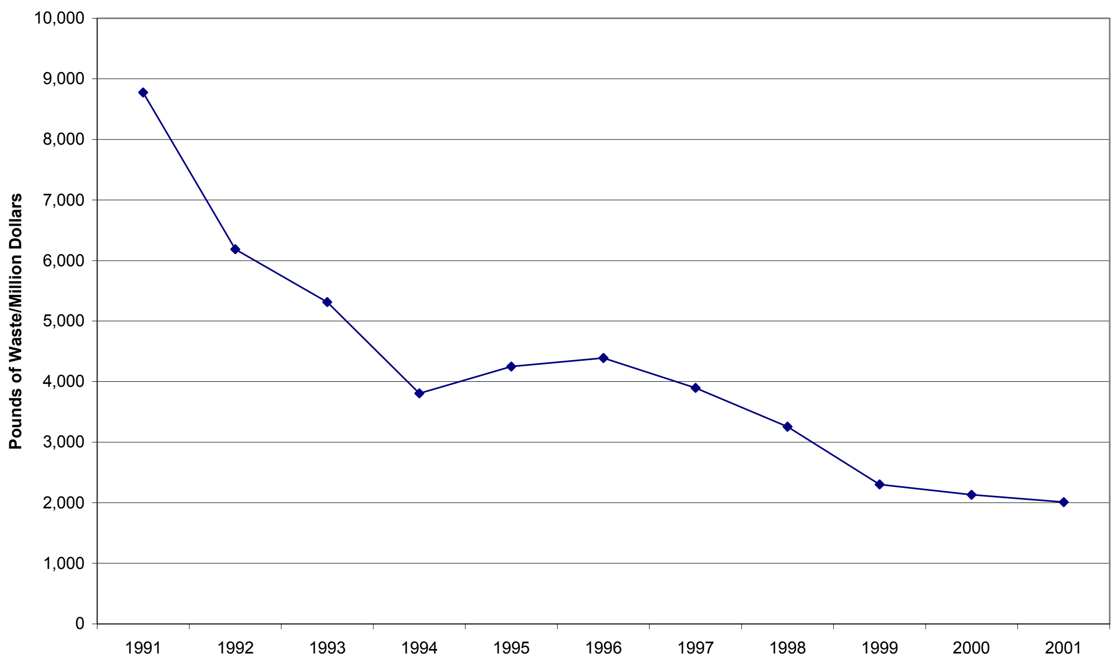


Figure 1b
California Chemical Industry: Hazardous Waste Managed Per Million Dollars GSP, 1991-2001



TRI data also give us an idea of how the California chemical industry managed its waste between 1991 and 2001, in terms of recycling, energy recovery, and treatment. Table 2 and Figure 2 demonstrate the quantities and trends of waste managed in this time period.

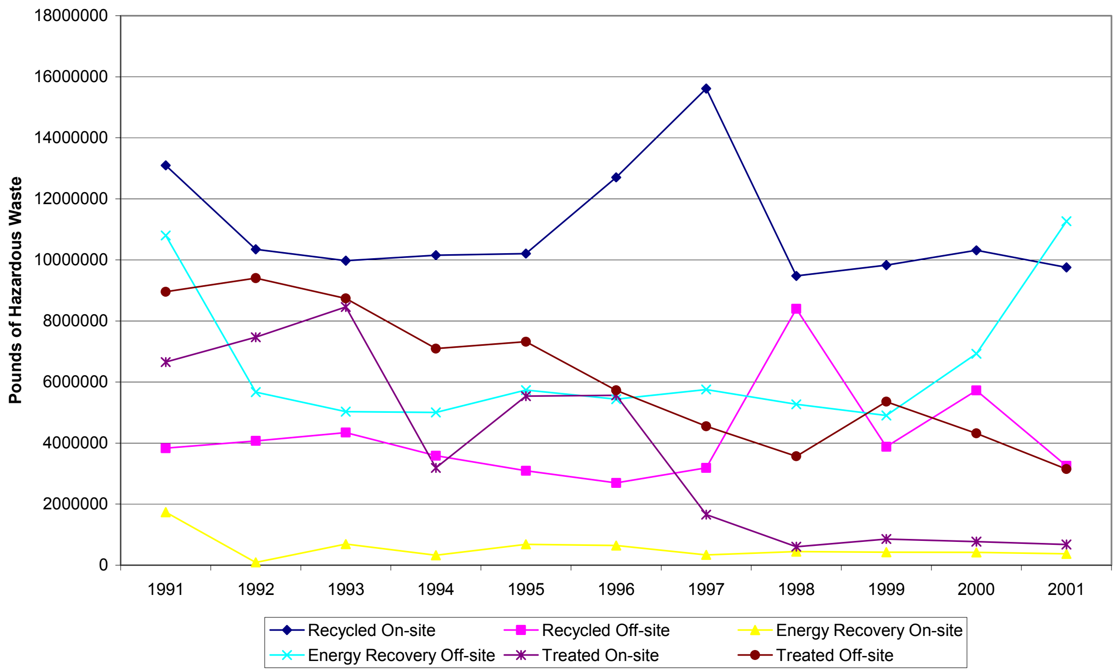
TABLE 2

**California Chemical Industry:
Hazardous Waste Management Approaches, 1991-2001**

Year	Recycled On-Site	Recycled Off-Site	Energy Recovery On-Site	Energy Recovery Off-Site	Treated On-Site	Treated Off-Site	Total Waste Managed
1991	13,094,417	3,835,004	1,738,002	10,798,489	6,654,254	8,955,575	51,684,630
1992	10,346,287	4,075,572	95,077	5,671,733	7,468,909	9,404,197	42,352,527
1993	9,974,121	4,343,191	694,267	5,031,707	8,459,307	8,734,040	40,933,328
1994	10,155,864	3,588,888	323,540	5,003,402	3,188,514	7,095,848	32,365,179
1995	10,204,641	3,092,426	686,807	5,738,398	5,536,552	7,318,397	35,521,124
1996	12,702,916	2,695,603	647,515	5,436,125	5,559,865	5,728,222	34,871,301
1997	15,612,127	3,189,636	339,191	5,753,894	1,659,760	4,553,137	32,991,709
1998	9,477,518	8,400,975	447,022	5,268,844	608,142	3,565,173	29,531,242
1999	9,825,878	3,882,588	424,238	4,901,071	855,940	5,359,386	27,130,723
2000	10,317,416	5,722,740	419,885	6,924,418	770,957	4,319,976	30,631,250
2001	9,756,951	3,253,409	370,441	11,263,130	678,960	3,148,760	30,290,422

Source: U.S. EPA, Toxics Release Inventory: http://www.epa.gov/triexplorer/industry.htm

Figure 2
California Chemical Industry: Hazardous Waste Management Trends, 1991-2001



We do not, of course, use TRI data in assessing SB 14 documents. The above information simply serves to give readers a general idea of the waste-generating and management practices of the California chemical industry. For a more direct example of the waste-generating activities of companies in the California chemical industry, we looked at the data contained in the SB 14 documents of the 22 facilities we reviewed. Keep in mind, however, that the 22 facilities are only a subset of the California chemical industry.

2.2 SB 14 Data

A compilation of the facilities' waste generation data for the baseline year (1994 for most facilities) and reporting year (1998 for most facilities) is included in Table 5, set forth in Section 4, "Summary Information." This table identifies the facility, California waste codes and descriptions of major waste streams generated by each facility, amounts of waste generated in 1994 and 1998, and how the waste streams were managed. Not all of the facilities provided the same kind or amount of information, and, therefore, our table reflects a less-than-complete picture. For example, not all facilities provided information on how they managed all their waste (recycling, treatment, disposal, etc.) - this kind of information was lacking for 11 waste streams.

When we add up the waste generation numbers in Table 5, we find that the total waste generated in 1994, by these 22 facilities, was 49,605,982 pounds versus 42,130,466 pounds generated in 1998, a 15 percent reduction. Unfortunately, we cannot normalize these numbers against production increases and other factors that affected waste generation. This information was not always available and also varied from facility to facility. A look at the facility profiles, however, shows that increased production was a commonly-cited factor that affected waste generation. Twelve out of the 22 facilities reported increased production, ranging from 14 percent to 400 percent, as a factor in their waste generation. Only one facility reported decreased production as a determining factor. Thus, not only did hazardous waste generation decrease overall in the 22 facilities, between the baseline year and reporting year, but decreased in the face of apparently increasing production.

We also looked at waste generation by SIC Code (not shown in Table 5) for 1998, as shown in Table 3.

TABLE 3

Number of Facilities and Pounds Hazardous Waste by SIC Code, 1998

SIC Code	Number of Facilities	Pounds of Waste Generated	Percent of Total
2869 – Industrial Organic Chemicals, NEC	6	17,387,324	41
2879 – Pesticides and Agricultural Chemicals, NEC	2	13,080,460	31
2819 – Industrial Inorganic Chemicals, NEC	10	8,772,409	21
2899 – Chemicals and Chemical Preparations, NEC	3	2,100,233	5
5169 – Chemicals and Allied Products, NEC	1	790,040	2

In our sample of chemical industry facilities, the larger waste producers seem to be the industrial organic chemical facilities and the agricultural chemical facilities.

We were not able to determine what quantities of waste were managed in specified ways, such as onsite recycling, onsite treatment, onsite disposal, release to a Publicly Owned Treatment Works (POTW) or National Pollutant Discharge Elimination System (NPDES), offsite recycling, offsite treatment, or offsite disposal, for two reasons. First, that information was often not available.[6] In addition, when that information was provided, the facility might have presented more than one management approach for the same waste stream (for example, recycling some of it onsite, but disposing of the unusable remainder offsite), without specifying amounts per management approach.

We also analyzed the amount of waste generated by the different industrial processes and activities, as reported by the 22 facilities (see Section 4.2). Listed below are the waste-generating categories that produced more than 100,000 pounds of waste in the reporting year.

[6] SB 14 requires that a description of current hazardous waste management approaches and all approaches implemented since the baseline year be included in the Report. This is an area in which the facilities we reviewed could improve their future SB 14 documents.

TABLE 4		
Pounds of Waste by Waste-Generating Activity		
Waste-Generating Activity	**Pounds of Waste**	**Percent of Total**[7]
Cleaning activities: cleaning bottles and glassware; washing out containers, tanks, reactor vessels, and other production equipment; flushing out lines	16,579,271	39
Plant washdown (including process washdown water and scrubber effluent from various units)	9,280,000	22
Production of off-specification materials and by-products	5,790,016	14
Distillation and reclamation activities	5,300,465	13
Onsite treatment of residuals and wastes	1,394,560	3
Spent materials (such as spent catalyst, solvent-water mixtures, and product conversion solutions)	458,003	1
Empty containers, including bags, liners, and packaging	187,121	<1

If we recall that the major waste streams generated in the reporting year totaled 42,130,466 pounds, we see that cleaning activities accounted for almost 40 percent of the waste generated, plant washdown for 22 percent, production of off-specification materials and by-products for 14 percent, and distillation and reclamation activities for 13 percent. All the remaining waste-generating categories (including those not shown above) were each under four percent of the total. Since cleaning activities generate such a large percentage of the total wastes generated, they may be a good target for future source reduction efforts. The submitted SB 14 documents frequently cited customer specifications as an obstacle to source reduction. Although this obstacle may account for a significant part of this waste stream, presumably because of high purity requirements, measures to address the large quantity of cleaning wastes are within the facilities' control. Section 4.3 describes a long list of approaches already being implemented by facilities to address this problem.

2.3 Compliance with SB 14

Some of the SB 14 documents submitted to DTSC provided a good description of waste-generating processes and source reduction measures, both implemented and proposed. However, most of the documents were deficient, either not providing enough information to convey an understanding of the source reduction evaluation review and analysis performed, or leaving out required sections altogether. In our review of and response to the documents submitted, DTSC requested 5 facilities with significant omissions to revise and resubmit their documents, and 17 facilities with lesser problems to revise their documents and confirm to DTSC that they had done so.

[7] This will not add up to 100% since we have included only major waste-generating activities in this table.

The main areas in which we felt the SB 14 documents were inadequate were:

- Inadequate descriptions of waste-generating activities. This component is essential to understanding the applicability of an implemented or proposed source reduction measure. We chose one facility for a case study based solely on how well its Plan provided this information.
- Inadequate descriptions of the source reduction measures. We found that descriptions were much too brief and superficial, thus limiting the opportunity to share information with other facilities producing similar waste streams or facing similar waste-generating challenges.
- A lack of economic analysis, for either implemented or proposed source reduction measures. "Although not quantifiable" was a common preface to a discussion of the results of implemented source reduction measures. One of the keys to success in a source reduction program is to be able to show that it saves the company money, or at least pays for itself. Without that kind of information, it is difficult to convince other facilities to invest in a particular measure. Again, we presented a case study of one facility based on the fact that it had provided an extensive discussion of the economic impacts of proposed and implemented source reduction measures.

Another area in which the documents could be improved was the presentation of information. The documents often lacked good organization and clarity. This problem confounds one of the purposes of SB 14: to present information that can be useful to other companies within the industry. In addition, it was not unusual for facilities to present information in the Plan (a prospective document) that should have been in the Performance Report (a historical document), and the reverse. This further contributes to confusion and difficulty in evaluating source reduction progress.

Our document review also discovered that more source reduction measures had been implemented in the preceding four years than were being proposed for the next four years (not including those measures that would be continued). Several facilities commented that they felt they had already taken source reduction as far they could. A frequently-cited obstacle to source reduction was that corporate headquarters and customer material specifications prevent the use of less hazardous raw materials. Thus, product reformulation and substitution of less hazardous materials in the manufacturing process were rarely considered or implemented.

In spite of the general weakness of the chemical industry source reduction documents, we frequently saw serious efforts made to identify source reduction and other waste minimization opportunities. Most of the facilities reviewed seemed to understand the relation of source reduction/waste minimization to production efficiency. It is interesting to note that many of the facilities discussed "waste minimization" actions or proposals, and thus did not limit the discussion entirely to source reduction.[8] While the focus of SB14 is source reduction, it is encouraging that facilities are looking at all means of minimizing waste. We also found the facility contacts receptive to our inquiries and willing to provide additional information and any updates we requested.

2.4 Management Commitment to a Source Reduction Ethic – Broad Based Systems

While some of the SB 14 documents that we reviewed discussed a commitment to a source reduction ethic or philosophy through the implementation of broad-based programs, few gave significant details. Listed below are programs that were discussed to varying degrees that address management's commitment to source reduction. One facility stands out in the fairly detailed account provided for management systems used to increase efficiency and reduce waste. That facility was Monsanto's Avon Plant, whose efforts are also described below.

Air Products and Chemicals, Incorporated, Vernon: Air Products has a Chemical Release and Waste Reduction Policy (provided in its SB 14 documents), and a stated commitment to the American Chemistry Council to support the principles of the "Responsible Care Program".[9] More specifically, Air Products has assigned the Environmental, Health and Safety Manager as the Waste Reduction Coordinator, and has a Central Safety Committee and a Central Quality Committee/Responsible Care Committee, which includes representatives of the entire work force. Furthermore, the facility:

- has an employees award system for meeting waste reduction goals, including the annual Corporate Environmental Achievement Award;
- evaluates new equipment, processes, and operations based on a no-net-emission-increase goal for new installations; and
- has developed an Environmental Procedures Manual to document environmental programs and goals, and to be a training resource for employees.

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[8] The distinction between waste minimization and source reduction can best be explained by looking at the waste management hierarchy. Source reduction tops the list of the waste management hierarchy which, in the order of descending preference, includes:

- source reduction
- reuse
- recycling
- treatment
- disposal.

Waste minimization includes all means of reducing hazardous waste (such as on- and off-site recycling), while source reduction specifically applies to practices that are taken before waste is generated and hence <u>prevent</u> the generation of waste.

[9] "Responsible Care" was adopted in 1988 by the U.S. chemical industry through the American Chemistry Council [formerly the Chemical Manufacturers Association (CMA)], as a voluntary program to achieve improvements in environmental, health and safety performance beyond levels required by the U.S. Government. Source: http://www.americanchemistry.com, November 25, 2003.

Air Products also stressed the importance of measurement, evaluation, and goal-setting in its Plant Chemical Release and Waste Reduction Policy, and noted its participation in U.S. EPA's 33/50 Program. The 33/50 Program was a U.S. EPA voluntary program that invited certain companies in the chemical industry to reduce releases and transfers for 17 targeted chemicals by 50 percent, by 1995, from the baseline year of 1988.[10] Air Products reduced the release and/or transfer of xylene, toluene, and methyl isobutyl ketone by 50 percent by 1995.

Dow Chemical, Pittsburg: The facility reports in its Plan that, in 1996, a series of broad environmental, health, and safety goals were established for 2005, including elements of responsibility and accountability, preventing Environmental Health & Safety (EH&S) incidents, and increasing resource productivity. A specific 2005 goal is to "reduce the amount of waste and waste water generated per pound of production by 50 percent" from the baseline year of 1994. Dow also states in its Performance Report that source and waste reduction are a top company priority.

Criterion Catalysts, Pittsburg: Criterion states in its documents that the facility's Hazardous Waste Minimization Program is based on good management practices (GMP), including goals for reducing hazardous waste management costs and minimizing potential environmental, health, and safety exposures and releases. It also expresses a strong management commitment to source reduction and hazardous waste minimization, reinforced through training programs and process reviews of every manufacturing system at the facility, covering optimal operating conditions, good management practices, environmental health and safety considerations, and hazardous waste minimization options.

General Chemical Corporation, Hollister: This facility stated its management commitment to waste minimization in its "SB 14 Plan and Report". This statement included the commitment that "waste minimization will be a concern in the planning and operation of all company activities". General Chemical then specified some of the steps to implement this commitment. These included data collection, brainstorming sessions, and walk-through audits to assess waste-generating activities at the facility.

Honeywell International, Incorporated, Santa Clara: Honeywell set forth the management systems it felt applied across the board to waste generation. We list a few that we feel are directly relevant to a source reduction ethic:

- a formal, written environmental policy;
- formal, institutionalized "lean manufacturing" operating systems designed to minimize the cost and use of raw materials, maximize the efficiency of production systems, and keep final goods inventories low;

[10] Source: U.S. Environmental Protection Agency, Office of Pollution Prevention and Technology Development, **33/50 Program, The Final Record**, EPA-745-R-99-004, March 1999.

- formalized “Six Sigma”[11] and ISO 9001[12] continuous improvement systems;
- use of cost accounting techniques that assign the cost of hazardous waste management to the production units generating the wastes, to ensure waste management costs are budgeted, controlled, and minimized like other production costs;
- staff training on lean manufacturing and continuous improvement management techniques.

Furthermore, Honeywell reported that, for the preparation of its SB 14 documents, it pulled together an in-house, cross-functional team that had extensive experience and familiarity with the production processes, operating procedures, and hazardous waste-generating activities at the site.

Monsanto, Avon: This facility reported implementing the following measures as part of its overall source reduction efforts.

- MOC. Monsanto initiated a management of change (MOC) process in 1991, whereby any proposed projects or changes had to be written up by the initiator of the idea and then reviewed by in-plant staff, including production and maintenance technicians. Subsequently, the initiator had to address concerns raised by the reviewers before any change could take place. In 1998, the MOC procedure was further refined to provide a detailed, standardized format for writing up proposed projects or changes. This revision in the MOC process has improved the execution of each project and change, and has reduced waste generation by minimizing the deviations for each project or change.
- Formalized Process Improvement Effort (PIM – Process Improvement Meetings). In order to improve cross-functional communication, the process improvement effort was formalized in 1996 to consist of regular meetings that brought together representatives from each department, namely Production, Maintenance, Engineering, and Environmental/Safety/Health.
- Preventive and predictive maintenance system. In 1996, Monsanto improved its formalized approach to maintenance planning to address daily maintenance management problems. The essential steps in this process were:
    - developing a formalized maintenance work order system, which included writing up the maintenance request, who made the request, who made the repairs, what was found, and what were the repairs;

[11] Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects in any process. The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of Six Sigma improvement projects. Source: http://www.isixsigma.com/sixsigma/six_sigma.asp, September 23, 2003

[12] ISO 9001 is a quality management system established by the International Organization for Standardization.

- installing meters on major machinery to document the hours of operation of a particular machine after it had been repaired, to develop a maintenance history;
- updating information and manuals for each piece of equipment, and cataloging them in a filing system;
- setting up a repair history file for each machine.

- Monsanto instituted a gain-sharing program for all plant employees when operational and safety goals are met. Monsanto believes higher than normal waste generation is associated with poor operational performance.

Rhodia, Martinez: This facility reported that many people, including managers, engineers, operators, and plant maintenance personnel were encouraged to submit ideas for source reduction planning.

In contrast, it is clear from the documents of several facilities that source reduction was not a high priority. For example, one facility honestly reported: "Waste reduction goals and intensity of work on source reduction have fluctuated over the past four years due to changes in EH&S staff at the site. Staff resources dedicated to source reduction have been limited due to concerns over employee safety, operational changes, tenant improvements, design project for new facilities, and maintaining compliance with the various safety, environmental, and fire code issues that govern hazardous materials management." This facility seems to be stating there is no time to develop source reduction strategies. It also illustrates that, for some companies, source reduction is seen as an additional task, rather than an ethic to be integrated into the operational philosophy of the facility or a means to increase production efficiency, or even a means to achieve compliance.

2.5 Conclusion

The purpose of the chemical industry assessment was to gather information on the source reduction progress and accomplishments of facilities within this industry, and to review the facilities' SB 14 documents for compliance. With a few exceptions, we did not find serious SB 14 compliance problems associated with the source reduction documents reviewed for this report. Most of the companies had, to varying degrees, documented their evaluation of source reduction options in the reporting year and recorded their source reduction and waste management practices in the preceding years. In most cases, more detail in explaining waste generation processes and source reduction measures would have improved the documents and provided more helpful information to others in the industry.

Although not all facilities articulated an overall management commitment or broad-based management goals with regard to source reduction, a few facilities provided descriptions of systems and programs for the integration of source reduction into the production process. None of these facilities, however, measured the effect of such programs on source reduction. The challenge for the chemical industry (as for all industries) is to quantify the effects of broad-based source reduction systems that have become part of a company's ethic and production processes.

With regard to hazardous waste generation, a few findings stand out:

- If we assume increasing production, as the California Department of Finance data and the anecdotal evidence provided by our 22 facilities indicate, it appears waste generation in this industry has declined significantly. Even without taking into account production increases, the total waste generated by the facilities we reviewed declined 15 percent in a four year period.
- The largest hazardous waste-generating SIC categories in our study were industrial organic chemicals (comprising six facilities) and pesticides and agricultural chemicals (comprising two facilities).
- The largest sources of hazardous waste were the multiple cleaning activities, such as rinsing bottle and glassware, washing containers, tanks, and production equipment, and flushing out production lines. These activities seem to be good candidates for future source reduction efforts.
- Other significant sources of hazardous wastes were plant washdown wastes, off-specification materials and by-products, and distillation and reclamation wastes.

We were somewhat struck by the frequent citing of one particular obstacle to source reduction, that customer specifications and corporate headquarters requirements prevent product reformulation or raw material substitution, to allow use of less-hazardous materials. Without strong leadership from corporate headquarters in encouraging source reduction and other pollution prevention solutions, including the development of materials and product specifications that will satisfy customer demands while being less hazardous, it is difficult for facilities such as those we assessed to use less-hazardous materials in their manufacturing operations. The Responsible Care Program, embraced in 1988 by the American Chemistry Council, specifically includes the following objectives:

- providing chemicals that can be manufactured, transported, used and disposed of safely;
- making health, safety, the environment and resource conservation critical considerations for all new and existing products and processes.

However, the absence of any mention or consideration of the Responsible Care Program in most of the source reduction documents we reviewed raises the question as to whether chemical facilities are getting encouragement in this direction from their corporate and association leadership.[13]

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[13] In a discussion with Tim Shestek of the American Chemistry Council, Mr. Shestek explained that about half of the companies reviewed are not members of the American Chemistry Council and thus would not be participating in this American Chemistry Council program. In addition, he believes that some of the facilities reviewed may be participating in this program, but may not actually be using the "Responsible Care" label in describing their programs.
Meeting between the Mr. Shestek and the author, March 29, 2004.

3. SOURCE REDUCTION HIGHLIGHTS

One of the most important aspects of source reduction planning is the measurement or quantification of source reduction accomplishments. This effort is critical in source reduction planning as it not only reinforces a company's commitment to pollution prevention, but also demonstrates to other companies the benefits of this commitment. We present below the facilities that included this crucial element of source reduction planning in their SB 14 documents.

Criterion Catalyst, Azusa reported:

- A reduction in waste catalyst fines by nearly 80 percent in spite of a 14 percent increase in production. This achievement consisted of the reduction of over- and under-size catalyst, off-specification catalyst, spilled catalyst, baghouse catalyst dust, and extruder scrap.

  Quantities: 1994 345,596 pounds
  1998 69,692 pounds

  Accomplished by: increased utilization of waste fines as raw material in the manufacturing process; new tracking and managing procedures; new formulas, which increased the use of the fines in the product.

- A 65 percent reduction in the floor sweepings wastes, alongside a 14 percent increase in production.

  Quantities: 1994 46,750 pounds
  1998 16,211 pounds

  Accomplished by: eliminating spill sources; repairing equipment that leaks; conducting regular preventive maintenance; reducing use of sweeping aid by using central vacuum whenever possible; implementing an employee training program.

- A nearly 70 percent reduction in its clarifier sludge waste, alongside a 14 percent increase in production.

  Quantities: 1994 39,615 pounds
  1998 12,200 pounds

  Accomplished by: reduction of baghouse dust waste, as a result of using new types of filter bags and installing a broken bag detector.

- A 62 percent reduction in its baghouse and dryer filter waste, alongside a 14 percent increase in production.

Quantities: 1994 10,175 pounds
1998 3,831 pounds

Accomplished by: using new, more durable bags; replacing the rotary valve at the bottom of the baghouse, thereby preventing erosion of the bags; and less frequently changing dryer filters.

Dow Chemical reported a significant decrease in the wastes that fell under CWC 751 (solids or sludges with halogenated organic compounds > or = 1000mg/Kg). Although this waste code included several waste streams, the facility reported an overall CWC 751 decrease of about 49 percent, against an increase in production between 18 percent and 32 percent at the different plants on the facility.

Quantities: Total CWC 751 1994: 4,230,000
Total CWC 751 1998: 2,163,000

These impressive results were achieved, in part, by reductions in the following specific waste stream:

- Non-conforming MEI (methyl ester intermediate):
  - Source reduction projected in 1994 Plan: 10,000 lbs/yr
  - Source reduction achieved by 1998: 24,200 lbs/yr

Accomplished by: making the off-specification MEI into a slurry using n-Methyl-2-Pyrrolidone (NMP) solvent and reintroducing it into the manufacturing process.

- Reactor solids:
  - Source reduction projected in 1994 Plan: 15,000 lbs/yr
  - Source reduction achieved by 1998: 20,000 lbs/yr

Accomplished by: a change in the reactor jet nozzle design, resulting in better mixing and reaction, thereby reducing the amount of carbon generated; better drying operations on the picoline raw material; changes in flow meters and control valves, which helped stabilize temperature variations; and improved operating discipline.

- Solid waste from fouled vessel internals:
  - Source reduction projected in 1994 Plan: 8,000 lbs/yr
  - Source reduction achieved by 1998: 8,000 lbs/yr

Accomplished by: ultrasonic cleaning, which eliminated the disposal of the vessel internals.

- Waste from vessel inspections:
  - Source reduction projected in 1994 Plan: 50,000 lbs/yr
  - Source reduction achieved by 1998: 400,000 lbs/yr

  Accomplished by: extending the time between vessel inspections, from five years to ten years, by using ultrasonic and x-ray thickness tank testing (vessels have to be cleaned prior to inspection, thereby generating a water and solids waste stream).

- Lontrel® solids:
  - Source reduction projected in 1994 Plan: 2,000 lbs/yr
  - Source reduction achieved by 1998: 2,000 lbs/yr

  Accomplished by: installation of stainless steel catch pans around material handling connections and installation of a venturi/eductor on the blending tanks to recover the product.

- Carbon tetrachloride distillation bottoms:
  - Source reduction projected in 1994 Plan: 250,000 lbs/yr
  - Source reduction achieved by 1998: 500,000 lbs/yr

  Accomplished by: piping modifications and process design changes to recycle this waste stream back to the chlorpyridines plant.

General Chemical, Hollister Works reported a 61 percent decrease in total waste generated between 1994 and 1998, when normalized against pounds of product produced.

Quantities:	Total waste 1994	180,740
	Total waste 1998	341,099
	Pounds of product 1994	2,014,109
	Pounds of product 1998	9,642,327
	Pounds waste/pounds product 1994	0.090
	Pounds waste/pounds product 1998	0.035

Accomplished by:

- increasing distillation efficiency;
- testing solvent rinseate following cleaning between batches to determine if the equipment has been adequately cleaned, and thereby minimizing rinse cycles;
- testing all raw material solvents to ensure they meet specifications;

- installing dedicated process lines, reducing the need for cleaning equipment; specifically, an entirely new purification process for perfluorocarbon compound solvents was built and dedicated to such products. This allowed longer product runs by type of chemical, client use, and client specification, reducing waste generation during product changeovers.
- extending process runs, also reducing the need for cleaning equipment.

Monsanto reported a nearly 55 percent decrease in its "trash contaminated with vanadium pentoxide" waste stream (CWC 141).

Quantities: 1994 2,985 lbs
1998 1,387 lbs

Accomplished by: eliminating the generation of contaminated inner liners by changing the incoming raw material containers from 55-gallon lined drums to tote bins.

Ondeo Nalco reported:

- A 30 percent decrease in its process waste water (CWC 134) between 1998 and 2002, along side a four-fold increase in production.

  Quantities: 1998 20,616,750 pounds
  2002 14,428,200 pounds

  Accomplished by: employee training in spill prevention, good housekeeping, and the minimization of water used in the cleaning processes; the installation of dedicated lines and equipment in the manufacturing process to reduce line flushing and spill clean-up.

- A 67 percent decrease in its oil and solvent waste (CWC 221), along side a three-fold increase in production of oil-based products.

  Quantities: 1998 29,343 pounds
  2002 9,757 pounds

  Accomplished by:
  - the installation of a dedicated transfer lines and other equipment (including one blender) for the product of highest use;
  - the use of management forecasting to determine if and when consecutive chemical batches can be manufactured, and good engineering practices to schedule consecutive oil-based batches when possible, thus minimizing the number of line and equipment rinses; and
  - the transfer of much of the Port-A-Feed® cleaning process to an off-site contractor.

Procter & Gamble reported:

- A 90 percent decrease in its spent catalyst waste (CWC 162) between 1998 and 2001.

  Quantities: 1998 820, 660 pounds
  2001 81,560 pounds

  Accomplished by: recycling the major portion of the reduction as a feedstock in an offsite asphalt manufacturing operation[14]; conversion to a more reactive catalyst, which reduced change-out during the hydrogenation process from 10 percent catalyst change-out to 6 percent catalyst change-out.

- The elimination of oil-containing "foots" (dregs) from the coconut oil refining process.

  Quantities: 1998 187,500 pounds
  2001 0 pounds

  Accomplished by: the installation of an alternative manufacturing process, which switched from caustic refining of coconut oil to steam refining. The new process uses steam and a diatomaceous earth filter instead of a caustic, thereby eliminating the hazardous constituent, the caustic.

[14] A generator must be extremely careful when transferring a waste material for use as feedstock in a product that is placed on land, as the law is very specific under which circumstances the waste material would qualify for a recycling exclusion. Failure to understand and follow the law correctly could result in serious liability issues for the generator. See section 25143.2 of the California Health and Safety Code, and Article 3, Chapter 16, Division 4.5, of the California Code of Regulations.

4. FACILITY PROFILES AND CASE STUDIES

4.1 Facility Profiles

A large part of this assessment report is devoted to facility profiles. This is due partly to the fact that the activities of the different facilities were sufficiently varied to make it difficult to summarize the manufacturing practices of the "chemical industry", as represented by the facilities we reviewed. It also enables us to present in detail valuable source reduction information presented in the facility documents and to show the progress these facilities have made in the four years preceding the reporting year. The quantity and quality of information presented below varies based on what the facilities provided us and what we were able to learn additionally from telephone conversations.

APPLIED BIOSYSTEMS

850 Lincoln Centre Drive
Foster City, California 94404

SIC Code: 2869 Industrial Organic Chemicals, NEC[15]

Business Activity

Applied Biosystems develops and markets instrument-based systems, reagents, software, and contract services to the life science industry and research community. The major operations at the 850 Lincoln Centre facility include reagent manufacturing, product development and research.

Manufacturing Processes

In both manufacturing and research and development operations, liquid or gas phase reactions occur in process vessels using materials that primarily include the solvents acetonitrile, heptane, and methylene chloride. Following the initial reactions, process mixtures are dried, filtered and/or washed with aqueous or organic solvent solutions. Processes such as continuous countercurrent extraction columns remove solvents and impurities from process mixtures. Chromatographic separation columns or a thin film evaporator further purify the products. In addition to manufacturing, facility activities that generate waste include cleaning of glassware and process vessels, quality control, laboratory research and development, instrument assembly, and packaging.

[15] NEC: Not Elsewhere Classified

Major Waste Streams and Waste-Generating Activities in 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Water with Methylene Chloride	134	342,360	Glassware cleaning activities in manufacturing processes.
Liquid Waste with Halogenated Organic Compounds	741	264,112	Over 60 percent is byproduct from chemical synthesis processes. Smaller quantities come from chemical synthesis laboratory, quality control operations, instrument assembly, and cleaning operations.
Solid Organic Waste	352	30,950	Contaminated gloves, wipes, chromatographic supports, drying agents, plastic ware, and glassware.

Source Reduction and Waste Management Activities, 1994-1998:

Water with Traces of Methylene Chloride (CWC 134):

Source reduction measures and waste management activities from 1994 to 1998:
- Increased substitution of acetone for methylene chloride.
- Developed cleaning procedures and protocols.
- Included onsite treatment, consisting of evaporating waste water to concentrate methylene chloride. This resulted in the recovery of one gallon of methylene chloride per 100 gallons of contaminated water; the treated water was discharged to a POTW.

Proposed measures, 1998:
- Eliminate use of methylene chloride where possible, and evaluate other solvents.
- Evaluate cleaning parameters, such as time and temperature.
- Training: periodically review cleaning procedures and conduct frequent training on procedures.

Liquid Waste with Halogenated Organic Compounds (CWC 741):

Source reduction and waste management activities, 1994 to 1998:
- Replaced acetonitrile and methylene chloride with less toxic chemicals, such as ethyl acetate/heptane in several process steps.
- Installed larger, more efficient, production vessel which reduced use of solvent for cleaning.
- Acquired dedicated process vessels, eliminating the need to run full cleaning cycles between batches.
- Developing and improving methods to rework off-specification batches.
- Used offsite treatment, consisting of destructive incineration.

Results:

- o Increased yield (80 percent-90 percent) in the larger vessels reduced solvent waste by 10 percent.
- o Larger, more efficient reaction vessel for tetrazole production resulted in an 80 percent reduction in waste from this process.
- o Use of dedicated vessels reduced need to clean between batches and consequently reduced solvent use by 2-4 liters per cleaning event.

Proposed measures, 1998:

- Conduct further research into replacing hazardous solvents with less hazardous solvents.
- Perform study to use less toxic reagents for manufacturing process.
- Add 300-gallon reactor vessel to enable producing larger batches when needed.
- Set up system for off-specification batch rework.

Solid Organic Waste (CWC 352):

Source reduction and waste management activities, 1994 to 1998:

- Replaced activated carbon filters with double volatile organic compounds (VOC) vapor condensers as an air abatement device for the chemical synthesis, thereby eliminating spent activated carbon beds.
- Developed training to improve chemical handling and prevent excessive use of solvent, and to segregate hazardous from non-hazardous waste.
- Expanded use of secondarily contained chemical carts and bottle carriers, to reduce glassware breakage and spills.
- Used offsite treatment, consisting of destructive incineration.

Results:

- o Reduced solid hazardous waste by approximately 1,000 pounds per quarter, by replacing activated carbon filters with double VOC vapor condensers.

Proposed measures for 1998 Reporting Year:

- Evaluate better hazardous material handling equipment as it becomes available.
- Develop formal training plans.
- Developed training to improve chemical handling and prevent excessive use of solvent, and to segregate hazardous from non-hazardous waste.

Factors Affecting Waste Generation

Net revenue increased from $ 386.7 million to $ 921.8 million (138 percent) between 1994 and 1998, while production increased by approximately 120 percent from 1994 to 1999. At the same time, hazardous waste generation only increased from

192,936 pounds in 1994 to 264,112 pounds in 1998 - a 37 percent increase. If we normalize the hazardous waste increase against net revenue, we find that hazardous waste generation decreased from 498 pounds per million dollars net revenue in 1994 to 287 pounds hazardous waste per million dollars net revenue in 1998, or a 42 percent decrease.

BAKER PETROLITE

5135 Boylan Street
Bakersfield, California 93308

SIC Code: 5169 Chemicals and Allied Products, NEC

Business Activity

Baker Petrolite produces a variety of products, including emulsion breakers, corrosion inhibitors, scale inhibitors, water treatment products, hydrogen sulfide scavengers, oxygen scavengers, paraffin solubilizers, and industrial cleaners, primarily for oilfield applications, as well as for industrial and refinery clients.

Manufacturing Processes

Facility activities include:

- receiving blends and raw materials, as liquids in bulk or drums, and as dry bagged material;
- blending components with oil or water-based solvents;
- packaging products; and
- re-packaging/re-labeling products, both bulk and in drums.

All blends are made in a batch process in blend tanks at ambient temperature and pressure. Raw materials are stored in drums, bags, or bulk storage tanks.

Major Waste Streams and Waste-Generating Activities, 2002

Waste Streams	CWC	Pounds	Waste-Generating Activities
Cleaning area waste (Unspecified organic liquid mixture)	343	357,490	Rinsing field tanks and bulk polymer and silicone containers with a water or oil-based solvent.
Experimental products (Unspecified solvent mixture and unspecified oil-containing waste)	214, 223	305,214	Products formulated for a specific location or field, which can no longer be used or recycled.
Off-specification polymers and their rinsates (Off-specification, aged, or surplus organics)	331	127,336	Expired shelf life of long chain molecular polymers.

Source Reduction and Waste Management Activities, 1998-2002

Source reduction measures and achievements, 1998-2002:

- Recycling of oil-based and water-based chemicals and washes;
- Limiting the number of blend unit washdowns;
- Use of absorbents to remediate spills (far less absorbent than rinse water needs to be used to clean up a spill);
- Installation of storm water abatement controls in the catch basins and chemical blending areas;
- Installation of additional draining racks to recover more useable chemical from containers, and consequently reduce residual left in drums ("heels");
- Use of dedicated 550 gallon intermediate bulk containers, which can be returned to the supplier for multiple refills, to reduce heels left in the smaller drums; the facility also installed a railcar spur to allow delivery of the 550 gallon bulk containers
- Use of cone bottom field tanks for polymers that allow circulation of product to keep it in solution.

Proposed measures, 2002:

- Product reformulation: return slightly off-specification products to the manufacturing process; develop more stable polymers. Sixteen percent of the total waste produced was generated by unstable and temperature sensitive polymers. Baker-Petrolite anticipates a 2.5 percent reduction from this measure.
- Use of solid absorbents to clean containers will result in a reduction of rinsates from the cleaning process. The clay absorbent that is used as a cleaning agent can be reused a number of times; thus, far less of the clay absorbent is needed to clean the same amount of containers than rinse water.
- Installation of additional draining racks to recover more useable chemical from containers;
- Stricter inventory controls, including revised sales chemical usage forms and chemical change forms. This allows the sales staff of the facility to notify the production unit in advance if a customer plans to discontinue purchasing a product or change the product formulation, thereby reducing the purchase of unnecessary raw materials.

Factors Affecting Waste Generation

- Increase in production.
- Merger of Baker Performance Chemicals and Petrolite Corporation.

BIO-RAD LABORATORIES

2000 Alfred Nobel Drive
Hercules, California 94547

SIC Code: 2869 Industrial Organic Chemicals, NEC

Business Activity

Bio-Rad Laboratories manufactures life science research products, including reagents, buffers, gels (such as electrophoresis media) and ion exchange resins, for use in analytical research, biotechnology, and molecular biology. This facility's SB 14 documents combined two sites for purposes of reporting.

Manufacturing Processes

Operations at Bio-Rad Laboratories include:

- batch reactor processing
- product washing for purification or conversion
- product drying
- product sizing
- vessel cleaning and maintenance
- gel manufacturing activities

Major Waste Streams and Waste-Generating Activities in 1998

Regatta Boulevard Site

Waste Stream	CWC	Pounds	Waste-Generating Activities
Mixed flammable liquids	214	314,422	Product washing/purifying generates solvent-water mixtures (e.g., methanol-water or isopropyl alcohol-water) for removal of unreacted monomers, water, solvents, and other waste elements. Product drying generates waste solvents such as ethanol, methanol, or isopropyl alcohol, in removing water from the product. Vessel cleaning and maintenance: solvents and water are used to clean each vessel before introducing the next product.
Mixed flammable, corrosive liquids	741	21,819	Product conversion generates waste sodium chloride or hydroxide, ferric chloride, hydrochloric acid and other solutions, as well as a washwater that sometimes follows conversion.

Wright Avenue Site

Waste Stream	CWC	Pounds	Waste-Generating Activities
Mixed flammable liquids (ethyl acetate and acrylamide)	212	45,348	Spent mother liquor from manufacturing.
Contaminated lab waste solid with resin monomer	352	42,045	Outer packaging of raw materials.
Mixed flammable liquids (methanol and water)	132	28,581	Spent mother liquor from manufacturing.
Non-RCRA hazardous waste liquid	134	8,130	Unusable raw materials.

Source Reduction for All Major Waste Streams, 1994-1998

Source reduction measures and achievements, 1995-1998:

Bio-Rad took the following measures between 1995 and 1998 to reduce waste:

- Reviewed specifications for shelf-life and inventory stocking levels for hazardous raw materials.
- Varied the batch sizes for various products, attempting to match product manufactured with product sold. The balancing reduced the amount of hazardous solvent used.
- Substituted a 50 percent water plus 50 percent solvent for 100 percent water as a first wash, thereby combining washing/purification and drying steps. This reduced the amount of water used by 50 percent and increased the BTU value of the waste, allowing it to be used in the fuel blending program.
- Reduced the amount of batches required per year, by updating manufacturing procedures and training operators to reduce batch failure. This reduced solvent use, as well as failed batches.

Bio-Rad reported the following waste comparisons for 1995 to 1998:

CWC	1995	1998	Percent Change
132	45,509	1,811	- 96
214	390,736	314,682	-19
741	17,328	21,677	25
132	12,148	28,526	134
134	0	8,173	NA
212	54,599	45,398	-17
352	15,306	41,990	174

These changes in waste generation were reported along side an approximate 70 percent increase in sales revenue.

Proposed source reduction measures:

- Establish manufacturing leadership team to oversee/confirm implementation of proposed source reduction measures.
- Improve written procedures to specify:
    - o quantities of rinsing solutions required, based on end-point detection for each product, and
    - o water flowrate and timing, based on end-point detection for sizing.
- Improve operator training.
- Use less-hazardous solvent.
- Combine or re-sequence washing and drying (rinse) steps to optimize chemical usage.
- Evaluate product lines to optimize chemical usage during rinsing steps.
- Re-evaluate customer-necessitated changes that increase amount of solvents used in rinsing and re-work.
- Recycle water used in wet screening rigs (equipment for segregating certain products, such as beads, into their appropriate sizes).
- Reduce solvent and water usage in cleaning vessels.

Factors Affecting Waste Generation

- Addition of new processes.

CRITERION CATALYST COMPANY L.P.

1001 North Todd Avenue
Azusa, CA 91702

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

Criterion manufactures several types of hydrotreating catalysts, which are used by the petroleum industry to remove impurities such as sulfur and nitrates in the refining of crude oil.

Manufacturing Processes

Some of the catalysts are produced by mixing alumina powder, water and other additives together to form a moist mixture, which is then passed through an extruder to be formed into a certain size and shape. The extruded material is passed first through a low temperature oven, and then through a high temperature furnace. The product is then cooled and screened for size (oversized and undersized product is removed), and finally bagged for customer delivery. Another operation is similar, but does not add metal solutions to the alumina carrier until the extrudate has passed through the high-temperature furnace. After the extrudate leaves the high-temperature furnace and is screened to remove over- and under-sized pieces, it passes through an impregnator, where it is sprayed with metal solutions. The product then passes through a low-temperature oven and high-temperature furnace again, before being bagged for storage or shipping.

Major Waste Streams and Waste-Generating Activities in 1998:

Waste Stream	CWC	Pounds	Waste-Generating Activities
Non-reusable catalyst fines	181	69,692	This waste stream consists of over- and under-size catalyst, off-specification catalyst, baghouse catalyst dust, and extruder scrap. Catalyst fines can be recycled into the manufacturing process, if the subsequent product runs are compatible with adding the material. The fines not consumed are wet extruder scrap and mixtures of catalyst fines, which are incompatible.
Mezzanine sludge	132	23,200	Wash-down, collected in a sump pit, of materials spilled from opening raw material packages in the process area.
Floor sweepings	181	16,211	Clean-up of material spilled during the manufacturing process and fugitive dust from the manufacturing equipment generate this waste stream. Most of the weight in the floor sweepings is the sweeping compound.
Clarifier sludge	132	12,200	Sewer clarifier sludge which occasionally becomes contaminated with metals from torn filters in the NO_x baghouse.

Source Reduction and Waste Management Activities, 1994-1998:

Catalyst fines (CWC 181):

Source reduction and waste management activities, 1994-1998:

- Criterion reported a 79.8 percent reduction in this waste stream, alongside a 14.4 percent increase in production volume. This was achieved by increased utilization of fines in manufacturing the product; through new tracking and managing procedures; and use of new formulas to produce the product.

Proposed measures, 1998:

- Further evaluate catalyst fines management system, to increase utilization of fines.

Other waste management, 1994-1998: Recycled onsite (feedstock for manufacturing); recycled offsite (metals recovery); or sent to Class I disposal.

Mezzanine sludge (CWC 132):

Proposed measures, 1998:

- Keep the sump pit empty by improving the housekeeping in that area: pump the liquid out of the sump pit and recycle the liquid back into the catalyst manufacturing process.

Floor sweepings (CWC 181):

Source reduction and waste management activities, 1994-1998:

- Criterion claimed a 65.3 percent reduction in this waste stream, alongside a 14.4 percent increase in production volume. This was achieved through:
    - eliminating spill sources; repairing equipment that is spilling material; performing regular preventive maintenance;
    - using central vacuum system (thereby reducing use of sweeping aid) whenever practical;
    - instituting an employee training program

Proposed measures, 1998:

- Evaluate the practice of sweeping the catalyst building floor every shift, to see if reducing clean-up frequency will reduce the amount of waste generated (reduced sweeping frequency will reduce the amount of sweeping compound used - the sweeping compound is the major weight contribution to this waste stream).
- Evaluate eliminating the use of a floor-sweeping aid, again reducing the largest part of the waste stream.

Other Waste Management, 1994-1998: Class I disposal.

Clarifier Sludge (CWC 132):

Source reduction and waste management activities, 1994-1998:

- Criterion reported a 69.2 percent reduction in this waste stream, alongside a 14.4 percent increase in production volume. A major contributor to this waste stream was escaped dust from the baghouses. The facility reduced the waste by using a new type of filter bags and installing a broken bag detector.

Proposed measures, 1998:

- Evaluate optimum method for running the broken bag detector and the duplex filter.

Polyethylene liners (CWC 181):

Source reduction and waste management activities, 1994-1998:

- Criterion reported a 77.9 percent reduction in this waste stream, alongside a 14.4 percent increase in production volume. This was mainly achieved through use of super sacks with attached liners and halting the return of super sacks from customers. For those customers who wanted to receive the product in their own bulk containers, the packaged goods were transferred to the bulk containers, and the super sacks were reused.

Other waste management: Class I disposal.

Factors Affecting Waste Generation

Production levels (increased by 14 percent).

CRITERION CATALYSTS/PITTSBURG

2480 Willow Pass Road
Pittsburg, CA 94565

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

Criterion's Pittsburg facility manufactures over 40 different hydrotreating and dehydrogenation catalysts used in oil refining and plastics manufacturing. The facility has both batch processing and continuous manufacturing operations.

Manufacturing Processes

The hydrotreating catalyst manufacturing process mixes aluminum oxide (alumina) and sometimes metals, such as chromium, nickel, cobalt, molybdenum, etc., along with nitric acid, ammonia solution, and deionized water, in a muller (a device whose method of mixing wet and dry ingredients, by rubbing and smearing, is analogous to a mortar and pestle). The mixture is extruded in spaghetti-like strings, which break up into different lengths and are screened for appropriate length. Catalyst extrudates that meet specification lengths are calcined in rotary kilns; those that are too long are processed through a breaker and re-screened, and those that are too short are fed through a grinder, and then fed back into the muller if they meet the raw materials specifications. The calcined catalysts are re-screened, with the same process followed as above for long and short lengths, while the specification length-calcined catalyst is either packaged and sold, or impregnated with metal salt solutions (for example, nickel, cobalt, molybdenum, etc.). The catalysts to be impregnated are mixed in a tumbler with phosphoric acid, nickel nitrate, cobalt nitrate, hydrogen peroxide, and/or deionized water, and then calcined in rotary kilns.

For the dehydrogenation catalyst, which is produced sporadically, iron oxide is mixed with chrome oxide and other materials, processed through a pellet mill, and then dried. Iron oxide fines are recycled into the process.

Major Waste Streams and Waste-Generating Activities in 1998.

Waste Stream	CWC	Pounds	Waste-Generating Activities
Waste catalysts, including: extruder clean-out waste (30 percent), street sweepings from belt spillage (25 percent), nuisance dust (20 percent), off-specification catalyst fines (20 percent), debris (20 percent).	181	3,231,510	The largest contributors to the Criterion Pittsburg facility hazardous waste are extruder clean-out waste, sweepings due to belt spillage, nuisance dust, and off-specification catalyst fines.

Source Reduction and Waste Management Activities, 1994-1998

Selected source reduction measures for evaluation:

Input changes:

- Evaluate potential for increased recycling of catalyst fines, as raw material for product;
- Evaluate potential for recycling nuisance dust back into product.

Product reformulation:

- Evaluate changing binders and additives from dry to liquid to potentially reduce fines generation;
- Evaluate system for recycling non-calcined extrudate back to muller;

Operational Improvements:

- Flush process equipment with waste catalysts between selected process runs to prevent cross-contamination of new catalyst runs. When necessary, the “flushing” waste catalyst is similar to the material for the next run, and the waste catalyst acts as a cleaning abrasive. This could reduce total waste catalyst generation by 5,000 to 10,000 pounds annually.
- Recycle left-over product that will not fill a super sack back into the product;
- Re-use empty raw material containers and super sacks for on-site product movement and inter-company off-site shipments;
- Segregate waste catalysts based on different hazardous classifications.
- Evaluate increasing the size of product containers to reduce the quantity of waste containers.

Production Process Changes:

- Optimize screening to reduce fines and increase final product quantities;
- Evaluate options for more consistent solid raw material delivery to the mullers, so that product mixtures in the mullers are consistent. This could reduce muller

clean-outs from extrudate that is too wet or too dry, and minimize off-specification product;
- Grind fines and recycle them back into product at the mullers;
- Install catch bins between the extruder and belts in one specified product line to catch non-calcined extrudate before it hits the belt, to reduce product loss and improve housekeeping;
- Install wider extruder belt on one product line to improve housekeeping and reduce product loss;
- Modify vent filtration to potentially reduce powder loss and extruder plugging;
- Evaluate installation of down spouts and equipment guards to minimize vertical drops for product transfers in order to reduce catalyst breakage, which increase fines generation;
- Evaluate calcining, grinding, and recycling extruder waste back into product;
- Evaluate pelletizing non-calcined extrudate, rather than relying on natural breakage of catalyst, to potentially reduce fines.

Administrative:
- Implement a bar code tracking system for waste catalyst, to increase proper segregation and therefore facilitate recycling of waste catalyst back into the product as raw material;
- Maximize use of the new Process Development Unit (PDU) pilot system to test R&D proposals, rather than using large plant systems. This will reduce the quantity of off-specification catalyst;
- Enhance operator training to reduce errors in catalyst manufacturing;
- Enhance operator training in Statistical Process Control (SPC) software, to ensure the manufacturing process is not deviating from operating parameters to reduce off-specification catalysts;
- Improve quality control check of incoming aluminum oxide powder by:
    - o requesting that the facility sending raw materials take more quality control samples, and
    - o purchasing analytical equipment to analyze aluminum oxide powder upon arrival, to potentially reduce off-specification catalysts.

Waste Management:

Off-site recycling and off-site land disposal.

Between 1994 and 1998, waste generation of the major waste stream, waste catalyst, increased from 380,106 pounds to 3,231,510 pounds (about a 750 percent increase), perhaps due to the factors listed below. On the other hand, Criterion decreased an off-specification aluminum oxide waste stream from 44,930 pounds in 1994 to 23,789 pounds in 1998, a 47 percent reduction.

Factors Affecting Waste Generation

- Catalyst production increased more than 48 percent from 1994 to 1998.

- Criterion disposed of over-produced catalysts accumulated in previous years in 1998.
- Difficulties with new process introduced in 1996 increased off-specification waste catalyst generation.

DOW CHEMICAL

901 Loveridge Road
Pittsburg, CA 94565

SIC Code: 2879 Pesticides and Agricultural Chemicals, NEC

Business Activity

Dow's Pittsburg facility develops and produces products for agricultural operations, pest control services, pulp and paper manufacturers, carpet and flooring mills, and personal care. Major products are Latex, Vikane®, N-Serve®, Verdict® intermediate, Lontrel®, Dowicil®, and intermediates used in agricultural chemical production.

Manufacturing Processes

Operating units integrate the use of caustic soda, chlorine, and organic chemicals, among other materials. Several different departments include a power plant, a methyl ester intermediate (MEI) plant, a chlorpyridines plant, fluorinated products and intermediates plants, and specialty chemicals plants, employing a variety of manufacturing processes. The Pittsburg site is also a bulk chemical storage and distribution terminal for the West Coast.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Industrial flow to POTW	135	9,280,000	From process washdown water and scrubber effluent streams from various operating units in Manufacturing Services Department.
Chlorinated Pyridine Tar Waste	751	2,163,000	From distillation/separation columns, in the Chlorpyridines Plant, where the final products are purified.
Fluorinated Pyridine Tars with Ethylene Glycol	741	1,180,200	From distillation column, in Methyl Ester Intermediate Plant, where solvent is recovered to be recycled back into the process.
Salt Solution/Ethylene Glycol	341	393,340	From process tank washouts at the Methyl Ester Intermediate Plant and from tank truck clean outs of trucks handling the fluorinated pyridine tars.

Source Reduction and Waste Management Activities, 1994-1998

Industrial flow to POTW (CWC 135)

Waste Management, 1994-1998: onsite treatment in Process Water Treatment Plant, using steam stripping and carbon beds to remove impurities; water evaporation in Brine/Condensate Plant, producing brine which is sent to POTW. Dow reported reducing this waste stream from 13,300,000 pounds in 1994 to 9,312,380 pounds in 1998, a 30 percent reduction.

Solids or Sludges with Halogenated Organic Compounds (CWC 751)

Source Reduction and Waste Management, 1994-1998:

- Non-conforming MEI: Dow Chemical eliminated the off-specification methyl ester intermediate (MEI) waste stream by making it into a slurry with n-Methyl-2-Pyrrolidone (NMP) and recycling it back into the MEI production process.
- Reactor solids: A change in the reactor jet nozzle design resulted in better mixing and reaction in the vapor phase reactors of the Chlorpyridines Plant, thereby reducing the amount of carbon generated. Better drying operations on the raw material, changes in flow meters and control valves, and improved operating discipline also helped reduce carbon formation. These process and operation improvements achieved a source reduction of 20,000 pounds per year, which is two thirds of the waste stream that was being generated (30,000 pounds per year) and 5,000 pounds per year more than the original source reduction projection four years earlier.
- Fouled Vessel Internals: Ultrasonic cleaning of vessel internals eliminated need to dispose of vessel internals, thereby reducing this waste stream by 8,000 pounds per year, at a savings of $80,000 per year.
- Vessel Cleaning Wastes: Use of Ultrasonic and X-ray thickness testing reduced the required frequency of vessel testing, which had to be cleaned when tested, thereby reducing cleaning wastes by 400,000 pounds per year.
- Lontrel® Solids: Installation of stainless steel catch pans around material handling connections and a venturi/eductor on the blending tanks has eliminated wash-out of the Lontrel® dust during baghouse/dryer clean-outs. This amounted to an elimination of 2,000 pounds per year (100 percent).
- Carbon Tetrachloride Distillation Bottoms: Piping modifications and process design changes were implemented to recycle this waste stream back to the Chlorpyridines Plant, where chlorinated pyridines were recovered as product.

Due to the above source reduction strategies, Dow reduced this waste stream from 4,230,000 pounds in 1994 to 2,163,000 pounds in1998, a 49% reduction.

Fluorinated Pyridine Tars with Ethylene Glycol (CWC 741)

Proposed source reduction measure, 1998:

- Dow proposed designing and installing process equipment to add an additional evaporation step on the MEI plant fluorinated pyridine tars to recover more n-methyl-2-pyrillodone solvent for reuse in the process. The process equipment involved a LCI (Luwa) 316 stainless steel, agitated thin-film vacuum evaporator and appropriate instrumentation for computer control. An update of the measure indicated the measure had not achieved the projected waste reduction due to plugging problems, which Dow is working to address.

This waste stream came down to 1,619,030 pounds in 1998, from 2,150,000 pounds in 1994, a 25 percent reduction.

Salt Solution/Ethylene Glycol (CWC 341)
Proposed source reduction measure, 1998:

- Dow anticipated that reduction of fluorinated pyridine tars would reduce the number of times tank trucks that carried this waste would have to be cleaned out, thereby reducing the tank truck washout volume.

Unspecified aqueous solution (CWC 135)
Source reduction and waste management, 1994-1998:

- Reduction in water used for process washdown and use of catch pans reduced the quantity of waste aqueous solution generated.

Factors Affecting Waste Generation

- Rainfall is a major factor in the amount of process water that must be treated.
- Production activity for the Chlorpyridines Plant, Latex Plant, and MEI Plant increased by approximately 18 percent, 18 percent, and 32 percent respectively.

EKC

2520 Barrington Court
Hayward, California 94545-1163

SIC Code: 2899 Chemicals and Chemical Preparations, NEC

Business Activity and Manufacturing Processes:

EKC is a specialty solvent blending and packaging operation, producing proprietary blends of chemicals to remove photoresist from silicon wafers in the semi-conductor industry. Also, it is involved in research and development of slurries for the chemical mechanical planarization process. Manufacturing activities include blending, bottling, and packaging.

Major Waste Streams and Waste-Generating Activities, 1998:

Waste Stream	CWC	Pounds	Waste-Generating Activities
Facility-wide, water-based cleanup wastes (aqueous solution <10 percent total organic residues)	134	403,190	Equipment cleaning and line purging.
No phenol/negative photoresist products; positive photoresist products; hydroxylamine products (unspecified organic liquid mixture)	343	145,675	Equipment cleaning and line purging.

Source Reduction and Waste Management Activities, 1994-1998

This facility set forth source reduction options by product line, but its proposals can generally be divided into two groups, one set of proposals for CWC 134 and 343 together and one set of proposals for CWC 343 alone.

CWC 134 and 343:

- improve process knowledge to eliminate waste-generating steps
- rework material back into process

CWC 343:

- rework line purging of final product into product
- reduce sample volume from 16 ounces to 4 ounces
- reduce Simplex cleaning/draining waste volume from 210 pounds (or 25 gallons) to 42 pounds (or 5 gallons) by using nitrogen to blow lines clear

GENERAL CHEMICAL – BAY POINT WORKS

501 Nichols Road
Pittsburg, CA 94565

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

General Chemical Bay Point Works (GCBP) manufactures and/or packages high purity etchants, solvents, and photoresist strippers for the electronic components (semiconductor) industry. The facility also manufactures aluminum sulfate (alum), which is manufactured to clarify, deodorize and purify waste and potable water, and as an essential chemical in the manufacture of paper, fire extinguisher compounds, cosmetics, drugs and other products.

In addition, several solvents are re-packaged from bulk.

Manufacturing Processes

Ammonium Hydroxide: Anhydrous ammonia liquid is fed through a steam-heated vaporizer to form ammonia gas, which is subsequently filtered and purged through deionized water in a stainless steel reactor to form the aqueous ammonia. The gases are continually purged to achieve a 29 percent concentration.

Ammonium Fluoride: Anhydrous ammonia liquid is fed through a steam-heated vaporizer to form ammonia gas, which is subsequently sparged through a mixture of deionized water and hydrofluoric acid to produce a 40 percent ammonium fluoride solution.

Hydrofluoric Acid: Anhydrous hydrogen fluoride of 99.99 percent purity is delivered under pressure to a reactor, where it is treated with proprietary agents and steam-heated. Anhydrous hydrogen fluoride vapors then enter an absorption column and are scrubbed with deionized water, forming electronic grade hydrofluoric acid.

High Purity Acids: Hydrochloric acid, acetic acid, and nitric acid are purified in glass distillation columns to remove non-volatile impurities.

Batch Acids: High-purity blends of acids are manufactured or blended in various small reactors and/or portable skid tanks or totes.

Major Waste Streams and Waste-Generating Activities, 2002

Waste Stream	CWC	Pounds	Waste-Generating Activities
Mixed acid waste	131	1,300,000	Equipment draining, servicing, line-flushing in the production, packaging, and bottle-filling processes. Also, off-specification product that cannot be recycled into the process.

Source Reduction and Waste Management Activities, 1998-2002:

Source reduction measures, 1998-2002

- In 2002, the nitric tailings tank was replaced, as proposed in the 1998 Plan. When the nitric acid was distilled, a separate tank was used to store the less pure fraction of that product. This tank was difficult for the facility to empty, and as a result the tank collected residuals, which were called “tailings”. The tailings had to be removed by a hazardous waste hauler, thus generating a hazardous waste. The nitric tailings tank has been replaced by a tank that can readily be emptied by the facility, thereby eliminating the tailings waste stream all together.
- Off-specification product is recycled into the process whenever possible.

Proposed source reduction measures, 2002

- The line flushing between product batches creates a large volume of weak acid hazardous waste. The facility plans to evaluate rebuilding the piping system to allow the initial, more highly contaminated few gallons of flush water to be separated from the subsequent flush water (which would not then be hazardous).
- The facility plans to improve its spill prevention program by using soda ash as a clean-up material for spills instead of flushing those spills with water. This would generate a smaller quantity of waste material.
- Rain water that is captured in the secondary containment areas and contaminated through drips and leaks in the equipment also increases the volume of hazardous waste generated at this facility. General Chemical plans to address this problem through improved maintenance of the equipment, lessening the incidence of drips and leaks.

Factors Affecting Waste Generation

- Increasingly stringent customer-driven product specifications.

GENERAL CHEMICAL-HOLLISTER WORKS

3240 Bert Drive
Hollister, California 95023

SIC Code 2899 Chemicals and Chemical Preparations, NEC

Business Activity and Manufacturing Processes

General Chemical-Hollister produces ultra-pure solvents for the electronics and optical industries. The purification processes used are primarily distillation systems that utilize pressure-regulated steam to heat the solvent in the reboiler. The high efficiency of the distillation system allows for nearly complete solvent recovery operations, minimizing potential waste. Other processes include filtering and drying.

Other products produced onsite in 1998 included other cleaning material (typically blends of solvents, detergents, and water) and other chemicals (acids, bases, and oxidizers) used in the same industries. Waste amounts associated with the production of these products were minor compared to those waste streams generated by purification activities.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activity
Flammable solvent mixture (acetone, n-butyl acetate)	212	271,845	Cleaning of equipment following purification processes.
Non-flammable solvent mixture (perfluoro compounds)	741	57,791	Cleaning of equipment following purification processes.

Source Reduction and Waste Management Activities, 1994-1998

General Chemical-Hollister reported two major waste streams in 1998, as shown above. Because both waste streams are from cleaning operations, General Chemical-Hollister's source reduction evaluation addressed these waste streams as a single waste stream.

Source reduction strategies for reducing solvent waste, implemented between 1994 and 1998, included:

- Increasing distillation efficiency
- Testing solvent rinseate following cleaning between batches to determine if the equipment has been adequately cleaned, and thereby keeping rinse cycles to a minimum
- Testing all raw material solvents upon receipt to ensure they meet specifications, thus reducing the discard of off-specification materials
- Installing dedicated process lines, reducing the need for line cleaning
- Extending process runs, also reducing the need for cleaning operations.

Source reduction progress, 1994-1998

Although, overall, waste increased from 180,740 pounds to 341,099 pounds, production also increased. On a normalized basis (pound of waste generated per pound of product produced), waste was reduced 61 percent.

SB 14 Performance Report Data	1994 Pounds	1998 Pounds	Percent change
Total waste	180,740	341,099	89 percent increase
Pounds of products produced	2,014,109	9,642,327	379 percent increase
Pound of waste/pound of product	0.090	0.035	61 percent decrease

In addition, the facility modified management of the primary flammable waste solvent waste stream to include temporary storage in 55-gallon drums and off-site shipment in bulk, via vacuum trucks. This approach has reduced the cost of waste management, as well as reducing the risk of accidents and spills.

Proposed source reduction measures, 1998

- Use contaminated solvent for initial cleaning. The volume of waste solvent generated will be reduced by using contaminated/off-specification solvent rinse prior to a pure solvent rinse at product changeovers. The expected reduction in the amount of solvent used depends on how many rinse cycles are necessary or possible before the rinse solvent must be disposed.

Factors Affecting Waste Generation

- Production increased almost 400 percent from 1994 to 1998.
- A changing client base and increased product diversity has resulted in more specialized management of the varied waste streams.
- Purity requirements have increased. Many clients require contamination (i.e., particles or water content) standards in the part per trillion (or better) levels, efforts to maintain equipment cleanliness throughout the plant have increased, with attendant changes in cleaning solvent/blend use.
- The facility is operating longer, more voluminous product runs for the same product specification. This reduces the number of product changeovers, reducing the waste generated from cleaning between product runs. An example of this operation is the installation of an entirely new purification process dedicated to the production of perfluorocarbon compound solvents.
- Facility improvements, such as the installation of a larger solvent purification system, a new product blend tank, etc., have increased production capacity.

GENERAL CHEMICAL CORPORATION - RICHMOND WORKS

525 Castro Street
Richmond, California 94801

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

General Chemical – Richmond produces various grades of sulfuric acid by thermal decomposition of spent alkylation acid and sulfur from the petroleum refining process.

Manufacturing Processes

Spent sulfuric acid, sulfur, natural gas, and air are fed into two high-temperature decomposition chambers, which break down the spent sulfuric acid and sulfur to sulfur dioxide. The resultant hot gases pass through two waste heat boilers, which generate steam, and then through a gas-cooling tower. The process gas is then passed through electrostatic precipitators, a gas drying tower, and mist eliminators, to remove water, acid mist, and particulates, prior to heating for the conversion reaction. A catalytic converter reacts the clean sulfur dioxide with oxygen to form sulfur trioxide, which is reacted with water to form sulfuric acid.

Major Waste Streams and Waste-Generating Activities in 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Decomposition Chamber Refractory Brick	181	95,340	Brick replacement in decompositions chambers (prorated over four years). Approximately 50-150 tons may be removed and replaced during a major turn around.
Plant Sweepings	181	17,550	Housekeeping activities.
Fly Ash w/Nutshells	181	10,800	The nut shells are generated by walnut shell "nutblasting" of the waste heat boiler tubes. Fly ash is generated from the combustion of the hydrocarbons in the spent acid while it passes through the waste heat boilers. Materials created by the erosion of the brick linings and corrosion of the boiler tubes are also removed from the heat boilers and thus make up part of this waste stream.

Source Reduction Measures and Waste Management Activity, 1994-1998

The facility has not identified any new source reduction opportunities as a result of its source reduction measures evaluation. However, it is continuing many of the source reduction steps implemented in the past.

Decomposition Chamber Refractory Brick (CWC 181):

- Continue to review turnaround time for brick replacement, to maximize brick life.
- Continue to consider economic feasibility of purchasing longer-lasting refractory bricks.

Plant Sweepings (CWC 181)

- Continue to profile waste streams more frequently, to prevent managing non-hazardous wastes as hazardous.

Fly Ash with Nutshells (CWC 181)

- Continue use of control, monitoring, and alarm systems for temperature, oxygen, raw material flow, and process pressure to reduce not only the waste carbon in the decomposition chambers, but also the generation of fly ash. This last result minimizes the fly ash-with-nutshells abrasive blasting waste stream.
- General Chemical, Richmond, will continue to review the effectiveness of using CO2 blasting for its applications.

Sulfur Dirt and Debris (not a major waste stream)

- The facility significantly reduced the amount of sulfur and sulfur debris generated through a program to detect and quickly fix leaks. This program has been very successful, reducing this waste stream from 20,700 pounds in 1994 to only 1,800 pounds in 1998 (approximately a 90 percent reduction).

Factors Affecting Major Waste Streams

- The cyclical nature of refractory brick replacement (occurring during major plant turn-arounds).
- The nature and quantity of impurities in the spent acid.
- The amount of sandblasting and nature of maintenance activities generating plant sweepings and cleanup debris.
- Variable contaminants, such as metals acquired from acid-containing equipment and piping used to handle the spent sulfuric acid fed into the decomposition chambers.

HONEYWELL – EL SEGUNDO

850 S. Sepulveda Blvd.
El Segundo, California 90245[16]

SIC Code: 2869 Industrial Organic Chemicals, NEC

Business Activity

Honeywell-El Segundo produced dichlorofluoroethane (HCFC141b), chlorodifluoroethane (HCFC142b), and hydrochloric acid.

Manufacturing Processes

Anhydrous hydrogen fluoride and 1,1,1-Trichloroethane were combined in a reactor. The crude liquid was then introduced to a process that included a phase separator, recovery column, and distillation columns, from which initially HCl was distilled, followed by HCFC 142b, and finally HCFC 141b.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Waste Corrosive Liquid	792	1,411,480	High-boiler waste (by-product of the chemical process)
Mole Sieve	181	80,000	Filtration of crude liquid product (mole sieve).

[16] This facility is now closed.

Source Reduction and Waste Management Activities, 1994-1998

Waste Corrosive Liquid (CWC 792):

- Recycling of off-specification product back into the process. The process was originally designed to minimize waste and to maximize recycling.
- Fine tuning of process parameters.
- Inventory control systems that reduced excess inventory chemicals.
- Enhanced training program in waste minimization.

Waste Mole Sieve (CWC 181):

- Recycled on- and off-site.
- Mole sieve replaced alumina, as a drying agent, thereby reducing waste generation by extending filter media use.
- The mole sieve filters were also regenerated on-site to maximize filter life span.
- Enhanced training program in waste minimization.

Proposed waste minimization measures in 1998:

Plans included improvement of operations through the facility's Six-Sigma program. This program, as applied by Honeywell, El Segundo, to waste minimization, encouraged loss prevention, waste segregation, production scheduling, and maintenance.

Factors Affecting Waste Generation

- Customer specification requirements.

IMC CHEMICALS INCORPORATED (IMCC)

13200 Main Street
Trona, California 93562

SIC Code: 2819 Industrial Inorganic Chemicals, NEC
(as of April 1, 2003: SIC Code is 1474 and NAICS is 212391)

Business Activity

Three contiguous production facilities remove dissolved chemicals from the subsurface brines of Searles Lake, refine and store these chemicals, and subsequently transport them to customers. More specifically, IMCC extracts inorganic compounds of sodium and boron from the brine, and refines and sells them as soda ash, borax compounds, sodium sulfate, and boric acid.

Manufacturing Processes

In the liquid-liquid extraction (LLX) plant, brine is mixed with a proprietary barren organic extractant (produced at the plant) and kerosene to remove boron, along with some sodium and potassium, from the brine. The boron-loaded extractant is sent to the boric acid plant, while the depleted brine is passed through an oil-water separator and air stripper, before being returned to the lake. The LLX process produces a brine/organic emulsion residual called “crud”, which is treated through gravity, thermal and pH adjustment measures, to separate aqueous and organic phases. The crud treatment process recovers useable kerosene, which is recycled to the LLX process, brine, which is returned to the lake, and fuel oil (non-useable kerosene), which is manifested offsite.

The monoethanolamine plant (MEA) recovers carbon dioxide from boiler flue gas to produce soda ash. A monoethanolamine solution absorbs the carbon dioxide from the flue gas in an absorber column, and this mixture is then heated in stripping columns to release the carbon dioxide, which is compressed and piped to the soda ash carbonation plant. Some of the stripped MEA is reclaimed through heating, leaving “reclaimer bottoms”, which are hazardous because of the selenium concentration and are disposed of off-site as a waste.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Waste Fuel Oil	221	1,394,560	Treatment of “crud”, a brine/organic emulsion residual, from the liquid-liquid extraction process, which uses proprietary chemicals and kerosene to extract boron and other elements from brine.
Monoethanolamine (MEA) Reclaimer Bottoms	133	1,868,680	Reclamation of stripped MEA in MEA plant, following extraction and separation of carbon dioxide from boiler flue gas with MEA solution.

Source Reduction and Waste Management Activities, 1994-1998

Spent Lubrication Oil (CWC 221) [a 1994 waste stream not reported in 1998]:

- onsite oil filtration through
    - installation of in-line filters on selected facility equipment
    - contractor-provided recycling equipment
    - IMCC-owned filtration/centrifuge systems

Waste Fuel Oil (CWC 221):

This waste is essentially generated by a reclamation unit. The waste fuel oil is manifested offsite and recycled into ship fuel.

Monoethanolamine Reclaimer Bottoms:

- The facility is pursuing research to change the MEA process to reduce this waste stream and/or develop a method to remove the selenium, which causes this waste to be hazardous.

Factors Affecting Waste Generation

- Production rates.
- Alteration of plant operations to increase efficiency.

Updates

Monoethanolamine Reclaimer Bottoms: In October 2002, IMCC developed MEA reclaimer wash procedures that have reduced the MEA waste stream by approximately 30 percent.

JSR MICROELECTRONICS, INCORPORATED (JSR)

1280 North Mathilda Avenue
Sunnyvale, California 94089

SIC Code: 2869 Industrial Organic Chemicals, NEC

Business Activity

JSR manufactures photoresist products for the semiconductor industry. Photoresist is used in the manufacturing of integrated circuits and silicon microchips. JSR's operation involves the transfer and storage of raw materials, and the formulation, processing, packaging and storage of photoresist products. Many different photoresist products are manufactured in batches at the facility, and each recipe contains varying amounts of liquid solvents, polymers, photosensitizers and other powdered materials. Batch sizes range from 30 gallons to 1,250 gallons.

Manufacturing Processes

The steps involved in JSR's production are:

- pre-clean process tanks
- pump solvents from storage tanks directly into formulation tanks
- pump various resins and polymers into formulation tanks
- agitate and filter mixture in formulation tanks (from several hours to several days)
- after agitation, take samples for quality control (tested in onsite lab)
- once a batch meets specifications, pipe photoresist directly to bottling room, where the photoresist is bottled (after bottles are washed and dried), packaged, and either shipped or stored

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activity
Waste Solvent	214	141,943	Waste solvent is generated primarily from the cleaning of the formulation/mixing vessels before production – also from: • unused QA/QC samples, • small spills from solvent dispensing stations, • photoresist used for R&D activities, and • wash sink solvent from cleaning small parts.
Tetramethyl Ammonium Hydroxide (TMAH)	134	9,603	TMAH is generated from the Mark V & VIII developer machines, which are used to assess various parameters of the photoresist, and from residual virgin product from TMAH reservoir.

Source Reduction and Waste Management Activities, 1997-1998.

Waste Solvent (CWC 214):

Waste management, 1997-1998: Although, overall, solvent waste increased 9.5 percent from 1997 to 1998, *on a per batch basis it decreased by 38 percent* (from 1,052 gallons per batch to 651 gallons per batch). The reasons the waste decreased are:

- A reduction of solvent used to clean process tanks before and after formulation. JSR considered this the most significant measure, accounting for a 33 percent reduction in solvent use;
- A cessation of cleaning sample containers with solvent after their use;
- The implementation of waste reduction techniques during parts cleaning at the wash sink – e.g., soaking and hand-wipe cleaning instead of spray cleaning;
- Source reduction awareness and commitment through employee training.

Proposed measures in 1998:

- Install improved solvent distribution manifold to minimize spill/drips from the solvent distribution stations.
- Use one gallon of solvent, instead of two, to clean the bottle-filling nozzles prior to bottling.
- For further study: further reduce volume of solvent used to clean process tanks.

Tetramethyl Ammonium Hydroxide (TMAH) (CWC 134):

Waste management, 1997-1998: TMAH waste increased 76 percent between 1997 and 1998 due to an increase in production. A source reduction measure implemented in 1998 to curtail increases in TMAH waste was the purchase of a more efficient testing machine (Mark VIII, which is more advanced than Mark V).

Proposed measures, 1998:

- Contact the manufacturer of photoresist testing machines (Mark V and VIII) to see if units can be modified so that the water volume can be reduced in the rinse cycle.

Factors Affecting Major Waste Streams

- Increase in production.
- Purchase of new equipment.

MONSANTO

1778 Monsanto Way
Martinez, California 94553

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

Monsanto Avon produces potassium oxo-sulfato vanadates salts on a diatomaceous earth support for the sulfuric acid industry. This catalyst is used as a manufacturing aid for the sulfuric acid manufacturing process by converting sulfur dioxide in air to sulfur trioxide.

Manufacturing Processes

The multi-step catalyst manufacturing process consists of blending solid constituents with a catalyst solution, extruding the subsequent 'dough' as pellets or rings ("pills"), calcining and activating the pills, and finally removing dust, chips, chunks, etc., prior to packaging the product.

Off-sized catalyst material is either recycled back into the process or sold offsite.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Trash Contaminated with Catalyst Fines	141	24,386	Used dust collector bags from replacing white dust collector bags, final product dust collector bags, and repackaging dust collector bags. Catalyst and floor sweeping mixture. Used container liners from the catalyst dough recycling operation. Dirty mist eliminator packing. Contaminated mechanical parts from maintenance operations. Used steel drums for handling hot product.
Trash Contaminated with Lubricants	223	2,525	Dirty rags, contaminated clay absorbent, empty containers, and used filters, associated with replacing gearbox oil operations and other maintenance operations. Empty lubricant bottles.
Trash Contaminated with Vanadium Pentoxide	141	1,387	Dirty protective clothing, personal protective equipment and used dust collector cartridges from vanadium pentoxide operations; contaminated spare parts; contaminated inner liners.

Source Reduction and Waste Management Activities, 1994-1998

Trash Contaminated with Catalyst Fines (CWC 141)

- Installation of vibratory-flat screens to replace de-dusting boxes in 1996 for de-dusting the final product before packaging reduced the number of contaminated liners (from containers of catalyst that had to be run through the de-dusting process again) from 16 to 8 per run. The number of lots that had to be set aside due to excessive dust was also reduced from 4 to 2, as was the frequency of quality control analysis, by 80 percent.

Proposed new measures in 1998 were to:

- Replace the dust collection unit in the plant catalyst manufacturing operation with a more efficient unit, resulting in longer bag lives and thus reduced generation of hazardous waste dust collection bags.

Trash Contaminated with Lubricants (CWC 223)

- The installation of a separate lubrication filtration unit (including a gearbox and filter) in 1998 for one of the two pellet mills in the extrusion section of the plant reduced the number of filters that had to be replaced. Previously the two pellet mills shared one filtration loop, causing contamination from one pellet mill to affect both the filtration units in the loop. The installation of a separate filtration unit cut down on the maintenance of the two mill gearboxes and reduced the oil filter replacement by facilitating the identification of lubricant problems.

Trash Contaminated with Vanadium Pentoxide (CWC 141)

- In 1998, Monsanto replaced the 55-gallon raw material vanadium pentoxide drums with steel tote bins. A steel tote bin contains 3,400 to 5,500 pounds of material, compared to 400 pounds per drum. With the help of its supplier, Monsanto modified its vanadium transfer system to allow use of the totes. Part of the modification included converting the vacuum/pressure transfer process from an open system to a totally enclosed rotary air lock/removable tote bin block valve. These changes eliminated the generation of contaminated container liners from the 55-gallon drums, and reduced the generation of contaminated personal protective clothing and equipment, which had to be worn when emptying the 55-gallon drums. Monsanto estimates that implementing this measure reduced the vanadium pentoxide-contaminated waste stream by 85 percent from 1998 to 1999 alone.
- Additional spillage of the material occurs as a result of the new transfer system; Monsanto proposes to address this problem by better utilizing the vacuum in the transfer system and modifying the valve assembly on the tote.

Administrative measures that affected all waste streams:

- Monsanto initiated a management of change (MOC) process in 1991, whereby any proposed projects or changes had to be written up by the initiator of the idea and then reviewed by in-plant staff, including production and maintenance technicians. Subsequently, the initiator had to address the concerns raised by the reviewers, before any change could take place. In 1998, the MOC procedure was further refined to provide a detailed, standardized format for writing up proposed projects or changes. This revision in the MOC process has improved the execution of each project and change, and, while not quantifiable, has reduced waste generation by minimizing the deviations for each project or change.
- Formalized Process Improvement Effort (PIM – Process Improvement Meetings). In order to improve cross-functional communication, the process improvement effort was formalized in 1996 to consist of regular meetings that brought together representatives from each department, namely Production, Maintenance, Engineering, and Environmental/Safety/Health. Results for waste minimization were:
    - recommendations on the vanadium pentoxide transfer process and tote bin inverter project; and
    - improvement to the dedusting system that reduced the generation of contaminated liners.
- Preventive and predictive maintenance system. In 1996, Monsanto improved its formalized approach to maintenance planning to address daily maintenance management problems. The essential steps in this process were:

  - a formalized maintenance work order system, which included writing up the maintenance request, and who made the request, who made the repairs, what was found, and what were the repairs;
  - the installation of meters on major machinery to document the hours of operation of a particular machine after it had been repaired, to develop a maintenance history;
  - updating information and manuals for each piece of equipment, and cataloging them in a filing system;
  - setting up a repair history file for each machine.
- Visual workplace effort. This practice provides visual means for technicians and mechanics to identify and correct deviations in an operation, in a timely manner. Examples of the practice include process area graphics incorporated into the plant process control computer upgrade project; marking of process indication gauges to show normal operating range; and color-coding of all metal lines to identify what material they are carrying.
- Monsanto instituted a gain-sharing program for all plant employees when operational and safety goals are met. Monsanto believes higher than normal waste generation is associated with poor operational performance.

Although waste reduction for each measure was not quantifiable, overall, increased plant efficiency and less repair work reduced waste generation. Between 1990 and 1998, trash contaminated with catalyst fines decreased by 23 percent, even though production increased by 30 percent.

Factors Affecting Waste Generation

Level of production.

ONDEO NALCO

2111 East Dominguez Street
Long Beach, California 90810

SIC Code: 2869 Industrial Organic Chemicals, NEC

Business Activity

Nalco manufactures specialty treatment chemicals at this facility. Products include chemicals for treating: crude oil (demulsifiers, scale inhibitors, corrosion inhibitors); water used in steam boilers; water for cooling towers; and wastewater. Specialty chemicals are also manufactured for the petroleum, paper, and steel manufacturing industries.

Manufacturing Processes

Manufacturing operations consist primarily of batch-blending materials to form aqueous and oil-based solutions. Five blenders and one reactor are used to manufacture all of the chemical products. In addition:

- all raw materials are tested before being used;
- production blenders, hoses, pumps and transfer lines are decontaminated between batches;
- batches are tested for quality control;
- the product is packaged in Porta-Feeds® (stainless steel or plastic totes up to 400 gallon capacity), 55-gallon drums, pails, bulk storage tanks, and bulk tanker trucks; and
- the final product is again tested for quality control.

Major Waste Streams and Waste-Generating Activities, 2002

Waste Stream	CWC	Pounds	Waste-Generating Activities
Process Wastewater	134	14,428,200	Rinsing and washing equipment (blenders, reactors, etc.) [60 percent]; floor washing activities, due to spills during product packaging [20 percent]; rinsing and decontaminating reusable shipping containers called Porta-Feeds® [15 percent]; collection of storm water from storage tank containment dikes [5 percent].
Empty Containers	512, 513	80,000	Disposal of chemical raw material shipping containers, including chemical bags [45 percent] and fiber drums [45 percent], as well as empty pails, jars, hoses, pallets, etc. [10 percent].
Waste Oil and Mixed Oil (oil and solvent wastes)	221	9,757	Equipment rinsing (required to decontaminate the manufacturing equipment between customer batch orders) and transfer line flushes. Additional solvents collected from air pollution control scrubbers.
Liquid Trench Sludge	134	7,260	Cleaning of a gel residue from the trenches of the wastewater treatment system. This gel residue comes from flushing a particular version of a product out of a line used for two versions of the same product.

Source Reduction and Waste Management Activities, 1998-2002

Process Waste Water (CWC 134):

- In the past four years, Ondeo decreased generation of this waste stream by 6,188,550 pounds (about 30 percent) due to:

  - employee training in spill prevention, good housekeeping, and the minimization of water used in the cleaning processes; and
  - the installation of dedicated lines and equipment in the manufacturing process to reduce line flushing and spill clean-up.

- In its 2002 documents, Ondeo proposes to:
  - expand an approach, “rinse and hold”, already used for some product lines to other products. This approach involves capturing and storing water-based batch rinses and flushes for use as charge material into the next batch of the same product. This measure requires additional purchases of Porta-Feeds®, as well as additional capital investment to maintain inventory. It also requires consideration of issues like regulatory permitting, effect on product quality, and the potential for discharges or releases to the environment, associated with the increased storage and handling of chemical inventory. Ondeo expects this measure will reduce process waste water by 15 percent, when applied to 10 percent of its products, and save $100-$200 per product line per year.
  - install new dedicated pumps and lines from the chemical storage containers to the manufacturing process, thereby reducing leaks caused by frequent disconnection of the lines, and line flushings. Due to the high cost of dedicated transfer systems, Ondeo proposes to install these systems for the two to three most highly-used materials within the next two years. Ondeo calculates the cost of a dedicated transfer system can exceed $150,000, with a result of approximately 10 percent waste reduction and $10,000 savings per year.
  - recycle Port-A-Feed® rinse water, doing the first rinsing with recycled water and final rinse with fresh water. The facility anticipates this will reduce the Port-A-Feed® waste water stream by 25 percent.

- Process waste water that is not recycled is treated onsite and discharged to a POTW.

Empty Containers (CWC 512 and 513):

- Between 1998 and 2002, this waste stream tripled. The facility attributes this to a four-fold increase in production. Source reduction measures practiced during this time period include:
  - ordering liquid chemical raw materials in returnable tote containers whenever possible; and
  - ordering dry materials in large bags that provide more raw material per container.

- Ondeo proposes to install super-sack handling equipment, and thus be able to purchase raw materials in super sacks of 1,000 to 2,000 pounds each (presently the facility purchases powdered raw materials in 50 pound bags), which can deliver more raw material per weight of shipping container. At a cost of $100,000 per installation, with an anticipated savings of $20,000 per year in reduced material cost, handling cost, and waste disposal cost, there should be an approximately five year pay-back period. Ondeo believes this measure would reduce the empty container waste stream by 25 percent.

- Empty containers are manifested offsite for land disposal.

Oil and Solvent Waste (CWC 221):

- From 1998 to 2002, this waste stream decreased by 19,586 pounds, or 67 percent, while production of oil-based products increased three-fold, due to:
    - the installation of a dedicated transfer lines and other equipment (including one blender) for the product of highest use;
    - the use of management forecasting to determine if and when consecutive chemical batches can be manufactured, and good engineering practices to schedule consecutive oil-based batches when possible, thus minimizing the number of line and equipment rinses; and
    - the transfer of much of the Port-A-Feed® cleaning process to an off-site contractor.

- The facility is considering implementing more dedicated transfer lines and equipment, possibly by the end of next year. A dedicated system could cost over $150,000, with an anticipated savings of $10,000 per year, and expected 15 percent reduction of this waste stream.

Liquid Trench Sludge (CWC 134):

- Ondeo is considering installing a second set of dedicated lines for one of the two versions of the same product, thereby eliminating the need for flushing after production of one version. The facility anticipates the piping systems will cost approximately $15,000, reducing waste by about 30 drums a year at a savings of approximately $6,000. Thus the pay-back period would be just over two years.

Factors Affecting Waste Generation

- Specific customer requirements/quality control requirements.
- Customer demand/level of production.

THE PROCTER & GAMBLE MANUFACTURING COMPANY

8201 Fruitridge Road
Sacramento, California 95813

SIC 2869 Industrial Inorganic Chemicals, NEC

Business activity:
Procter & Gamble (P&G) manufactures oleochemicals from coconut and palm kernel oil feed stock.

Manufacturing Processes:

The facility's main process involves reacting coconut oil, which is composed primarily of triglycerides, with a sodium methylate catalyst (manufactured onsite with methanol and sodium hydroxide), resulting in the formation of two layers. From one layer, consisting of glycerin, methanol, and water, P&G separates purified glycerin for sale and distills out pure methanol for reuse onsite. From the other layer, consisting of water-soluble methyl esters and some methanol and water, the facility separates the methyl esters and methanol/water fraction. The methyl esters are fractionated into a light cut, two middle cuts, and a heavy cut. The light cut is acidified to split it into fatty acids and methanol, both or which are purified, the former for sale and the latter for onsite reuse. The middle and heavy cut esters are hydrogenated using a copper chromite catalyst to yield alcohols, methanol, and water. The fatty alcohols are separated into different molecular weights for sale.

Major Waste Streams and Waste-Generating Activities, 2001

Waste Stream	CWC	Pounds	Waste-Generating Activities
Spent catalyst	162	119,260	This waste is produced from the hydrogenation process. The copper chromite catalyst, containing 47.6 percent copper and 30.2 percent chromium (tri-valent), is slurried in fatty alcohol to catalyze the hydrogenation reaction of fatty esters into fatty alcohols. Spent catalyst is separated by filters and discharged to plastic-lined containers for landfill disposal.

Source Reduction and Waste Management Activities, 1998-2001

Spent Catalyst:

- In 1997, P&G converted to a new catalyst that provided higher efficiency. This new product was not a different catalyst altogether, but a more reactive material which was developed by working with the catalyst manufacturer. The higher activity level of the improved catalyst reduced change-out of the catalyst during the hydrogenation process, from ten percent to six percent.

- During 1999, P&G continued to run pilot tests using a copper zinc catalyst (which would eliminate the chromium in the subsequent waste stream), with some success. This catalyst is being evaluated for future use on a regular basis. The plant is also evaluating the use of exotic metals, such as palladium, as a fixed-bed catalyst. This option is several years down the road because the technology has not yet been proven effective in the alcohol hydrogenation process.
- Employees are encouraged through an in-plant recognition program to take actions that reduce wastes and reduce water disposal costs.
- In-house quality control policies encourage the proper operation of the catalyst system.

Unspecified Oil-containing Waste (CWC223) - "foots" from the coconut oil refining:

- These dregs from the coconut oil refining process, which amounted to 187,500 pounds of waste generated in 1998, were completely eliminated as a hazardous waste stream by 2001 due to a change in the manufacturing process. Procter & Gamble switched from caustic refining to physical refining, which uses steam and a diatomaceous earth filter instead of a caustic. The "foots" were originally hazardous because of the caustic content, which was eliminated with the process change.

Factors Affecting Waste Generation

- Changes in business activity:
- Availability of off-site recycling options.

RHODIA

100 Mococo Road
Martinez, California 94553-1340

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Nature of Business

Rhodia manufactures (regenerates) various strengths and grades of sulfuric acid and oleum (fuming sulfuric acid), ammonium sulfate/bisulfite liquor (from the final system scrubber), which is sold as a fertilizer product, and zinc sulfate fertilizers from zinc extracted from groundwater. Rhodia's sulfuric acid and oleum are mainly used as catalysts in petroleum refining.

Manufacturing Processes

Spent sulfuric acid and molten sulfur, combined with fuel and air, are combusted in an industrial furnace. The flue gas from the combustion, which has a high concentration of sulfur dioxide, is cooled, cleaned and dried in the waste heat boiler, the quench tower, the electrostatic precipitators, and the drying tower. The gas is then forced through a catalytic converter and two absorption towers, where sulfur dioxide is converted to sulfur trioxide and then combined with water to produce sulfuric acid and oleum. Exhaust gas is cleaned in an ammonia scrubber/mist eliminator and discharged to the atmosphere.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Acidic Waste Water	791	340,530	A weak (ten percent) sulfuric acid waste is generated from the gas cleaning process (including the gas cooler, precipitators, and quench tower).
Spill Control Pond Solid	181	42, 220	Solids/sludge, high in mercury, were removed from a pond that collects storm water and washdown water from material loading areas, and process upset streams.

Source Reduction and Waste Management Activities, 1994-1998

Acidic Waste Water (CWC 791):

Source reduction measures and waste management activity, 1994-1998:

- Onsite recycling, including the use of quench acid as a raw material, has reduced acidic waste by 4.7 percent, or 20,000 pounds/year. (A 28 percent decrease in plant production reduced this waste stream by another 68,220 pounds/year.)
- Acid waste that is not recycled is neutralized with caustic soda, combined with non-hazardous process waste water, and released to an NPDES system.

Proposed source reduction measure, 1998:

- Improve communication with ammonium sulfate/bisulfite customer on delivery scheduling, thereby reducing excess bisulfite product inventory, which must be recycled to the furnace. The facility believed this would reduce acid waste by 10,000 pounds/year, at an annual savings of $20,000.

Spill Control Pond Solids (CWC 181):

- Stopped burning geothermal Stretford sulfur for sulfuric acid production, to avoid mercury contamination of the pond solids. This measure had no associated cost.

Factors Affecting Waste Generation

Decrease in plant production.

SHELL CHEMICALS

10 Mococo Road
Martinez, California 94553

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

Shell produces two catalysts at this facility, RM17 and ethylene oxide (EO) catalyst. RM17 is used in the Shell petroleum hydroformulation process, while EO catalyst is sold for production of ethylene oxide. A distillation column is also used for the processing of spent sulfinol from a refinery.

Manufacturing Processes

In the ethylene oxide production process, water, silver nitrate, caustic, oxalic acid, and amines are combined in a reactor to produce a silver solution. The silver solution is then impregnated onto alumina beads, which are centrifuged, dried, and stored in 55 gallon drums prior to custom packing.

The RM17 catalyst is produced in a batch reactor, with proprietary ingredients, and distilled in wiped film evaporators.

The distillation column processes spent sulfinol to produce sulfinol in a simple distillation process that removes undesirable heavy ends.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activity
Liquid Waste (Toluene)	212/221	88,585	The non-recoverable fraction of a toluene recycling system in the RM17 catalyst manufacturing process.
Chemical and Oily Solid Waste	223	36,710	Contaminated personal protective equipment, empty sample containers, and empty raw material containers.
Cooling Tower Sludge	132	14,400	Solids, contaminated in the past with the water-treatment chemical, chromate, that were cleaned out from the bottom of a cooling water tower.

Source Reduction and Waste Management Activities, 1994-1998

Chemical and Oily Solid Waste:

- The facility has been using larger containers to minimize the total pounds of waste.

Cooling Tower Sludge (CWC 132):

- The facility ceased using chromate, which was used in the past to treat the cooling water. Chromate is what caused the cooling tower sludge to be hazardous. Without the chromate contaminant, this measure would result in a source reduction of 14,400 pounds of hazardous waste.

Factors Affecting Waste Generation

Weather conditions, specifically annual rainfall, can contribute to the quantity of process water (not a major waste stream in 1998), which includes storm water.

U.S. BORAX, INCORPORATED

300 Falcon Street
Wilmington, California 90744-6495

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

Business Activity

U.S. Borax manufactures and distributes inorganic borate chemicals, including boric acid, borax, potassium borates, sodium metaborates, POLYBOR, zinc borate, borate granular fertilizer, SOLUBOR, and TIM-BOR.

Manufacturing Processes

Most of the products are produced by dissolving raw materials, such as sulfuric acid, boric acid, zinc oxide, caustic soda, potassium hydroxide, 5 Mol dust, 5 Mol granular, and/or 10 Mol Granular, in a steam-heated solution. The mixture is then filtered and cooled. After the cooled material crystallizes, contaminants are removed by centrifugation, and the material is screened to ensure uniform particle sizes. The screened material is then dried. The facility also performs regular equipment maintenance.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Waste zinc borate	181	47,454	Periodic cleaning of scales and products that deposit onto the heat exchanger tubes, baffles, and reactor interior.
Waste sulfuric acid	791	29,032	Storage tank clean-out.

Source Reduction and Waste Management Activities, 1994-1998

Waste Zinc Borate (CWC 141):

Source reduction and waste management, 1994-1998:

- Filters replaced dust collector socks, which were used to collect the zinc borate product prior to packaging, in some of the zinc borate production machines. The filters are more efficient than the socks, and do not need to be changed out as often as the socks, thereby reducing the generation of waste zinc borate dust collector socks.
- Preventive maintenance on the dust collectors was increased, reducing the amount of dust being generated and the frequency of sock replacement.

Proposed source reduction measures in 1998:

- U.S. Borax proposed to reduce excess waste zinc borate by reengineering the production line to create a separate line for the production of zinc borate fine products, as opposed to the zinc borate regular products. The zinc borate production line produces two zinc borate products (regular and fine), and it normally takes a couple of production runs to clean out the system following "regular" product runs, before the "fine" zinc borate product runs can meet specifications. The facility anticipated that installation of a separate zinc borate production line would reduce the waste stream from this source by 50%, and would cost approximately one million dollars.

Factors Affecting Waste Generation

U.S. Borax is expected to increase business approximately 15 percent annually. This increase in production is directly correlated to an increase in waste production.

Updates (November 2003)

Waste Zinc Borate (CWC 181):

U.S. Borax installed the proposed fines milling production line. The concurrent introduction of robotic packing units, which did not function well, drastically increased waste production and the robots were consequently removed. The robot experiment makes it difficult to assess the new production line's effect on waste generation. The robots were removed in September 2003, and the facility has generated half of the waste zinc borate, to date, that was generated in 2002. U.S. Borax anticipates that it will reduce this waste stream further through improved dust control.

Waste Sulfuric Acid (CWC 791):

This waste was overlooked as a major waste stream, originally, due to confusion in reporting waste oil as a major waste stream, when in fact it was non-routinely generated and thus not subject to SB 14. The waste sulfuric acid is produced when sulfuric acid used in the manufacturing process is stored in carbon steel tanks, where it reacts with the walls of the tank to create a sludge. Eventually this sludge accumulates inside the tank and inhibits the operation of the transfer pumps.

Several source reduction measures are being considered. One approach is to pump down the tanks completely before refilling. This would prevent the sulfuric acid from reacting with the walls of the tank and generating sludge in the bottom of the tank. A second approach is to manufacture the product without sulfuric acid. Bench testing is currently being implemented. The facility anticipates that it will take one year to work out manufacturing feasibility and marketing considerations. If the product can be manufactured and sold without using sulfuric acid, the entire production line will be transferred to its Boron facility. If the production line stays at its current location and continues to use sulfuric acid, the facility will line the tank with a non-reactive coating, thereby eliminating the waste stream.

WILBUR-ELLIS COMPANY

2737 S. Golden State
Fresno, California 93725

SIC Code: 2879 Pesticides and Agricultural Chemicals, NEC

Business Activity

Wilbur-Ellis formulates and distributes ready-to-use agricultural chemicals, including pesticides, herbicides, fungicides, surfactants, adjuvant, emulsifiers, foliar nutrients, and micronutrients.

Manufacturing Processes

This facility formulates solvent-based liquids, water-based liquids, and solids.
The plant blends concentrated active ingredients with various carriers, including petroleum solvents and water, for the liquid product formulations, and sand and clay for the solids product formulations, along with additives.

Major Waste Streams and Waste-Generating Activities, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Empty Pesticide and Fertilizer Containers	511/513	43,500	Empty containers that carried active ingredients or additives. The majority of containers is less than 30 gallons volume and includes paper bags and fiber drums.
Pesticide and Fertilizer Rinse Water	231	20,420	Equipment cleaning to conduct routine maintenance and repairs; flushing micronutrient product lines; rinsing empty containers for recycling. Also, rainwater accumulates on wash pad and flows into sump with rinse water.

Source Reduction and Waste Management, 1998

Pesticide and Fertilizer Rinse Water (CWC 231):

Proposed source reduction measures:

- Enclose the wash pad to prevent rainwater from entering the sump.
- Increase employee awareness of waste minimization by reviewing importance of good housekeeping, inventory control, and waste segregation at quarterly employee safety meetings.

Factors Affecting Waste Generation

Regulatory changes. Waste classification, regulation of pesticides, or any change in ingredients/formulation requires new state and federal product registration.

Changes in business activity. The amount of empty pesticide containers and other generated waste is produced in direct proportion to the amount of production and therefore varies from year to year.

Changes in product formulation and the related raw ingredient container types used by suppliers. A formulator has very little control over its suppliers.

4.2 Case Studies

We are including two case studies of facilities that submitted plans that were outstanding for the way they approached the source reduction planning process, as well as for being generally well organized, clearly written documents. These two facilities are Air Products, Los Angeles, and Honeywell International, Santa Clara. We visited both facilities.

* * *

First, we would like to present a case study that illustrates how well a facility can describe implemented and proposed source reduction measures and their associated costs in the Performance Report and Plan.

AIR PRODUCTS AND CHEMICALS, INCORPORATED

3305 East 26TH Street
Vernon, California 90023

SIC Code 2899 Chemicals and Chemical Preparations, NEC

Business Activity

Air Products and Chemicals, Incorporated is an international supplier of industrial gases, chemicals, equipment and technology. The Vernon facility manufactures epoxy curing agents, which are used in the production of paints, adhesives, building products and coatings. The facility produces six major groups of products:

1. aliphatic amines
2. amidoamines
3. polyamides
4. cycloaliphatic amines
5. aromatic amines
6. accelerator and catalysts (tertiary amines)

This facility produces approximately 150 products, and handles over 250 different chemicals. Once the finished product reaches its destination, it is used to produce such end products as marine and maintenance coatings, adhesives, electrical potting compounds, aerospace composites and concrete bonding compounds.

Manufacturing Processes

Products are prepared in reactors, through batch manufacturing. Raw materials, including amine blends, phenol, fatty acid mixtures, resin, formaldehyde, benzyl alcohol, and salicylic acid, are fed into reactor systems from liquid bulk storage tanks, bulk tank trucks, drums, and sacks. A top mounted agitator system mixes the ingredients. All the reactors have a heating/cooling system. Two of the reactors have a reactor overhead system, consisting of a distillation column with a reflux condenser and a separate receiver with a total condenser, to remove water from the product. The reactor contents (the product) are drained from the bottom of the reactor, and can be pumped through a filter to another reactor, drumming station, intermediate tanks, or can be recirculated back to the reactor, in the event the product needs additional filtration.

Major Waste Streams and Waste-Generating Processes, 1998

Waste Stream	CWC	Pounds	Waste-Generating Activities
Contaminated trash	352	122,613	Contaminated personal protective equipment, filter bags, used spill clean-up equipment, and lab sampling containers.
Off-specification, aged, or surplus organics	331	68,085	Errors in batch ingredients or amount of raw materials used, producing off-specification product; aged raw materials or product; inventory of unsaleable product; samples; spill clean-ups.

Source Reduction Accomplishments, 1994-1998

Ketimine Waste – CWC 212 (oxygenated solvents)
Background/Description: At Air Products, three ketimine products require the use of methyl isobutyl ketone (MIBK) in excess. In the past, this resulted in the generation of large quantities of unreacted MIBK that was disposed of as a hazardous waste. The longer the cycle times and the lower the conversion rates, the more MIBK that was left over and required disposal.

Source reduction measures:

I. Cycle Time Reduction Team Formation

A team was formed to improve the process of making ketimine products, with the goals to reduce the cycle time and increase the conversion of reactants. The team worked on changing temperatures, hold times, and other aspects of the process, and was subsequently able to reduce the cycle time and increase the conversion of reactants.

Costs

Capital costs: None
Recurring costs: None
Cost savings or avoidance: Estimated $7,000/year (avoided disposal costs)
Pay-back period N/A

Result
Air Products estimated source reduction at approximately 10,000 pounds per year due to the increased conversion of MIBK. Reducing the quantity requiring disposal, in conjunction with recycling, has eliminated this as a hazardous waste stream.

Other benefits
Off-site disposal of this waste has been eliminated.

II. Recycling of Unreacted MIBK

Air Products explored the possibility of recycling the ketimine waste material back into the manufacturing process. This resulted in reintroducing the ketimine waste stream containing MIBK into the reactor as a raw material. It now serves as a supplement to the fresh MIBK, which is still used in the process at reduced amounts.

Costs

Capital costs:	None; existing equipment was utilized.
Recurring costs:	None
Cost savings or avoidance:	Estimated $600,000/year (avoided disposal costs)
Pay-back period:	N/A

Result
The recycling of the used MIBK, along with the improved conversion rate discussed above, has eliminated disposal of ketimine waste. In 1998, this recycling eliminated the need to dispose of nearly one million pounds of ketimine waste as hazardous waste.

<u>Off-specification, aged, and surplus organics – CWC 331</u>

I. "First time prime" program implementation
Background/Description: Breakdowns at various points in the production process would occasionally allow for the production of batches of off-specification material, requiring re-working or disposal as off-specification material.

In order to reduce these breakdowns and refine production to increase the number of "first time prime" batches, significant employee input is periodically requested. The operating procedures are refined and changed based upon the observations of the operators and engineers so that best work practices can be determined. In addition, the First Time Prime program requires an investigation into the root cause of each off-specification batch that is produced.

Costs

Capital costs:	None
Recurring costs:	None
Cost savings or avoidance:	$1.40/pound product x 30,000 pounds product = $42,000/year
Pay-back period:	N/A

Result
Estimated source reduction: approximately 30,000 pounds per year.

Other benefits
By reducing the amount of material that needs adjustment following initial production, the amount of sampling performed would also be reduced, reducing the amount of sample jars contributing to contaminated trash.

II. Cleaning Matrix
Background/description:
There are many causes for the production of off-specification material. One potential contamination source is the cleaning process. Inappropriate cleaning practices could mix incompatible material and result in build-up on the reactors, which could contaminate product.

To eliminate such contamination, a program was established to set specific procedures for cleaning, which explained in detail the practices for cleaning the various pieces of equipment for each product. A cleaning matrix previously existed; however, it was not used or updated as often as necessary. A more comprehensive and useful cleaning matrix was developed to determine the best practices for cleaning in each situation and set in place a process to ensure compatible products were being used and optimal conditions maintained.

Costs

Capital costs:	N/A
Recurring costs:	N/A
Cost savings or avoidance:	Savings associated with raw material cost: $1.40/pound x 30,000 pounds/year = $42,000/year
Pay-back period	N/A

Result
It is estimated that this reduced off-specification material by one batch annually. Based on average batch size, this accounts for a waste avoidance of 30,000 pounds per year.

Other benefits
The matrix has also reduced the amount of wastewater sent to the POTW (not a hazardous waste). This resulted in an approximate reduction of 500,000 gallons per year.

III. Installation of sample hoods
Background/Description:
One of the components of the surplus, aged, or off-specification material generated was product that had been bled from piping lines during product sampling. In order to obtain a representative sample, it is necessary to first bleed the sample line. The material removed from the lines was previously collected in a bucket and sent off-site for disposal.

To eliminate this waste, sample hoods with special lines were installed to recycle the material that had to be cleared out of the sample line. The lines pull the material directly down a piping system, which pump the material back into the reactors, thus eliminating waste from this process. This strategy was implemented in 1995.

Costs

Capital costs:	($3,000 per sample hood, labor, and material x 5 sample hoods) + $1,000 for branch to scrubber = $16,000
Recurring costs:	N/A
Cost savings or avoidance:	(based on raw material costs) $1.40/pound x 35,000 pounds/year = $50,400
Pay-back period (not reported):	0.3 years

Result
The amount of product previously emptied from the sample lines was approximately two gallons per sample. Samples are taken approximately six times a day, resulting in a reduction of 36,000 pounds per year of off-specification, aged, or surplus material.

IV. Continued piping and process equipment upgrades
Background/Description:
Inaccurate mixing and poor control of the addition of raw materials were responsible for some of the generation of off-specification, aged, or surplus organic material. Production of certain products previously required the use of hoses and other mixing approaches, which allowed for the generation of off-specification material. More precise mixing of the products reduced this waste stream.

Improvements to this delivery system included installing hard piping, rather than using hoses, and installing various valves, which allow the operators to control the amounts of raw material going to the product.

Costs

Capital costs:	$200,000
Recurring costs:	N/A
Cost savings or avoidance:	40,000 pounds/year product x $1.40 per pound product = $56,000/year saved
Pay-back period: (not reported)	5 years

Result

Estimated source reduction: approximately 40,000 pounds per year.

Other benefits/considerations

By reducing the amount of material needing adjustment following initial production, the amount of sampling performed was also reduced, thereby reducing the number of sample jars contributing to contaminated trash. The elimination of flexible hoses has also reduced the amount of material spilled, reducing the amount of spill cleanup material in the contaminated trash.

<u>Contaminated Trash – CWC 352 (other organic solids)</u>

I. Process pump improvements

Background/Description:

Spill cleanup material is a component of “contaminated trash” (CWC 352). Within the process, numerous pumps deliver product and raw materials to various stages of the reaction. These pumps become worn in time, and often have seal leaks (major or minor, depending on the extent of failure). This generates product waste as well as contaminated trash waste.

This strategy focused on reducing the amount of spilled material requiring clean-up. Leaking pumps were identified and replaced or repaired as necessary. A maintenance program was then put into place to inspect the pumps daily, to prevent any leaks from continuing. In addition, the procedure for entering maintenance requests was computerized in order to expedite these requests. This strategy was implemented in 1996.

Costs

Capital costs:	$110,000
Recurring costs:	N/A
Cost savings or avoidance:	Savings determined by the cost of contaminated trash disposal: $0.50/pound x 15,000 pounds = $7,500
Pay-back period (not reported):	15 years

[While this may seem too long a pay-back period to justify the measure above, discussions with the facility revealed that there were other production efficiency benefits that were not quantified in this economic analysis.]

Result
The estimated reduction associated with these improvements is in the range of 10,000-15,000 pounds per year.

Other benefits
Production efficiency was increased. This strategy reduces the volume of off-specification, aged, or surplus organic material generated as waste.

II. Vapor recovery system on underground storage tanks
Background/Description:
Underground storage tanks hold raw materials. Potential emissions from these tanks were prevented using activated carbon. Once exhausted, the carbon required replacement; the used carbon was disposed as contaminated trash.

To eliminate this waste stream, vapor recovery systems were installed on the tanks to return emissions to the tank, thereby eliminating the need for activated carbon filters. This strategy was implemented in 1997.

Costs

Capital costs:	$25,000 (4 vapor recovery systems)
Recurring costs:	N/A
Cost savings or avoidance:	$3,000/year (savings in disposal costs)
Pay-back period (not reported):	8 years

[While this may seem too long a pay-back period to justify the measure above, discussions with the facility revealed that there were other production efficiency benefits that were not quantified in this economic analysis.]

Result
Estimated reduction of 3,000 to 4,000 pounds per year.

Summary of Source Reduction Progress, 1994-1998

SB 14 Performance Report Data	1994 Pounds	1998 Pounds	Percent Change
CWC 352 contaminated trash	103,470	122,613	19 percent increase
CWC 331 off-specification organics	224,850	68,085	70 percent decrease
CWC 212 ketimine waste	1,025,764	0	100 percent decrease
Total SB 14 waste	1,354,084	1,221,732	10 percent decrease

The facility reported that this source reduction occurred alongside a 30 percent increase in production.

Source Reduction Strategies Proposed in 1998

Air Products and Chemicals, Incorporated proposed the following measures for evaluation for the two major waste streams reported in 1998:

- contaminated trash (CWC 352), and
- off-specification, aged, or surplus organics (CWC 331)

Several of the measures below had extended pay-back periods, which led us to question the viability of the proposed measures. We discussed this long pay-back period with facility representatives, who indicated that the proposed measured were part of a plan to upgrade outdated equipment. These measures, if adopted, would thus contribute to increased plant efficiency, including waste reduction.

<u>Contaminated Trash – CWC 352 (other organic solids)</u>

I. Installation of hard piping rather than using hoses in truck loading station

Background/description:

The use of hard piping at the truck loading station will reduce the disposal of contaminated hoses as contaminated trash. Periodically, the hoses become clogged and require replacement. This is not difficult; the main obstacles will be approval for capital requirements and coordination of improvements with plant operations.

Costs

Capital costs:	$200,000
Recurring costs:	N/A
Cost savings or avoidance:	3,000 pounds/year x $1.000/pound = $3,000/year
Pay-back period	67 years

Expected result

A reduction of 3,000 pounds annually of this waste stream.

Other benefits

The installation of the truck loading station will also reduce product contamination, improving overall product quality.

Obstacles

Availability of capital.

II. Continued pump seal repairs and pump replacements

Background/description:

These repairs will improve the overall condition of the facility while reducing the amount of spill cleanup material requiring management as hazardous waste. This source reduction strategy has already been undertaken in some areas (begun in 1994).

Costs

Capital costs:	$100,000
Recurring costs:	N/A
Cost savings or avoidance:	3,000 pounds/year x $1.00/pound = $3,000/year saved
Pay-back period	33 years

Expected result

Reduction of 3,000 pounds annually of this waste stream.

Other benefits

Reduced cleanup needed; less contact with product; fewer slipping hazards.

Obstacles

Availability of capital; improvements must be arranged so that production is not unnecessarily interrupted.

III, Potential reclassification of trash

Background/description:

Currently, a portion of the trash that is disposal as hazardous could be reclassified and disposed as regular, non-hazardous trash. A group will be assigned the duty of determining what material is currently disposed to hazardous trash bins that could be disposed as non-hazardous material. Scheduled for implementation in 2002.

Costs

Capital costs:	$0
Recurring costs:	N/A
Cost savings or avoidance:	$4,000 pounds/year x $1.00/pound = $4,000/year saved
Pay-back period	N/A

Expected result

Reduction of 4,000 pounds annually of this waste stream

Off-specification, aged, and surplus organics – CWC 331

I. Continue piping and process equipment upgrades (process change).

Background/description:
Previous piping upgrades have allowed operators more precise control over the addition raw materials, thereby reducing the amount of off-specification material produced. Additional upgrades will bring about more improvement.

Feasibility
Depends on capital requirements and budgetary allowances

Costs

Capital costs:	$200,000
Recurring costs:	N/A
Cost savings or avoidance:	$10,000-$15,000 (savings in disposal costs) 30,000 pounds/year x $1.40/pound product = $42,000/year saved (savings in material costs)
Pay-back period	5 years

Expected result
One less off-specification batch/year. Off-specification batches would be reduced, resulting in the production of more high-quality product.

Other benefits
Expected improved health and safety due to less manual charging of raw materials to reactors.

Schedule
This is a continuation of a strategy begun in 1994; continues as opportunities become available.

II. Automation of Phases I and II (process change).

Background/description:
Automation of the process will allow operators even more control of raw material additions and will standardize operations.

Costs

Capital costs:	$600,000
Recurring costs:	N/A
Cost savings or avoidance:	$10,000-$15,000
Pay-back period	40 years

Expected result
One less off-specification batch/year

Schedule
Begin in 2003 if capital investment can be justified.

III. Develop a team to oversee and instruct on the disposal of off-specification, aged or surplus organic material.
Background/description:
This team will determine which material can be re-worked, which material can be sold, and which must be disposed. More material will be used as product rather than become waste.

Costs

Capital costs:	$0
Recurring costs:	N/A
Cost savings or avoidance:	$1,000-$2,000/year (in waste disposal costs) 4 drums/year x $750/drum= $3,000/year saved (in material costs)
Pay-back period	N/A

Result
This team was fully functional in 1999 and working to efficiently manage this waste. In 2000, the disposal numbers for this category increased significantly as a result of a significant effort to begin management of this material.

Other benefits
The team will reduce the amount of unnecessary material stored onsite, reducing clutter, and generally make the area safer.

Source Reduction Strategies Rejected in 1998

Air Products and Chemicals, Incorporated Vernon plant stated it is “unable to make any modifications to the specifications, design or composition of our products.”

* * *

For our other case study, we chose a set of SB 14 documents that illustrate the clarity with which waste-generating activities can be laid out in the Plan. We were very impressed with the organization and thoroughness of Honeywell’s Plan, particularly with regard to connecting manufacturing processes with waste generation processes.

HONEYWELL INTERNATIONAL

3500 Garrett Drive
Santa Clara, California 95054

SIC Code: 2819 Industrial Inorganic Chemicals, NEC

"It is appropriate to think of 'waste' as a production defect to be controlled and minimized." [17]

Business Activity

The Honeywell International Santa Clara facility manufactures specialty chemicals, such as "spin-on" glasses, dielectrics, dopants, and polymers that are used for the manufacture of semiconductors. The company also operates a quality control laboratory and conducts some product development at this site. The core manufacturing process involves mixing a series of high-grade, ultra-pure organic solvents, such as acetone and isopropanol, with small amounts of inorganic polymers (silicates) and other additives, then filtering and bottling the final product. Site operations include shipping and receiving, raw material/chemical storage, the manufacturing Mix Shop, the manufacturing High Bay, work-in-progress storage, filtration and bottle filling, labeling and bagging, final goods inventory, quality control and research and development laboratories, and hazardous waste storage.

Waste-Generating Activities, by Manufacturing Processes

Honeywell's *Source Reduction Evaluation Review and Plan* meticulously lays out how waste is generated at its Santa Clara facility by outlining the different operations of the facility, and describing the manufacturing activity that occurs in these operations and the wastes that are subsequently generated. The following is a summary of Honeywell's manufacturing and related waste-generating activities:

Raw Material Storage Area: Most of the raw materials used at the site are received and stored in one-gallon containers, although the site also receives materials in 5-gallon, 2.5-liter, 1-liter, 500 milliliter and 250 milliliter bottles. High volume solvent feedstocks come in 55-gallon polypropylene or steel drums, in addition to the one-gallon bottles. In this section, Honeywell listed the raw materials used in manufacturing its products.

Since no raw material containers are opened in the chemical storage area, the only hazardous wastes generated are small amounts of personal protective equipment, such as gloves, housekeeping wipes, and expired or discarded raw materials, a significant portion of which are unused research and development chemicals.

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[17] Honeywell/Santa Clara's *Hazardous Waste Source Reduction Evaluation Review and Plan*, *2002,* p. 21

Manufacturing – Mix Shop: In the batch production method that begins product manufacture, facility personnel weigh specific quantities of raw materials, according to detailed product recipes, on a digital scale and then mix them in 22-liter flasks. The flasks are then sealed and automatically mixed for a specified period of time, during which additional raw materials may be added. Once the mixing is complete, the contents of the flasks are transferred to a large plastic carboy, which is wheeled into the next manufacturing area, the High Bay. The primary raw materials used in the Mix Shop operation are organic solvents, silicate polymers, and acids. To minimize cleaning and avoid cross-contamination, each major product line has dedicated mixing equipment work areas.

Hazardous waste-generating activities in the Mix Shop include flask cleaning and preparation, emptying raw material containers, cleaning and flushing pumps used to transfer flasked materials to the carboys, quality control sampling, and use of personal protective equipment. The wastes generated include:

- used cleaning (including pump flushing) solvents, primarily acetone or isopropyl alcohol;
- bad batches of flasked material;
- bad product batches containing low concentrations of metals;
- residual raw materials that are too small an amount to be returned to the raw material storage area;
- empty raw material containers, primarily one-gallon bottles, but also including 55-gallon drums; and
- hazardous solid debris, including protective gloves, wipes, disposable quality control sampling supplies, and broken glassware.

Manufacturing – High Bay: The materials from the Mix Shop (now in carboys) undergo additional mixing, the addition of more raw material (solvents and polymer), and then further mixing. The carboys are then transferred to the refrigerated Work-in-Progress storage area, from where they may occasionally be returned to the High Bay for additional mixing.

Hazardous waste is generated in the High Bay by cleaning carboys and mixing units, emptying raw material containers, use of personal protective equipment, and quality control sampling. The wastes generated, much like the Mix Shop area, include:

- used cleaning solvents;
- bad batches of carboy materials;
- residues from raw material containers;
- empty raw material containers;
- personal protective equipment, wipes; and
- waste quality control sampling equipment.

Work-in-Process Storage: No manufacturing occurs in this area. Work-in-process materials only need to be filtered and bottled before shipping to the customer.

The only hazardous wastes generated in this area are expired product and used personal protective equipment, wipes, and quality control sampling equipment (such as pipettes).

Filtration, Particle Counting, and Bottling: Dedicated filter lines have been established for individual product lines to minimize set-up and cleaning. Prior to processing carboy materials, the filter assembly and transfer pump are rinsed with solvent and then flushed with two to three liters of the product that will be filtered. Following filtration of the material, samples are taken from the filtered and bottled product for a particle count analysis, to ensure the desired purity of the product. Product "retain samples" are also taken, to be kept for future reference in the event of quality issues with a customer.

Hazardous wastes include the rinsing solvents, product flush, empty solvent containers, waste samples, empty product containers from the particle count, failed product, Teflon® and polypropylene filters from the filtration process, personal protective equipment, disposable sampling equipment, and wipes.

Labeling and Bagging: Product bottle leaving the filtration area are labeled and sealed in plastic bags, and moved to Final Goods Inventory for shipment.

The only hazardous waste generated in this operation is personal protective equipment used by plant employees.

Finished Goods Inventory: In this area, which shares a space with the raw material storage area, all finished products are kept in refrigerated lockers until moved for final packaging and shipment to a customer.

The main hazardous wastes generated in this area are expired product and "retain samples" (taken after filtering). A small number of used gloves and wipes are also generated.

Quality Control and Research and Development Laboratories

A number of quality control tests, as well as process and product improvement research, are conducted in the laboratories. Honeywell points out that although the wastes generated by laboratory scale research are exempt from SB 14, these wastes are typically co-mingled with other laboratory and facility wastes.

Hazardous waste-generating activities include sample preparation and analysis, sample disposal, cleaning of glassware and laboratory equipment, and the use of personal protective equipment. The wastes generated include used solvents, empty containers, and hazardous solid debris.

Major Hazardous Waste Streams, 2002

Waste	CWC	Pounds
Mixed flammable liquids	212	95,354
Empty raw material containers (primarily 1-gallon plastic bottles)	513	53,668
Hazardous debris (gloves, wipes, pipettes, sample bottles, filters, etc.) contaminated with solvents	352	30,315
Mixed flammable liquids (expired product)	551	12,474

Source Reduction and Waste Management Activities, 2002

Because Honeywell acquired the Santa Clara facility in 1999 and therefore did not have 1998 SB 14 documents, facility staff used 2002 as both the baseline and reporting year. Thus, the following section addresses Honeywell's current and proposed source reduction actions, as well as other waste management activities.

Overall Source Reduction Techniques, Applicable to All Waste Generation:

- A formal written environment policy, backed by top management, demonstrating a commitment to pollution prevention, regulatory compliance and continuous improvement;
- Formal, institutionalized "lean manufacturing" operating systems to minimize cost and use of raw materials, maximize efficiency of production systems, and limit size of final goods inventories in accordance with customer demand.
- Formalized "Six Sigma" and ISO 9001 continuous improvement systems;
- Use of cost accounting techniques that assign the cost of hazardous waste management to the production units generating the wastes to ensure waste management costs are budgeted, controlled, and minimized like other production costs;
- Staff training in lean manufacturing and continuous improvement;
- Use of performance incentives and employee reward and recognition programs to reward desired environmental management behavior;
- Use of formal written operating procedures for all critical business activities, from ordering and purchasing raw materials, to material receiving and storage, equipment cleaning and preparation, batch processing, final product packaging and order fulfillment.
- On-site quality control testing at various points in the production process to minimize off-specification product lots;
- Trained, on-site emergency response team to minimize amount of contaminated material generated in event of spill;
- Routine monthly inspections of chemical storage, manufacturing, and waste management areas to identify and mitigate potential problems;
- Waste segregation to avoid mixing hazardous with non-hazardous waste;
- Use of production scheduling systems to optimize product lot size and sequencing.

Mixed Flammable Liquids (CWC 212):

- Ongoing source reduction and waste minimization efforts:
    - prepare flasks, mix and filter product, and conduct other production steps in fume hoods to minimize potential for spills and material losses
    - use dedicated process equipment for individual product families to avoid excess equipment cleaning and the potential for cross-contamination of product lots
    - prepare written specifications on equipment cleaning and flushing, to avoid excess waste generation

- Proposed source reduction measures:
    - improve and/or clarify written operating procedures used by production personnel in the filter shop. The improvements relate to equipment cleaning, material handling, and bottle filling and processing steps. Honeywell estimates that these changes will result in a five percent reduction in mixed flammable wastes generated from the filter shop.
    - modify the cooling water circulation system in the mix shop to provide more reliable flow. Insufficient cooling water flow rates can result in off-specification product and cause flasked materials to be discarded. Honeywell estimates this measure will reduce mix shop flammable liquid waste by ten percent.
    - improve waste generation data collection and tracking systems to obtain more accurate information on the relative contribution of each waste-generating activity. Honeywell recognizes the value of measuring production "defects," including waste generation, as a way to drive additional operating improvements and subsequent waste reduction. While the facility believes it is difficult to quantify projected source reduction from this measure, it is estimating a five percent reduction.

- Currently, these wastes are recycled offsite as fuels.

Empty Raw Material Containers (CWC 513):

- Ongoing source reduction and waste minimization measures:
    - purchase high-volume raw materials, such as acetone and isopropanol, in 55-gallon drums, where possible;
    - reuse empty 55-gallon raw material drums for hazardous waste collection and disposal

- Proposed source reduction measures:
    - institute bulk delivery system for these high-volume solvents by mid-2004

- Before August 2002, empty raw material containers were incinerated offsite. Currently, the raw material containers are sent to a hazardous waste landfill.

Hazardous Solid Debris (CWC 352):

- Ongoing source reduction and waste minimization measures:
  - segregate waste

- The selected source reduction measure is to ensure that non-hazardous solid waste is not co-mingled with hazardous solid debris for disposal by conducting refresher training for operating personnel. The facility estimates that this measure will reduce hazardous solid debris by ten percent.

- Currently, this waste stream is incinerated offsite.

Mixed Flammable Liquids [Loose Pack / Expired Raw Materials and Product] (CWC 551):

- Ongoing source reduction and waste minimization measures:
  - inspect incoming raw materials to ensure proper materials and quantities are received, and containers are in good condition
  - enter and track date-sensitive material in inventory system, to minimize generation of expired materials
  - use computerized lean inventory system to time receipt of raw materials as close to time of use as possible, to avoid excess inventory build-up
  - use specially designed storage areas, such as refrigerators with temperature sensors and alarms, enclose storage areas with secondary containment, and segregate hazardous versus non-hazardous storage, to minimize waste generation

- Selected source reduction measures include the following:
  - Improve inventory control operating procedures and information systems to reduce the amount of product that exceeds its shelf life and the amount of expired raw material. Examples of this measure are to: upgrade the communication system between the final goods inventory supervisors and the production supervisors; and requiring the chemical storage staff sign out production materials to manufacturing personnel on an as-needed basis.
  - Implement awareness training with research and development (R&D) staff and purchasing staff, to ensure they are ordering the smallest volume of chemicals necessary to conduct R&D operations and are not producing unnecessary waste chemicals or expired raw materials. In 2002, approximately 70 percent of the mixed flammable liquids/loose pack waste stream (CWC 551) was composed of expired and unused raw materials, most of which seem to be associated with R&D laboratory operations. Because of the nature of R&D operations and the subsequent difficulty in establishing rigorous operating controls on the amount of chemicals used, Honeywell determined that the best source reduction approach would be a customized waste minimization training session for the R&D laboratory to

ensure a high degree of awareness regarding hazardous material purchase and disposal costs, and the associated environmental impacts. Including the chemical purchasing staff in this training ensures that the purchasers and chemical users are working towards the same goal.

- This material is currently incinerated offsite.

Factors Affecting Waste Generation

- continued weak demand within semiconductor industry, which caused manufacturing levels below those achieved earlier (although production was actually up by 26 percent in 2002, from 2001);
- major house cleaning in 2002 to reduce amount of raw material storage, which accounts for about 70 percent of mixed flammable liquids/loose pack wastes;
- modification of waste management of empty raw material containers, from repacking them in their cardboard shipping boxes and shrink-wrapping 27 boxes on a pallet (which was then sent off for incineration) to placing empty 1-gallon containers in a 40-yard roll-off bin for off-site disposal at a class I facility (cardboard boxes and pallets are now recycled as non-hazardous material, so this is a good example of waste segregation)
- modification of waste codes (CWCs) by new transportation and disposal vendor, which impacted reporting (although not volume) of waste streams;
- new product development, involving experimental batches and increased quality control testing.

Comments

Honeywell purchased the Santa Clara facility in 1999, and thus did not already have 1998 SB 14 documents. The facility chose to use the year 2002 as both its baseline and reporting years. Although Honeywell does not report source reduction accomplishments, its documents are an example of a well thought-out and meticulous explanation of how waste is generated at this facility, and identifies the most effective ways to reduce that waste. It is noteworthy that Honeywell's source reduction emphasis is on a facility-wide management commitment to source reduction and the importance of raising the awareness of facility personnel, with regard to waste minimization.

Updates

Mixed Flammable Liquids (CWC 212): The new cooling water system intended to reduce generation of off-specification product due to insufficient cooling water flow rates has been installed.

Empty Raw Material Containers (CWC 513): Honeywell is now implementing a bulk delivery system to minimize the amount of one-gallon container waste.

Hazardous Solid Debris (CWC 352): Refresher training for operating personnel to ensure that non-hazardous solid waste is not co-mingled with hazardous solid debris has been completed.

Mixed Flammable Liquids [Loose Pack/Expired Raw Materials and Product] (CWC 551): Improved inventory control operating procedures and information systems have been implemented, as has been awareness training for Research and Development (R&D) and Purchasing staff to ensure they are ordering the smallest volume of chemicals necessary to conduct R&D operations.

5. SUMMARY INFORMATION

5.1 Compilation of Waste Generation and Waste Management Data

The following table (starting on next page) identifies the facility, each waste stream's California Waste Code and description, pounds of waste generated in 1994 and 1998 for each waste stream, and how the wastes were managed in that time span. A blank space indicates the facility did not provide that information or, with regard to blanks in the 1994 column, the facilities preparing SB 14 documents for the first time may have only provided information for the reporting year, 1998.

TABLE 5
Compilation of SB 14 Waste Generation and Waste Management Data for the Reviewed Facilities

COMPANY	CWC	Waste Description	1994	1998	Onsite Recyc-ling	Onsite Treat-ment	Onsite Dis-posal	POTW/ NPDES	Offsite Recyc-ling	Offsite Treat-ment	Offsite Dis-Posal
Air Products	212	ketimine waste	1,025,764	1,031,034	x						X
	352	contaminated trash	103,470	122,613							X
	331	off-specification organics	224,850	68,085							X
Applied Biosystems	134	Water with methylene chloride	146,169	342,360		x				x	
	741	liquid waste with halogenated organic compounds	192,936	264,112						x	
	352	solid waste	9,375	30,950						x	
	791	organic acid waste	9,862	0						x	
Baker Petrolite (1998/2002)	343	cleaning area waste (organic liquid mixture)	190,694	357,490					x		
	214	experimental and surplus product	452,194	305,214					x		
	331	off-specification polymers and their rinsates	241,749	127,336					x		
Bio-Rad/Regatta St.	214	mixed flammable liquids	390,736	314,682					x	x	
	741	mixed flammable/corrosive liquids	17,328	21,819					x		
	132	mixed flammable liquids (methanol & water)	45,509	1,811						x	
Bio-Rad/Wright St.	212	mixed flammable liquid (ethyl acetate & acrylamide	54,599	45,398					x	x	
	352	contaminated lab waste with resin monomer	15,306	41,990						x	
	132	mixed flammable liquids (methanol and water)	12,148	28,526						x	
	134	Non-RCRA hazardous waste liquid	0	8,173						x	

TABLE 5
Compilation of SB 14 Waste Generation and Waste Management Data for the Reviewed Facilities

COMPANY	CWC	Waste Description	1994	1998	Onsite Recyc-ling	Onsite Treat-ment	Onsite Dis-posal	POTW/ NPDES	Offsite Recyc-ling	Offsite Treat-ment	Offsite Dis-Posal
Criterion/Azusa	181	waste catalyst fines	345,596	69,692	x				x		x
	132	mezzanine sludge (from sump pit)		23,200							
	181	floor sweepings	46,750	16,211							X
	132	clarifier waste	39,615	12,200							
	181	polyethylene liners	23,125	5,135							X
	181	baghouse filter waste	10,175	3,831							X
Criterion/Pittsburg	181	waste catalysts	380,106	3,231,510	x						
Dow Chemical	135	industrial flow to POTW	13,300,000	9,280,000				x			
	751	chlorinated pyridine tar waste	4,230,000	2,163,000	x						
	741	fluorinated pyridine tars with ethylene glycol	2,150,000	1,180,200						x	
	341	Salt solution/ethylene glycol	481,000	393,340						x	
EKC	134	aqueous clean-up wastes		403,190							
	343	waste photoresist and hydroxylamine products		145,675							
General Chemical/Bay Point (1998/2002)	131	mixed acid waste, pH<2	734,000	1,300,000	x						
	134	mixed acid waste, pH>2	908,000								
General Chemical/Hollister	212	flammable solvents (acetone, n-butyl acetate)	174,760	271,845						x	
	741	non-flammable solvents (perfluoro compounds)		57,791						x	
General Chemical/Richmond	181	refractory bricks (in the facility Plan and Profile, this waste stream was pro-rated over four years)	306,090	0							X

TABLE 5
Compilation of SB 14 Waste Generation and Waste Management Data for the Reviewed Facilities

COMPANY	CWC	Waste Description	1994	1998	Onsite Recyc-ling	Onsite Treat-ment	Onsite Dis-posal	POTW/ NPDES	Offsite Recyc-ling	Offsite Treat-ment	Offsite Dis-Posal
	181	plant sweepings	10,350	17,550						x	x
	181	fly ash with nutshells	12,150	10,800						x	X
Honeywell/ El Segundo	792	corrosive liquid		1,411,480	x						
	181	mole sieve		80,000	x				x		
Honeywell/ Santa Clara	212	mixed flammable liquids		95,354						x	
	513	empty containers		53,668						x	X
	352	hazardous debris (gloves, wipes, lab equipment, etc.)		30,315						x	
	551	mixed flam. liquids/expired product		12,474						x	
IMC	133	monoethanolamine reclaimer bottoms		1,868,680							X
	221	waste fuel oil	905,230	1,394,560	x						
JSR Microelectronics	214	waste solvent	128,407	141,943					x		
	134	waste tetramethyl ammonium hydroxide	2,286	9,603					x		
Monsanto	141	trash with catalyst fines	6,656	24,386							
	223	trash with lubricants	1,799	2,525							
	141	trash with vanadium pentoxide	2,985	1,387							
Ondeo Nalco (1998/2000)	134	process wastewater	20,616,750	14,428,200				x			
	512/ 513	empty containers	30,080	80,000							X
	221	waste oil and mixed oil	29,343	9,757						x	
	134	liquid trench sludge		7,260							

TABLE 5
Compilation of SB 14 Waste Generation and Waste Management Data for the Reviewed Facilities

COMPANY	CWC	Waste Description	1994	1998	Onsite Recyc-ling	Onsite Treat-ment	Onsite Dis-posal	POTW/ NPDES	Offsite Recyc-ling	Offsite Treat-ment	Offsite Dis-Posal
Procter and Gamble (1998/2001)	162	spent catalyst	820,660	119,260							X
Rhodia	791	acidic waste water	428,750	340,530	x	x		x			
	181	spill control pond solid	42,220	42,220							X
Shell Chemicals	212/ 221	liquid waste toluene	279,310	88,585						x	
	223	chemical and oily solid waste		36,710							
	132	cooling tower sludge		14,400							
U.S. Borax	141	waste zinc borate	27,100	47,454							X
	791	waste sulfuric acid		29,032							X
Wilbur-Ellis (1998/2001)	511/ 513	empty pesticide and fertilizer containers		43,500					x		
	231	pesticide and fertilizer rinse water		20,420	x						
TOTALS			**49,605,982**	**42,130,466**							

5.2 Waste-Generating Activities

Clearly identifying waste-generating activities is one of the key tasks in source reduction planning. A summary of the waste-generating activities helps to illustrate the challenges the chemical industry faces, in terms of source reduction. It also illustrates the diversity within the chemical industry of industrial processes and activities that produce waste. The following is a list of the major waste-generating activities we identified in the facility documents we reviewed, with details on the types, quantities, and sources of waste streams generated.

Cleaning activities: cleaning bottles and glassware; washing out containers, tanks, reactor vessels and other production equipment; flushing out lines.

Waste Stream	Pounds	Comments
Water with methylene chloride (CWC 134)	342,360	bottle/glassware cleaning
Cleaning area waste (CWC 343)	357,490	rinsing field tanks and bulk polymer and silicone containers with a water or oil-based solvent
Salt solution/ethylene glycol (CWC 341)	393,340	process tank washouts and tank truck clean outs
Water-based clean-up wastes (CWC 134)	403,190	equipment cleaning and line purging
Negative and positive photoresist products; hydroxylamine products (CWC 343)	145,675	equipment cleaning and line purging
Flammable solvent mixture (CWC 212)	271,845	equipment cleaning following purification process
Non-flammable solvent mixture (CWC 741)	57,791	equipment cleaning following purification process
Waste solvent	141,943	cleaning of formulation/mixing vessels
Process wastewater (CWC 134)	14,428,200	rinsing and washing equipment; floor washing; cleaning reusable shipping containers
Waste oil and mixed oil (CWC 221)	9,757	equipment rinsing and transfer line flushes
Liquid trench sludge	7,260	flushing specific product line
Pesticide and fertilizer rinse water	20,420	cleaning equipment, flushing lines, rinsing empty containers, plus rainwater
TOTAL	**16,579,271**	

Production of off-specification materials and by-products.

Waste Stream	Pounds	Comments
Liquid waste with halogenated organic compounds (CWC 741)	264,112	byproduct from chemical synthesis process
Experimental products (CWC 214, 223)	305,214	products formulated for a specific location or field, that can no longer be used or recycled
Off-specification polymers (CWC 331)	127,336	expired shelf life of long chain molecular polymers
Non-reusable catalyst fines (CWC 181)	69,692	over- and under-size catalyst; off-specification catalyst; baghouse dust; extruder scrap
Waste catalysts (CWC 181)	3,231,510	extruder clean-out waste, sweepings, nuisance dust, off-specification catalyst fines
Waste corrosive liquid (CWC 792)	1,411,480	high-boiler waste/by-product of chemical process
Tetramethyl ammonium hydroxide (CWC 134)	9,603	from developer machines used to assess photoresist, and from residual product from reservoir
Acidic waste water (CWC 791)	340,530	weak sulfuric acid generated from the gas cleaning process in sulfuric acid production
Waste zinc borate (CWC 141)	30,539	removal of scales and product that deposit onto heat exchanger tubes, baffles, and reactor interior
TOTAL	**5,790,016**	

Use of personal protective equipment, wipes, rags, filters, other equipment.

Waste Stream	Pounds	Comments
Solid organic waste (CWC 352)	30,950	contaminated gloves, wipes, plastic ware, etc.
Trash contaminated with vanadium pentoxide (CWC 141)	1,387	dirty protective clothing, personal protective equipment, used dust collector cartridges, contaminated spare parts
TOTAL	**32,337**	

Settling of sludges.

Waste Stream	Pounds	Comments
Mezzanine sludge (CWC 132)	23,200	wash-down materials from raw material area, collected in sump pit
Clarifier sludge (CWC 132)	12,200	sewer clarifier sludge
Spill control pond solid (CWC 181)	42,220	high mercury sludge from pond that collects storm water and washdown water
Cooling tower sludge (CWC 132)	14,400	chromate-contaminated solids cleaned out from bottom of cooling tower
TOTAL	**92,020**	

Housekeeping, including floor sweeping and spill clean-up.

Waste Stream	Pounds	Comments
Floor sweepings (CWC 181)	16,211	material spilled during manufacturing process and fugitive dust from manufacturing equipment
Plant sweepings (CWC 181)	17,550	housekeeping
TOTAL	**33,761**	

Plant washdown.

Waste Stream	Pounds	Comments
Industrial flow to POTW (CWC 135)	9,280,000	process washdown water and scrubber effluent streams

Distillation and reclamation activities.

Waste Stream	Pounds	Comments
Chlorinated pyridine tar waste (CWC 751)	2,163,000	from distillation/separation columns, during product purification
Fluorinated pyridine tars with ethylene glycol (CWC 741)	1,180,200	from distillation columns, during solvent recovery
Monoethanolamine (MEA) reclaimer bottoms (CWC 133)	1,868,680	reclamation of stripped MEA
Liquid waste toluene (CWC 212/221)	88,585	non-recoverable fraction of a toluene recycling system
TOTAL	**5,300,465**	

Brick replacement.

Waste Stream	Pounds	Comments
Decomposition chamber refractory brick (CWC 181)	95,340	brick replacement in decomposition chambers

Abrasive blasting of equipment.

Waste Stream	Pounds	Comments
Fly ash with nutshells (CWC 181)	10,800	walnut shell “nut-blasting” of waste heat boiler tubes

Product filtering:

Waste Stream	Pounds	Comments
Mole sieve	80,000	filtration of crude liquid product

Treatment of residuals/wastes onsite:

Waste Stream	Pounds	Comments
Waste fuel oil	1,394,560	treatment of "crud", a brine/organic emulsion residual

Empty containers, including bags, liners, and packaging:

Waste Stream	Pounds	Comments
Trash contaminated with catalyst fines (CWC 141)	24,386	used dust collector bags, container liners, mist eliminator packaging, used steel drums
Trash contaminated with lubricants (CWC 223)	2,525	empty containers, used filters, empty lubricant bottles
Empty containers (CWC 512, 513)	80,000	raw material shipping containers, including bags
Chemical and oil solid waste (CWC 223)	36,710	empty sample and raw material containers
Empty pesticide and fertilizer containers (CWC 511/513)	43,500	containers from active ingredients or additives; majority are paper bags, fiber drums, and containers less than 30 gallons
TOTAL	**187,121**	

Spent materials:

Waste Stream	Pounds	Comments
Spent catalyst (CWC 162)	119,260	filtered out spent catalyst following a hydrogenation process
Waste oil and mixed oil (CWC 221)	2,502	oil drained from machinery and other equipment
Mixed flammable liquids (CWC 214)	314,422	spent solvent-water mixtures from product washing/purifying/drying (also includes water/solvents from vessel cleaning)
Mixed flammable corrosive liquids (CWC 741)	21,819	product conversion generates waste sodium chloride or hydroxide, ferric chloride, hydrochloric acid and other solutions
TOTAL	**458,003**	

5.3 *IMPLEMENTED SOURCE REDUCTION MEASURES BY MAJOR WASTE-GENERATING ACTIVITIES*

In this section, we summarized implemented source reduction measures by waste-generating activity. The nature of the chemical industry suggests that the connection between the activity and the source reduction measure is more direct and informative than, for example, the connection between waste streams and source reduction measures. In parentheses, we identified the main waste streams generated by the activity.

Cleaning Activities: cleaning bottles and glassware; washing out containers, tanks, reactor vessels and other production equipment; line flushing (generating primarily California Waste Codes 134, 212, 341, 343[18]):

- Substitution of less toxic cleaning solvent, specifically substitution of acetone for methylene chloride.
- Development/refinement of cleaning procedures and protocols.
- Removal of toxic component from waste stream, thereby reducing volume of hazardous waste for disposal; specifically, onsite evaporation of waste water to concentrate and remove methylene chloride.
- Use of larger, more efficient production vessels reduced use of solvent for cleaning.
- Installation of dedicated process vessels eliminated the need to run full cleaning cycles between batches. Similarly, installation of dedicated lines and equipment in manufacturing operations reduced line flushing and spill clean-up.
- Recycling of solvent washes.
- Limiting number of blend unit wash-downs.
- Use of absorbent, versus washing down, to remediate spills; far less absorbent than rinse water needed to be used, to clean up a spill.
- Installation of storm water abatement controls in the catch basins and chemical blending areas.
- A change in manufacturing equipment and operating parameters reduced amount of carbon material generated while cleaning reactors. Specifically, maintenance on vapor phase reactors at a chlorpyridines plant required removal and disposal of carbon waste from cleaning the reactors. Carbon waste was reduced by: changing a reactor jet nozzle design, resulting in better mixing and reaction; better drying operations on picoline raw material, and changes in flow meters and control valves which helped to stabilize temperature variations.
- Ultrasonic cleaning technology eliminated the disposal of fouled vessel internals.
- Use of ultrasonic and X-ray thickness testing reduced required frequency of vessel testing; since the vessels had to be cleaned when tested, this reduced cleaning wastes.

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[18] California Waste Codes: 134 – aqueous solution with total organic residues < 10%; 212 – oxygenated solvents; 341 – organic liquids (nonsolvents with halogens); 343 – unspecified organic liquid mixture.

- Reduction in water used for process washdown and use of catch pans reduced quantity of waste aqueous solution.
- Reduced line cleaning/draining waste by using nitrogen to blow lines clear.
- Replaced a nitric acid storage tank that had been hard to empty, thereby generating a “tailings” waste, with a tank that could be readily emptied, thereby avoiding the generation of “tailings”.
- Tested solvent rinseate following cleaning between batches to determine if the equipment had been adequately cleaned, thereby keeping rinse cycles to a minimum.
- Extended process runs, thereby reducing the need to clean equipment.
- Reduction of solvent used to pre- and post- clean process tanks.
- Stopped cleaning sample containers after use.
- Implemented waste reduction measures at the wash sink, such as soaking and hand-wipe cleaning instead of spray cleaning.
- Implemented employee training in spill prevention, good housekeeping, and the minimization of water used in the cleaning processes.
- Used management forecasting and good engineering practices to determine if and when consecutive chemical batches can be manufactured, thus minimizing the number of line and equipment rinses.
- Transferred the Port-A-Feed® cleaning process to an off-site contractor.

Off-Specification Materials, Residual Raw Material/Product, and By-Products (generating primarily California Waste Codes 181, 214, 223, 741, 791[19]):

- Substituted less toxic raw material; for example, replacement of acetonitrile and methylene chloride with ethyl acetate and heptane in several process steps.
- Returned off-specification batches as raw material in manufacturing process. For example:
    - Returned off-size catalyst fines to manufacturing process.
    - Slurried off-specification methyl ester intermediate with n-methyl-2-pyrrolidone, to recycle it back into the methyl ester intermediate manufacturing process.
- Installation of additional draining racks to recover more material from containers, thereby reducing disposable residual.
- Use of dedicated 550 gallon intermediate bulk containers, which are returned to the supplier for multiple refills, to reduce disposal of residual material.
- Use of cone bottom field tanks for polymers, which allow circulation of product to keep it in solution, and thus reduce disposal of off-specification material.
- Inventory control. Reviewed specification for shelf-life and inventory stocking levels for raw materials.
- Varied batch sizes for various products, attempting to match product manufactured with product sold.

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[19] California Waste Codes: 181 – other inorganic solid waste; 214 – unspecified solvent mixture; 223 – unspecified oil-containing waste; 741 – liquids with halogenated organic compounds > or = 1000 mg/L; 791 – liquids with pH < or = 2.

- Reduced the number of batches required per year by updating manufacturing procedures and training operators to reduce batch failure, thereby reducing failed batches.
- Used new formula to produce catalyst.
- Reduced sample size.
- Tested all raw material solvents upon receipt to ensure they met specifications.

Housekeeping, including floor sweeping, spill clean-up, and plant washdown (generating primarily California Waste Codes 135, 181[20])

- Repaired equipment responsible for spills and implemented a regular preventive maintenance program.
- Used central vacuum system (as opposed to sweeping with a heavy sweeping compound) whenever practical.
- Profiled waste streams frequently to prevent managing non-hazardous waste as hazardous.

Distillation, reclamation and refining activities (generating primarily California Waste Codes 133, 223, 741, 751[21]):

- Implemented piping modifications and process design changes to recycle carbon tetrachloride distillation bottoms back to chlorpyridines plant, for product recovery.
- Coconut oil refining process dregs, which were hazardous because of their caustic content, were completely eliminated when the facility switched from caustic refining to physical refining, which used steam and a diatomaceous earth filter instead of caustic.

Empty containers, including bags, liners, and packaging (generating primarily California Waste Codes 141, 223, 511, 512, and 513[22]).

- Installation of vibratory-flat screens to replace de-dusting boxes reduced the number of contaminated liners from catalyst containers that had to be re-run through the de-dusting process.
- Replacement of smaller containers with larger containers, for example:
  - replaced 55-gallon raw material vanadium pentoxide drums with steel tote bins; this replaced 400-pound containers with 3,400 to 5,500-pound containers. This change eliminated the generation of contaminated container liners from the 55-gallon drums and reduced the generation of

[20] California Waste Codes: 135 – unspecified aqueous solution; 181 – other inorganic solid waste.
[21] California Waste Codes: 133 – aqueous solution with total organic residues 10% or more; 223 – unspecified oil-containing waste; 741 – liquids with halogenated organic compounds> or = 1000 mg/L; 751 – solids or sludges with halogenated organic compounds > or = 1000 mg/kg.
[22] California Waste Codes: 141 – Off-specification, aged, or surplus inorganics; 223 – unspecified oil-containing waste; 511 – empty pesticide containers 30 gallons or more; 512 – other empty containers 30 gallons or more; 513 – empty containers less than 30 gallons.

contaminated personal protective equipment, which had to be worn when emptying the drums.
- ♦ ordered liquid chemical raw materials in returnable tote containers;
- ♦ ordered dry materials in larger bags.

Spent materials (generating primarily California Waste Codes 162, 214, and 741[23]):

- ➢ Worked with manufacturer to create more reactive catalyst, which reduced the catalyst change-out during a hydrogenation process.
- ➢ Onsite recycling. For example, use of waste quench acid as a raw material at a sulfuric acid manufacturing facility.

Overall, administrative measures that affect all waste-generating activities:

- ➢ Enhanced waste minimization training.
- ➢ Refinement of a "management of change" process to provide a detailed, standardized format for writing up proposed projects or changes. The "management of change" process, initiated earlier than the 1994-1998 reporting cycle, required that any proposed project or changes had to be written up by the initiator of the idea and then reviewed by in-plant staff, including production and maintenance technicians; subsequently the initiator had to address any concerns raised by the reviewers, before the proposed change could take place.
- ➢ Implementation of a "Formalized Process Improvement Effort), consisting of regular meetings with representatives from each department, namely Production, Maintenance, Engineering and Environmental Safety and Health, to improve cross-functional communication.
- ➢ Preventive and predictive maintenance system, consisting of:
  - ♦ a formalized maintenance work order system
  - ♦ the installation of meters on major machinery to document the hours of operation of a particular machine after it had been repaired, to develop a maintenance history;
  - ♦ updating information and manuals for each piece of equipment;
  - ♦ setting up a repair history file for each machine.
- ➢ Visual workplace effort provides a visual means for technicians and mechanics to identify and promptly correct deviations in an operation; for example, color-coding of metal pipes to identify the material transported.
- ➢ On the assumption that higher than expected waste generation is associated with poor operation performance, a facility implemented a gain-sharing program for all plant employees when operation and safety goals are met.
- ➢ Implemented an in-plant recognition program for employees that take actions to reduce wastes and water disposal costs.

[23] California Waste Codes: 162 – other spent catalyst; 214 – unspecified solvent mixture; 741 – liquids with halogenated organic compounds > or = 1000 mg/kg.

6. GREEN CHEMISTRY

The obstacle to source reduction most often cited in the SB 14 documents reviewed was that corporate headquarters standards and customer specifications prevented any product reformulation or raw material substitution that would enable the use of less toxic materials. These are legitimate obstacles, in that the facilities we reviewed have little control over such factors. In order to reduce or eliminate hazardous constituents in a product, the corporate parent company and customers, with encouragement and assistance from government, must be willing to invest research resources in pollution prevention solutions. This kind of effort is now being promoted through government-industry-community partnerships around the world. To see how the chemical industry is involved in such efforts, we looked at several programs designed to promote a common pollution prevention goal.

A voluntary industry program that is directly relevant to the facilities we reviewed, and of which we saw only one mention in their SB 14 documents, is the "Responsible Care" program. Born in Canada in 1987 and adopted by the American Chemistry Council the following year, this program has now spread globally. The guiding principles of the program include:

- seeking and incorporating public input regarding products and operations;
- providing chemicals that can be manufactured, transported, used and disposed of safely;
- making health, safety, the environment and resource conservation critical considerations for all new and existing products and processes; and
- providing information on health or environmental risks and pursuing protective measures for employees, the public and other key stakeholders.

As a condition of membership, the program requires:

- a Responsible Care Management System
- an independent third party certification of the management system;
- tracking and publicly reporting performance based on economic, environmental, health and safety, societal and product-related metrics; and
- a security code that helps protect people, property, products, processes, information and information systems.

While facilities that must meet corporate and customer-driven specifications may not have ultimate control over the materials they use, they can, nonetheless, through an effective "Responsible Care" program, demonstrate a good-faith effort in considering health, safety, the environment and resource conservation as critical factors in their manufacturing processes, and set an example for corporate and customer product standards through the pursuit of pollution prevention strategies.

In 1991, U.S. EPA's Office of Pollution Prevention and Technology Development launched what has become known as the Green Chemistry Program. Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. The U.S. EPA's program promotes the research, development, and implementation of innovative chemical technologies that result in pollution prevention, through voluntary partnerships with academia, industry, other government agencies, and non-government organizations.[24]

A specific example of a government-industry-community partnership is the successful 33/50 voluntary program established by the U.S. EPA in 1988 for participating companies to reduce releases and transfers of 17 targeted chemicals, as reported to the Toxics Release Inventory (TRI), by 50 percent by 1995. The goal was actually reached in 1994. Furthermore, reductions for 33/50 chemicals continued at a higher rate than for other TRI chemicals even after the program ended.[25] For more information, go to: http://www.epa.gov/opptintr/3350/.

Another voluntary program addresses the lack of information about many chemicals currently being used today. This is commonly known as the “high production volume” (HPV) chemicals program. The U.S. EPA reported that, of the 3,000 chemicals that the United States imports or produces at over one million pounds per year, 43 percent of these high production volume chemicals have no testing data on basic toxicity and only 7 percent have a full set of basic data.[26] In 1999, the U.S. EPA challenged the American chemical industry, through the American Chemistry Council, to produce screening level data on 2,800 high production volume chemicals. We noted approximately 260 submissions of data posted on EPA’s website as we finalized this report.

The U.S. EPA has also established an agency-wide system, which involves industry and the public, for the management of persistent bioaccumulative and toxic (PBT) substances. This system has the following goals:

- preventing the introduction of new PBTs into commerce that may pose an unreasonable risk to human health and the environment, and requiring testing to confirm a chemical's PBT status
- encouraging voluntary reductions of priority PBTs in hazardous waste. The U.S. EPA's Office of Solid Waste has challenged industry to voluntarily target priority PBTs found in hazardous waste for waste minimization activities.
- increasing the public's right-to-know about local sources of PBT emissions by lowering TRI reporting thresholds for PBTs
- setting precautionary guidelines for chemical manufacturers to avoid bringing new PBTs to market
- establishing internet-based tools to assess chemicals for their potential persistence and capacity to bioaccumulate[27]

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[24] U.S. Environmental Protection Agency, Green Chemistry, at http://www.epa.gov/opptintr/greenchemistry/
[25] U.S. Environmental Protection Agency, *33/50 Program, The Final Record*, EPA-745-R-99-004, March 1999
[26] U.S. Environmental Protection Agency, High Production Volume (HPV) Challenge Program, at http://www.epa.gov./chemrtk/hazchem.htm
[27] Sources: U.S. Environmental Protection Agency, *Persistent Bioaccumulative and Toxic (PBT) Chemical Program Fact Sheet,* at http://www.epa.gov/pbt/fact.htm, and Lowell Center for Sustainable Production, “Precautionary Chemicals Policy Initiatives in the United States” at http://www.chemicalspolicy.org

The European Union, the world's largest chemical producer,[28] has been pursuing similar proactive objectives to ensure better health information and regulation of chemicals. On February 13, 2001, the European Union released a "white paper", announcing a strategy for a future Community Policy for Chemicals. "The main objective of the new Chemical Strategy," a press release reads, "is to ensure a high level of protection for human health and the environment, while ensuring the efficient functioning of the internal market and stimulating innovation and competitiveness in the chemical industry."[29] This relatively new policy emphasizes the Registration, Evaluation and Authorization of Chemicals (REACH), and specifically envisions:

- making industry responsible for chemicals testing, to provide information and evaluate risk;
- extending responsibility for testing and management throughout the entire manufacturing chain;
- substituting less toxic substances for those of high concern;
- fostering innovative research into safer chemicals; and
- minimizing animal testing. [30]

It is not within the scope of this assessment to evaluate the merits or results of the programs discussed above. Without a look at such government-industry-community efforts, however, an overview of source reduction possibilities within the chemical industry is incomplete.

[28] Lowell Center for Sustainable Production, University of Massachusetts Lowell: "Integrated Chemicals Policy – Seeking New Direction in Chemicals Management", page 10. This document reports that the EU's chemical industry represents about 28 percent of worldwide chemical output and is the third largest industry in Europe. Source: http://www.chemicalspolicy.org/downloads/ChemPolicyBrochure.pdf

[29] EU Institutions: http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/01/201|0|RAPID&lg=EN

[30] Lowell Center for Sustainable Production, University of Massachusetts Lowell: "Integrated Chemicals Policy – Seeking New Direction in Chemicals Management". Source: www.chemicalspolicy.org

APPENDIX A
Hazardous Waste Source Reduction Law

Article 11.9. Hazardous Waste Source Reduction and Management Review Act of 1989
(Article 11.9 added by Stats. 1989, Chapter 1218, Section 1.)

25244.12. This article shall be known and may be cited as the Hazardous Waste Source Reduction and Management Review Act of 1989.
(Added by Stats. 1989, Chapter 1218, Section 1.)

25244.13. The Legislature finds and declares as follows:

(a) Existing law requires the department and the State Water Resources Control Board to promote the reduction of generated hazardous waste. This policy, in combination with hazardous waste land disposal bans, requires the rapid development of new programs and incentives for achieving the goal of optimal minimization of the generation of hazardous wastes. Substantial improvements and additions to the state's hazardous waste reduction program are required to be made if these goals are to be achieved.

(b) Hazardous waste source reduction provides substantial benefits to the state's economy by maximizing use of materials, avoiding generation of waste materials, improving business efficiency, enhancing revenues of companies that provide products and services in the state, increasing the economic competitiveness of businesses located in the state, and protecting the state's precious and valuable natural resources.

(c) It is the intent of the Legislature to expand the state's hazardous waste source reduction activities beyond those directly associated with source reduction evaluation reviews and plans. The expanded program, which is intended to accelerate reduction in hazardous waste generation, shall include programs to promote implementation of source reduction measures using education, outreach, and other effective voluntary techniques demonstrated in California or other states.

(d) It is the intent of the Legislature for the department to maximize the use of its available resources in implementing the expanded source reduction program through cooperation with other entities, including, but not limited to, CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs. To the extent feasible, the department shall utilize cooperative programs with entities that routinely contact small business to expand its support of small business source reduction activities.

(e) It is the goal of this article to do all of the following:

(1) Reduce the generation of hazardous waste.

(2) Reduce the release into the environment of chemical contaminants which have adverse and serious health or environmental effects.

(3) Document hazardous waste management information and make that information available to state and local government.

(f) It is the intent of this article to promote the reduction of hazardous waste at its source, and wherever source reduction is not feasible or practicable, to encourage recycling. Where it is not feasible to reduce or recycle hazardous waste, the waste should be treated in an environmentally safe manner to minimize the present and future threat to health and the environment.

(g) It is the intent of the Legislature not to preclude the regulation of environmentally harmful releases to all media, including air, land, surface water, and groundwater, and to encourage and promote the reduction of these releases to air, land, surface water, and groundwater.

(h) It is the intent of the Legislature to encourage all state departments and agencies, especially the State Water Resources Control Board, the California regional water quality control boards, the State Air Resources Board, the air pollution control districts, and the air quality management districts, to promote the reduction of environmentally harmful releases to all media.

(Amended by Stats. 1998, Chapter 881, Section 5. Effective January 1, 1999.)

25244.14. For purposes of this article, the following definitions apply:

(a) "Advisory committee" means the California Source Reduction Advisory Committee established pursuant to Section 25244.15.1.

(b) "Appropriate local agency" means a county, city, or regional association that has adopted a hazardous waste management plan pursuant to Article 3.5 (commencing with Section 25135).

(c) "Hazardous waste management approaches" means approaches, methods, and techniques of managing the generation and handling of hazardous waste, including source reduction, recycling, and the treatment of hazardous waste.

(d) "Hazardous waste management performance report" or "report" means the report required by subdivision (b) of Section 25244.20 to document and evaluate the results of hazardous waste management practices.

(e) (1) "Source reduction" means one of the following:

(A) Any action that causes a net reduction in the generation of hazardous waste.

(B) Any action taken before the hazardous waste is generated that results in a lessening of the properties which cause it to be classified as a hazardous waste.

(2) "Source reduction" includes, but is not limited to, all of the following:

(A) "Input change," which means a change in raw materials or feedstocks used in a production process or operation so as to reduce, avoid, or eliminate the generation of hazardous waste.

(B) "Operational improvement," which means improved site management so as to reduce, avoid, or eliminate the generation of hazardous waste.

(C) "Production process change," which means a change in a process, method, or technique which is used to produce a product or a desired result, including the return of materials or their components, for reuse within the existing processes or operations, so as to reduce, avoid, or eliminate the generation of hazardous waste.

(D) "Product reformulation," which means changes in design, composition, or specifications of end products, including product substitution, so as to reduce, avoid, or eliminate the generation of hazardous waste.

(3) "Source reduction" does not include any of the following:

(A) Actions taken after a hazardous waste is generated.

(B) Actions that merely concentrate the constituents of a hazardous waste to reduce its volume or that dilute the hazardous waste to reduce its hazardous characteristics.

(C) Actions that merely shift hazardous wastes from one environmental medium to another environmental medium.

(D) Treatment.

(f) "Source reduction evaluation review and plan" or "review and plan" means a review conducted by the generator of the processes, operations, and procedures in use at a generator's site, in accordance with the format established by the department pursuant to subdivision (a) of Section 25244.16, and that does both of the following:

(1) Determines any alternatives to, or modifications of, the generator's processes, operations, and procedures that may be implemented to reduce the amount of hazardous waste generated.

(2) Includes a plan to document and implement source reduction measures for the hazardous wastes specified in paragraph (1) that are technically feasible and economically practicable for the generator, including a reasonable implementation schedule.

(g) "SIC Code" has the same meaning as defined in Section 25501.

(h) "Hazardous waste," "person," "recycle," and "treatment" have the same meaning as defined in Article 2 (commencing with Section 25110).

(Amended by Stats. 1998, Chapter 881, Section 6. Effective January 1, 1999.)

25244.15. (a) The department shall establish a program for hazardous waste source reduction pursuant to this article.

(b) The department shall coordinate the activities of all state agencies with responsibilities and duties relating to hazardous waste and shall promote coordinated efforts to encourage the reduction of hazardous waste. Coordination between the program and other relevant state agencies and programs shall, to the fullest extent possible, include joint planning processes and joint research and studies.

(c) The department shall adopt regulations to carry out this article.

(d) (1) Except as provided in paragraph (3), this article applies only to generators who, by site, routinely generate, through ongoing processes and operations, more than 12,000 kilograms of hazardous waste in a calendar year, or more than 12 kilograms of extremely hazardous waste in a calendar year.

(2) The department shall adopt regulations to establish procedures for exempting generators from the requirements of this article where the department determines that no source reduction opportunities exist for the generator.

(3) Notwithstanding paragraph (1), this article does not apply to any generator whose hazardous waste generating activity consists solely of receiving offsite hazardous wastes and generating residuals from the processing of those hazardous wastes.

(Amended by Stats. 2000, Chapter 343, Section 13.5. Effective January 1, 2001.)

25244.15.1. (a) The California Source Reduction Advisory Committee is hereby created and consists of the following members:

(1) The Executive Director of the State Air Resources Board, as an ex officio member.

(2) The Executive Director of the State Water Resources Control Board, as an ex officio member.

(3) The Director of Toxic Substances Control, as an ex officio member.

(4) The Executive Director of the Integrated Waste Management Board, as an ex officio member.

(5) The Chairperson of the California Environmental Policy Council established pursuant to Section 71017 of the Public Resources Code, as an ex officio member.

(6) Ten public members with experience in source reduction as appointed by the department. These public members shall include all of the following:

(A) Two representatives of local governments from different regions of the state.

(B) One representative of a publicly owned treatment works.

(C) Two representatives of industry.

(D) One representative of small business.

(E) One representative of organized labor.

(F) Two representatives of statewide environmental advocacy organizations.

(G) One representative of a statewide public health advocacy organization.

(7) The department may appoint up to two additional public members with experience in source reduction and detailed knowledge of one of the priority categories of generators selected in accordance with Section 25244.17.1.

(b) The advisory committee shall select one member to serve as chairperson.

(c) The members of the advisory committee shall serve without compensation, but each member, other than officials of the state, shall be reimbursed for all reasonable expenses incurred in the performance of his or her duties, as authorized by the department.

(d) The advisory committee shall meet at least semiannually to provide a public forum for discussion and deliberation on matters pertaining to the implementation of this chapter.

(e) The advisory committee's responsibilities shall include, but not be limited to, the following:

(1) Reviewing and providing consultation and guidance in the preparation of the work plan required by Section 25244.22.

(2) Evaluating the performance and progress of the department's source reduction program.

(3) Making recommendations to the department concerning program activities and funding priorities, and legislative changes, if needed.

(f) The advisory committee established by this section shall be in existence until April 15, 2002, by which date the department shall, in consultation with the advisory committee, evaluate the role and activities of the advisory committee and determine if the committee is beneficial to the implementation of this article. On and after April 15, 2002, the advisory committee shall continue to exist and operate to the extent that the department, in consultation with the advisory committee, determines the advisory committee continues to be beneficial to the operation of the department's source reduction programs.

(Added by Stats. 1998, Chapter 881, Section 7. Effective January 1, 1999.)

25244.16. The department shall do both of the following:

(a) Adopt a format to be used by generators for completing the review and plan required by Section 25244.19, and the report required by Section 25244.20. The format shall include at least all of the factors the generator is required to include in the review and plan and the report. The department may include any other factor determined by the department to be necessary to carry out this article. The adoption of a format pursuant to this subdivision is not subject to Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

(b) Establish a data and information system to be used by the department for developing the categories of generators specified in Section 25244.18, and for processing and evaluating the source reduction and other hazardous waste management information submitted by generators pursuant to Section 25244.18. In establishing the data and information system, the department shall do all of the following:

(1) Establish methods and procedures for appropriately processing or managing hazardous waste source reduction and management information.

(2) Use the data management expertise, resources, and forms of already established environmental protection programs, to the extent practicable.

(3) Establish computerized data retrieval and data processing systems, including safeguards to protect trade secrets designated pursuant to Section 25244.23.

(4) Identify additional data and information needs of the program.

(Amended by Stats. 1997, Chapter 520, Section 3. Effective January 1, 1998.)

25244.17. The department shall establish a technical and research assistance program to assist generators in identifying and applying methods of source reduction and other hazardous waste management approaches. The program shall emphasize assistance to smaller businesses that have inadequate technical and financial resources for obtaining information, assessing source reduction methods, and developing and applying source reduction techniques. The program shall include at least all of the following elements, which shall be carried out by the department:

(a) The department shall encourage programs by private or public consultants, including onsite consultation at sites or locations where hazardous waste is generated, to aid those generators requiring assistance in developing and implementing the review and plan, the plan summary, the report, and the report summary required by this article.

(b) The department shall conduct review and plan assistance programs, seminars, workshops, training programs, and other similar activities to assist generators to evaluate source reduction alternatives and to identify opportunities for source reduction.

(c) The department shall establish a program to assemble, catalogue, and disseminate information about hazardous waste source reduction methods, available consultant services, and regulatory requirements.

(d) The department shall identify the range of generic and specific technical solutions that can be applied by particular types of hazardous waste generators to reduce hazardous waste generation.

(Added by Stats. 1989, Chapter 1218, Section 1.)

25244.17.1. The department shall establish a technical assistance and outreach program to promote implementation of model source reduction measures in priority industry categories.

(a) Every two years, in the work plan required by Section 25244.22, the department shall, in consultation with the advisory committee, select at least two priority categories of generators by SIC Code. At least one selected category of generators shall be taken from the list of categories previously selected by the department under Section 25244.18. At least one selected category of generators shall be a category that consists primarily of small businesses.

(b) For each selected priority industry category, the department shall implement a cooperative source reduction technical assistance and outreach program to include the following elements:

(1) The department shall use available resources, including reports prepared pursuant to paragraph (4) of subdivision (a) of Section 25244.18 and information on source reduction methods from federal, state, and local governments and industry associations and industry members, to identify a set of model source reduction measures for each industry category.

(2) The department shall determine, with the assistance of the advisory committee, the most effective technical assistance and outreach methods to promote implementation of the model source reduction measures identified in paragraph (1).

(3) The department shall develop a plan and schedule to implement the technical assistance and outreach measures before the next biennial work plan. The measures may include, but are not limited to, all of the following:

(A) Holding, presenting at, or cosponsoring workshops, conferences, technology fairs, and other promotional events.

(B) Developing and distributing educational materials, such as short descriptions of successful source reduction projects.

(C) Developing checklists, training manuals, technical resource manuals and using those resources to train CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs.

(D) Preparing and distributing resource lists, such as lists of vendors, consultants, or providers of financial assistance for source reduction projects.

(E) Serving as an information clearinghouse to support telephone and onsite consultations with businesses and local governments.

(4) For industry categories that include primarily large or technically complex businesses, the source reduction technical assistance and outreach program shall emphasize activities that involve direct communication between department staff and industry members. For these industry categories, the department shall communicate with representatives of 80 percent of the state's companies in the category. For categories that consist primarily of small businesses, the cooperative source reduction program shall emphasize providing industry-specific training and resources to CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs for use in their inspections and other direct communications with businesses.

(c) While conducting activities under this section, the department shall coordinate its activities with appropriate industry and professional associations.

(d) The department shall coordinate activities under this section with grants made under Sections 25244.5 and 25244.11.5.

(Added by Stats. 1998, Chapter 881, Section 8. Effective January 1, 1999.)

25244.17.2. The department shall expand the department's source reduction program to provide source reduction training and resources to CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs so that they can provide technical assistance to generators in identifying and applying methods of source reduction.

(a) The program expanded pursuant to this section shall emphasize activities necessary to implement Sections 25244.17 and 25244.17.1.

(b) The department shall determine, in consultation with the advisory committee, the most effective methods to promote implementation of source reduction education programs by CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs. Program elements may include, but are not limited to, all of the following:

(1) Sponsoring workshops, conferences, technology fairs, and other training events.

(2) Sponsoring regional training groups, such as the regional hazardous waste reduction committees.

(3) Developing and distributing educational materials, such as short descriptions of successful source reduction projects and materials explaining how source reduction has been used by businesses to achieve compliance with environmental laws enforced by local governments.

(4) Developing site review checklists, training manuals, and technical resource manuals and using those resources to train CUPAs, small business development corporations, business environmental assistance centers, and other regional and local government environmental programs.

(5) Preparing and distributing resource lists such as lists of vendors, consultants, or providers of financial assistance for source reduction projects.

(6) Serving as an information clearinghouse to support telephone and onsite consultants with local governments.

(c) The department shall coordinate activities under this section with grants made under Section 25244.11.5.

(d) Each fiscal year, the department shall provide training and information resources to at least 90 percent of CUPAs.

(Added by Stats. 1998, Chapter 881, Section 9. Effective January 1, 1999.)

25244.18. (a) On or before September 15, 1991, and every two years thereafter, the department shall select at least two categories of generators by SIC Code with potential for source reduction, and, for each category, shall do all of the following:

(1) Request that selected generators in the category provide the department, on a timely basis, with a copy of the generator's completed review and plan and with a copy of the generator's completed report.

(2) Examine the review and plan and the report of selected generators in the category.

(3) Ensure that the selected generators in that category comply with Sections 25244.19 and 25244.20.

(4) Identify successful source reduction and other hazardous waste management approaches employed by generators in the category and disseminate information concerning those approaches to generators within the category.

(b) In carrying out subdivision (a), the department shall not disseminate information determined to be a trade secret pursuant to Section 25244.23.

(c) The department or the unified program agency may request from any generator, and the generator shall provide within 30 days from the date of the request, a copy of the generator's review and plan or report. The department or the unified program agency may evaluate any of those documents submitted to the department or the unified program agency to determine whether it satisfies the requirements of this article.

(d) (1) If the department or the unified program agency determines that a generator has not completed the review and plan in the manner required by Section 25244.19, or the report in the manner required by Section 25244.20, the department or the unified program agency shall provide the generator with a notice of noncompliance, specifying the deficiencies in the review and plan or report identified by the department. If the department or the unified program agency finds that the review and plan does not comply with Section 25244.19, the department or the unified program agency shall consider the review and plan to be incomplete. A generator shall file a revised review and plan or report correcting the deficiencies identified by the department or the unified program agency within 60 days from the date of the receipt of the notice. The department or the unified program agency may grant, in response to a written request from the generator, an extension of the 60-day deadline, for cause, except that the department or the unified program agency shall not grant that extension for more than an additional 60 days.

(2) If a generator fails to submit a revised review and plan or report complying with the requirements of this article within the required period, or if the department or unified program agency determines that a generator has failed to implement the measures included in the generator's review and plan for reducing the generator's hazardous waste, in accordance with Section 25244.19, the department or the unified program agency may impose civil penalties pursuant to Section 25187, in an amount not to exceed one thousand dollars ($1,000) for each day the violation of this article continues, notwithstanding Section 25189.2, seek an order directing compliance pursuant to Section 25181, or enter into a consent agreement or a compliance schedule with the generator.

(e) If a generator fails to implement a measure specified in the review and plan pursuant to paragraph (5) of subdivision (b) of Section 25244.19, the generator shall not be deemed to be in violation of Section 25244.19 for not implementing the selected measure if the generator does both of the following:

(1) The generator finds that, upon further analysis or as a result of unexpected consequences, the selected measure is not technically feasible or economically practicable, or if the selected approach has resulted in any of the following:

(A) An increase in the generation of hazardous waste.

(B) An increase in the release of hazardous chemical contaminants to other media.

(C) Adverse impacts on product quality.

(D) A significant increase in the risk of an adverse impact to human health or the environment.

(2) The generator revises the review and plan to comply with the requirements of Section 25244.19.

(f) When taking enforcement action pursuant to this article, the department or the unified program agency shall not judge the appropriateness of any decisions or proposed measures contained in a review and plan or report, but shall only determine whether the review and plan or report is complete, prepared, and implemented in accordance with this article.

(g) In addition to the unified program agency, an appropriate local agency that has jurisdiction over a generator's site may request from the generator, and the generator shall provide within 30 days from the date of that request, a copy of the generator's current review and plan and report.

(Amended by Stats. 1997, Chapter 520, Section 4. Effective January 1, 1998.)

25244.19. (a) On or before September 1, 1991, and every four years thereafter, each generator shall conduct a source reduction evaluation review and plan pursuant to subdivision (b).

(b) Except as provided in subdivision (c), the source reduction evaluation review and plan required by subdivision (a) shall be conducted and completed for each site pursuant to the format adopted pursuant to subdivision (a) of Section 25244.16 and shall include, at a minimum, all of the following:

(1) The name and location of the site.

(2) The SIC Code of the site.

(3) Identification of all routinely generated hazardous waste streams that annually weigh 600 kilograms or more and that result from ongoing processes or operations and exceed five percent of the total yearly weight of hazardous waste generated at the site, or, for extremely hazardous waste, that annually weigh 0.6 kilograms or more and exceed five percent of the total yearly weight of extremely hazardous waste generated at the site. For purposes of this paragraph, a hazardous waste stream identified pursuant to this paragraph shall also meet one of the following criteria:

(A) It is a hazardous waste stream processed in a wastewater treatment unit that discharges to a publicly owned treatment works or under a national pollutant discharge elimination system (NPDES) permit, as specified in the Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 and following).

(B) It is a hazardous waste stream that is not processed in a wastewater treatment unit and its weight exceeds five percent of the weight of the total yearly volume at the site, less the weight of any hazardous waste stream identified in subparagraph (A).

(4) For each hazardous waste stream identified in paragraph (3), the review and plan shall include all of the following information:

(A) An estimate of the quantity of hazardous waste generated.

(B) An evaluation of source reduction approaches available to the generator that are potentially viable. The evaluation shall consider at least all of the following source reduction approaches:

(i) Input change.

(ii) Operational improvement.

(iii) Production process change.

(iv) Product reformulation.

(5) A specification of, and a rationale for, the technically feasible and economically practicable source reduction measures that will be taken by the generator with respect to each hazardous waste stream identified in paragraph (3). The review and plan shall fully document any statement explaining the generator's rationale for rejecting any available source reduction approach identified in paragraph (4).

(6) An evaluation, and, to the extent practicable, a quantification, of the effects of the chosen source reduction method on emissions and discharges to air, water, or land.

(7) A timetable for making reasonable and measurable progress towards implementation of the selected source reduction measures specified in paragraph (5).

(8) Certification pursuant to subdivision (d).

(9) Any generator subject to this article shall include in its source reduction evaluation review and plan four-year numerical goals for reducing the generation of hazardous waste streams through the approaches provided for in subparagraph (B) of paragraph (4), based upon its best estimate of what is achievable in that four-year period.

(10) A summary progress report that briefly summarizes and, to the extent practicable, quantifies, in a manner that is understandable to the general public, the results of implementing the source reduction methods identified in the generator's review and plan for each waste stream addressed by the previous plan over the previous four years. The report shall also include an estimate of the amount of reduction that the generator anticipates will be achieved by the implementation of source reduction methods during the period between the preparation of the review and plan and the preparation of the generator's next review and plan. Notwithstanding any other provision of this section, the summary progress report required to be prepared pursuant to this paragraph shall be submitted to the department on or before September 1, 1999, and every four years thereafter.

(c) If a generator owns or operates multiple sites with similar processes, operations, and waste streams, the generator may prepare a single multisite review and plan addressing all of these sites.

(d) Every review and plan conducted pursuant to this section shall be submitted by the generator for review and certification by an engineer who is registered as a professional engineer pursuant to Section 6762 of the Business and Professions Code and who has demonstrated expertise in hazardous waste management, by an individual who is responsible for the processes and operations of the site, or by an environmental assessor who is registered pursuant to Section 25570.3 and who has demonstrated expertise in hazardous waste management. The engineer, individual, or environmental assessor shall certify the review and plan only if the review and plan meet all of the following requirements:

(1) The review and plan addresses each hazardous waste stream identified pursuant to paragraph (3) of subdivision (b).

(2) The review and plan addresses the source reduction approaches specified in subparagraph (B) of paragraph (4) of subdivision (b).

(3) The review and plan clearly sets forth the measures to be taken with respect to each hazardous waste stream for which source reduction has been found to be technically feasible and economically practicable, with timetables for making reasonable and measurable progress, and properly documents the rationale for rejecting available source reduction measures.

(4) The review and plan does not merely shift hazardous waste from one environmental medium to another environmental medium by increasing emissions or discharges to air, water, or land.

(e) At the time a review and plan is submitted to the department or the unified program agency, the generator shall certify that the generator has implemented, is implementing, or will be implementing, the source reduction measures identified in the review and plan in accordance with the implementation schedule contained in the review and plan. A generator may determine not to implement a measure selected in paragraph (5) of subdivision (b) only if the generator determines, upon conducting further analysis or due to unexpected circumstances, that the selected measure is not technically feasible or economically practicable, or if attempts to implement that measure reveal that the measure would result in, or has resulted in, any of the following:

(1) An increase in the generation of hazardous waste.

(2) An increase in the release of hazardous chemicals to other environmental media.

(3) Adverse impacts on product quality.

(4) A significant increase in the risk of an adverse impact to human health or the environment.

(f) If the generator elects not to implement the review and plan, including, but not limited to, a selected measure pursuant to subdivision (e), the generator shall amend its review and plan to reflect that election and include in the review and plan proper documentation identifying the rationale for that election.

(Amended by Stats. 2000, Chapter 343, Section 14. Effective January 1, 2001.)

25244.20. (a) On or before September 1, 1991, and every four years thereafter, each generator shall prepare a hazardous waste management performance report documenting hazardous waste management approaches implemented by the generator.

(b) Except as provided in subdivision (d), the hazardous waste management performance report required by subdivision (a) shall be prepared for each site in accordance with the format adopted pursuant to subdivision (a) of Section 25244.16 and shall include all of the following:

(1) The name and location of the site.

(2) The SIC Code for the site.

(3) All of the following information for each waste stream identified pursuant to paragraph (3) of subdivision (b) of Section 25244.19:

(A) An estimate of the quantity of hazardous waste generated and the quantity of hazardous waste managed, both onsite and offsite, during the current reporting year and the baseline year, as specified in subdivision (c).

(B) An abstract for each source reduction, recycling, or treatment technology implemented from the baseline year through the current reporting year, if the reporting year is different from the baseline year.

(C) A description of factors during the current reporting year that have affected hazardous waste generation and onsite and offsite hazardous waste management since the baseline year, including, but not limited to, any of the following:

(i) Changes in business activity.

(ii) Changes in waste classification.

(iii) Natural phenomena.

(iv) Other factors that have affected either the quantity of hazardous waste generated or onsite and offsite hazardous waste management requirements.

(4) The certification of the report pursuant to subdivision (e).

(c) For purposes of subdivision (b), the following definitions apply:

(1) The current reporting year is the calendar year immediately preceding the year in which the report is to be prepared.

(2) The baseline year is either of the following, whichever is applicable:

(A) For the initial report, the baseline year is the calendar year selected by the generator for which substantial hazardous waste generation, or onsite or offsite management, data is available prior to 1991.

(B) For all subsequent reports, the baseline year is the current reporting year of the immediately preceding report.

(d) If a generator owns or operates multiple sites with similar processes, operations, and waste streams, the generator may prepare a single multisite report addressing all of these sites.

(e) Every report completed pursuant to this section shall be submitted by the generator for review and certification by an engineer who is registered as a professional engineer pursuant to Section 6762 of the Business and Professions Code and who has demonstrated expertise in hazardous waste management, by an individual who is responsible for the processes and operations of the site, or by an environmental assessor who is registered pursuant to Section 25570.3 and who has demonstrated expertise in hazardous waste management. The engineer, individual, or environmental assessor shall certify the report only if the report identifies factors that affect the generation and onsite and offsite management of hazardous wastes and summarizes the effect of those factors on the generation and onsite and offsite management of hazardous wastes.

(Amended by Stats. 2000, Chapter 343, Section 15. Effective January 1, 2001.)

25244.21. (a) Every generator shall retain the original of the current review and plan and report, shall maintain a copy of the current review and plan and report at each site, or, for a multisite review and plan or report, at a central location, and upon request, shall make it available to any authorized representative of the department or the unified program agency conducting an inspection pursuant to Section 25185. If a generator fails, within five days, to make available to the inspector the review and plan or report, the department, the unified program agency, or any authorized representative of the department, or of the unified program agency, conducting an inspection pursuant to Section 25185, shall, if appropriate, impose a civil penalty pursuant to Section 25187, in an amount not to exceed one thousand dollars ($1,000) for each day the violation of this article continues, notwithstanding Section 25189.2.

(b) If a generator fails to respond to a request for a copy of its review and plan or report made by the department or a unified program agency pursuant to subdivision (c) of Section 25244.18, or by a local agency pursuant to subdivision (g) of Section 25244.18, within 30 days from the date of the request, the department or unified program agency shall, if appropriate, assess a civil penalty pursuant to Section 25187, in an amount not to exceed one thousand dollars ($1,000) for each day the violation of this article continues, notwithstanding Section 25189.2.

(c) (1) Any person may request the department to certify that a generator is in compliance with this article by having the department certify that the generator has properly completed the review and plan and report required pursuant to Sections 25244.19 and 25244.20. The department shall respond within 60 days to a request for certification. Upon receiving a request for certification, the department shall request from the generator, who is the subject of the request, a copy of the generator's review and plan and report, pursuant to subdivision (c) of Section 25244.19, if the department does not have these documents. The department shall forward a copy of the review and plan and report to the person requesting certification, within 10 days from the date that the department receives the request for certification or receives the review and plan and report, whichever is later. The department shall protect trade secrets in accordance with Section 25244.23 in a review and plan or report, requested to be released pursuant to this subdivision.

(2) This subdivision does not prohibit any person from directly requesting from a generator a copy of the review and plan or report. Solely for the purposes of responding to a request pursuant to this subdivision, the department shall deem the review and plan or report to be a public record subject to Section 25152.5, and shall act in compliance with that section.

(Amended by Stats. 1997, Chapter 520, Section 7. Effective January 1, 1998.)

25244.22. Commencing May 1, 2000, and on or before January 15 of every other year thereafter, the department shall prepare, and make available for public review within five days thereafter, a draft work plan for the department's operations and activities in carrying out this article. The department shall prepare the work plan in consultation with the advisory committee and with other interested parties, including local government, industry, labor, health, and environmental organizations. After holding a public meeting of the advisory committee to discuss the draft work plan, the department shall finalize the work plan on or before June 15, 2000, and on or before April 1 of every other year thereafter. The department may include this work plan within the report required pursuant to Section 25171. This work plan shall include, but not be limited to, all of the following information:

(a) A summary analysis of readily available data on the state's hazardous waste generation and management patterns. The analysis shall include information from various data sources including hazardous waste manifests, biennial generator reports, and United States Environmental Protection Agency Toxics Release Inventory reports. The department shall estimate the quantities of hazardous waste generated in the state, by hazardous waste stream, the amounts of hazardous waste generated in the state by industry SIC Code, and the amounts of hazardous waste state generators sent offsite for management, by management method.

(b) An evaluation of hazardous waste source reduction progress in this state, using the data summary analysis prepared pursuant to subdivision (a).

(c) Recommendations for legislation.

(d) Identification of any state, federal, or private economic and financial incentives that can best accelerate and maximize the research and development of source reduction and other hazardous waste management technologies and approaches.

(e) The status, funding, and results of all research projects.

(f) A detailed summary of the extent to which the statewide goal of 5 percent per year reduction of the generation of hazardous wastes, pursuant to subdivision (e) of Section 25244.15, has been attained, and a detailed summary of the extent to which different categories of facilities have attained the numerical goals established pursuant to paragraph (9) of subdivision (b) of Section 25244.19. This summary, which shall use the data summary analysis prepared pursuant to subdivision (a), shall include an evaluation by the department of the reasons why these goals have or have not been attained, including an evaluation of the impact of economic growth or decline and changes in production patterns, and a list of appropriate recommendations designed to ensure attainment of these goals.

(g) An outline of the department's operations and activities under this article proposed for the next two-year period. The department shall use the data summary analysis prepared pursuant to subdivision (a) to select hazardous waste stream and industries for source reduction efforts. When identifying activities for inclusion in the work plan, the department shall also consider potential benefits to human health and the environment, available resources, feasibility of applying source reduction techniques to reduce selected hazardous waste streams and to reduce hazardous wastes generated by selected industries, and availability of related resources from other entities, such as other states, the federal government, local governments, and other organizations.

(Amended by Stats. 1998, Chapter 881, Section 10. Effective January 1, 1999.)

25244.23. (a) (1) The department shall adopt regulations to ensure that trade secrets designated by a generator in all or a portion of the review and plan or the report required by this article are utilized by the director, the department, the unified program agency, or the appropriate local agency only in connection with the responsibilities of the department pursuant to this article, and that those trade secrets are not otherwise disseminated by the director, the department, the unified program agency, or any authorized representative of the department, or the appropriate local agency, without the consent of the generator.

(2) Any information subject to this section shall be made available to governmental agencies for use in making studies and for use in judicial review or enforcement proceedings involving the person furnishing the information.

(3) As provided by Section 25159.5, the regulations adopted pursuant to this subdivision shall conform with the corresponding trade secret regulations adopted by the Environmental Protection Agency pursuant to the federal act, except that the

regulations adopted by the department may be more stringent or more extensive than the federal trade secret regulations.

(4) "Trade secrets," as used in this section, may include, but are not limited to, any formula, plan, pattern, process, tool, mechanism, compound, procedure, production data, or compilation of information that is not patented, that is known only to certain individuals within a commercial concern who are using it to fabricate, produce, or compound an article of trade or a service having commercial value, and that gives its user an opportunity to obtain a business advantage over competitors who do not know or use it.

(b) The department, the unified program agency, and the appropriate local agency shall protect from disclosure any trade secret designated by the generator pursuant to this section. The department shall make available information concerning source reduction approaches that have proved successful, and that do not constitute a trade secret, when carrying out subdivision (c) of Section 25244.17 and to subdivision (a) of Section 25244.18.

(c) This section does not permit a generator to refuse to disclose the information required pursuant to this article to the department, the unified program agency, or the appropriate local agency, an officer or employee of the department, the unified program agency, or the appropriate local agency, in connection with the official duties of that officer or employee under this article.

(d) Any officer or employee of the department, the unified program agency, or the appropriate local agency, or any other person, who, because of his or her employment or official position, has possession of, or has access to, confidential information, and who, knowing that disclosure of the information to the general public is prohibited by this section, knowingly and willfully discloses the information in any manner to any person not entitled to receive it, is guilty of a misdemeanor and, upon conviction thereof, shall be punished by imprisonment in the county jail not exceeding six months, by a fine not exceeding one thousand dollars ($1,000), or by both the fine and imprisonment.

(Amended by Stats. 1997, Chapter 520, Section 9. Effective January 1, 1998.)

25244.24. (a) For purposes of this section the following definitions shall apply:

(1) "Program" means the voluntary program to reduce hazardous waste generation established by this section.

(2) "Release" means a release of a chemical into the environment in any manner and by any means. "Release" includes, but is not limited to, any release authorized or permitted pursuant to a statute, ordinance, regulation, or rule of any federal, state, local, or regional agency or government or by a permit, license, variance or other authorization from the agency or government.

(b) On or before October 1, 2000, the department shall, in consultation with the advisory committee established pursuant to Section 25244.15.1, conduct an inventory and analysis of low-cost voluntary programs that are, or have been conducted by other states, the federal government, or local government entities to reduce hazardous waste generation and other environmental releases of toxic chemicals, and shall develop recommendations for programs that would be effective and feasible in California, based on the inventory and analysis.

(c) In consultation with the advisory committee, large businesses, and the public, the department shall develop a low-cost voluntary program to further reduce generation of hazardous waste by large businesses in California. The program shall be designed to promote cooperative relationships between California business and the department, while creating a significant environmental benefit from reduced hazardous waste generation. The department shall include the program in the work plan required by Section 25244.22 on or before January 15, 2002.

(d) In designing and implementing the program the department shall take into consideration all of the following:

(1) Estimates of the volumes of potential reductions of hazardous waste generation and other possible program benefits.

(2) The types of facilities expected to participate and their current hazardous waste generation and other releases of toxic chemicals into the environment.

(3) The potential for reductions in hazardous waste generation resulting in an increase in releases of toxic chemicals to a different environmental medium.

(4) The potential public health and environmental benefits of the program.

(5) Methods for publicizing the program and encouraging facilities throughout the state to participate in the program.

(6) Providing appropriate public recognition of facilities that successfully are participating in the program.

(7) Establishing a means for monitoring the progress that each facility participating in the program is making toward implementing the program.

(8) Establishing methods for evaluating the implementation of the inventory, analysis, and program and for reporting on the progress of the program in the work plan required pursuant to Section 25244.22.

(9) Procedures for providing technical support to program participants to assist with the implementation of the program.

(e) Participation in the program shall not create a presumption that the participating facility has determined that any chemical release reduction measure is technically feasible or economically practicable pursuant to any other provision of law.

(f) Actions of the department pursuant to this section are exempt from the requirements of Chapter 3.5 (commencing with Section 11340) of Division 3 of Title 2 of the Government Code.

(g) If, on the basis of the inventory and analysis required by in subdivision (b), the department finds that it is not possible to design and implement, at relatively low cost, a voluntary program to promote cooperative relationships between California business and the department, while creating a significant environmental benefit, and the advisory committee concurs with this finding, the department is not required to implement the program.

(Added by Stats. 1998, Chapter 881, Section 11. Effective January 1, 1999.)

APPENDIX B
Hazardous Waste Source Reduction Regulations

Chapter 31. Waste Minimization

Article 1. Hazardous Waste Source Reduction and Management Review

§67100.1. Definitions.

For the purpose of this article, the following definitions shall apply:

(a) “Appropriate local agency” means a county, city, or regional association which has adopted a hazardous waste management plan pursuant to Article 3.5, Chapter 6.5, Division 20, Health and Safety code (commencing with Section 25135).

(b) “Baseline year” is any of the following, whichever is applicable:

(1) For a generator's initial report, the baseline year is the calendar year, selected by the generator, for which substantial hazardous waste generation, or onsite or offsite management data is available, except the generator may select the current reporting year as the baseline year for the initial report.

(2) For all subsequent reports, the baseline year is the reporting year of the immediately preceding report.

(c) “Concentration” means the amount of a given substance in a stated unit of mixture, solution or waste. For purposes of this article it also means the range of components typically found in the waste.

(d) “Hazardous waste management approaches” means methods and techniques of controlling the generation and handling of hazardous waste, including source reduction, recycling, and treatment of hazardous waste.

(e) “Hazardous waste management performance report” or “report” means the report required by Section 67100.7(a) of these regulations to document and evaluate the results of hazardous waste management practices.

(f) “Laboratory” means a facility where the “laboratory use of hazardous chemicals” occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

(g) “Laboratory scale” means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. “Laboratory scale” excludes those workplaces whose function is to produce commercial quantities of material.

(h) “Laboratory use of hazardous chemicals” means handling or use of such materials in which all of the following conditions are met:

(1) Chemical manipulations are carried out on a “laboratory scale”;

(2) Multiple chemical procedures or chemicals are used; and

(3) The procedures involved are not part of a production process, nor in any way simulate a production process.

(i) “Motor vehicle fluids” includes all fluids associated with the operation of a vehicle that is self propelled, for example, transmission oil, hydraulic fluid, brake fluid, antifreeze, power steering fluid, and gasoline.

(j) “Numerical Goal” means a single numerical percentage reflecting an estimate of the source reduction the generator could optimally strive to achieve over a four-year period.

(k) “Reporting year” is the calendar year immediately preceding the year in which plans, reports, and compliance checklist are to be prepared.

(*l*) “Routinely generated” means:

(1) Hazardous and extremely hazardous wastes that result from ongoing processes or operations.

(2) Hazardous wastes generated from regularly scheduled maintenance or production activities performed less frequently than once a year.

(m) “Small business” means “small business” as defined in Government Code, Section 11342(e).

(n) “Source reduction” means one of the following:

(1) Any action which causes a net reduction in the generation of hazardous waste.

(2) Any action taken before the hazardous waste is generated that results in lessening of the properties which cause it to be classified as a hazardous waste.

(o) “Source reduction evaluation review and plan” or “review and plan” or “plan” means a review conducted by the generator of the processes, operations, and procedures in use at a generator's site, required pursuant to Section 67100.4(a) completed according to the format established by the Department in Section 67100.5. Plans do both of the following:

(1) Determine any alternatives to, or modifications of, the generator's processes, operations, and procedures that may be implemented to reduce the amount of hazardous waste generated.

(2) Include a plan to document and implement source reduction measures for the hazardous wastes specified in paragraph (1) which are technically feasible and economically practicable for the generator, including a reasonable implementation schedule.

§67100.2. Applicability.

(a) This article applies to generators who, by site, routinely generate, through ongoing processes and operations, more than 12,000 kilograms of hazardous waste in the reporting year, or more than 12 kilograms of extremely hazardous waste in a reporting year.

(b) A generator may petition the Department in writing to exempt a hazardous waste stream. The generator shall provide documentation to demonstrate that no source reduction opportunities exist for the requested waste stream exemption. The Department shall public notice the proposed acceptance of any exemption petition. A minimum of 45 days shall be provided for public review and comment prior to the Department rendering any determination on a petition.

(c) The following hazardous wastes shall not be included in calculating the volume, or comparable weight of waste produced and are not subject to this article:

(1) The following exempted hazardous waste streams:

(A) Motor vehicle fluids and motor vehicle filters.

(B) Lead acid batteries.

(C) Household hazardous wastes, wastes from household collection events and wastes separated at community landfills.

(D) Waste pesticides and pesticide containers collected by County agricultural commissioners.

(E) Spent munitions and ordnance.

(F) Decommissioned utility poles.

(G) Oil generated from decommissioned refrigeration units.

(H) Mercury relays and low-level radioactive tubes generated from removal of telephone equipment.

(I) Lighting wastes including ballasts and fluorescent tubes.

(2) The following hazardous waste streams that are not routinely generated:

(A) Waste from site cleanup and mitigation activities including remedial investigations.

(B) Samples and evidence from enforcement actions.

(C) Asbestos.

(D) PCBs

(E) Formation fluids and solids from oil, gas and geothermal exploration and field development.

(F) Demolition waste/major renovation waste.

(G) Waste generated from emergency response actions.

(H) Waste generated from laboratory scale research.

(3) Medical Waste.

(d) When there is a change in ownership of the business, institution, or facility, the new owner shall have six months from the date of purchase to amend or rewrite the plan and the report. If the new owner fails to revise the plan and report during this time, the existing plan and report shall remain in effect.

(e) When there is a change in the state or federal analysis and testing criteria which causes additional materials to be classified as hazardous waste, these newly classified hazardous wastes shall be considered in calculating the volume, or comparable weight of hazardous waste produced at the generator's site starting the next reporting year.

(f) Any generator that is a small business may complete the forms contained in the documents listed below and include Sections 1, 3, 4, 5, and 6 of the Compliance Checklist Form, September 1993, or January 1997, as the plan. Documents for specific industries are available from the Department. The generator's most recent biennial report, as required by Section 66262.41 can be used as the report required by this article. The following are available from the Department and are hereby incorporated by reference:

(1) Waste Audit Study -- Automotive Repairs, May, 1987

(2) Waste Audit Study -- Automotive Paint Shops, January, 1987

(3) Waste Audit Study -- General Medical and Surgical Hospitals, August, 1988

(4) Waste Audit Study -- Paint Manufacturing Industry, April, 1987
(5) Waste Audit Study -- Drug Manufacturing and Processing Industry, May, 1989
(6) Waste Audit Study -- Metal Finishing Industry, May, 1988
(7) Waste Audit Study -- Pesticide Formulating Industry, November, 1987
(8) Waste Audit Study -- Research and Educational Institutions, August, 1988
(9) Waste Audit Study -- Photoprocessing Industry, April, 1989
(10) Waste Audit Study -- Fiberglass-Reinforced and Composite Plastic Products, April, 1989
(11) Waste Audit Study -- Marineyards for Maintenance and Repair, August, 1989
(12) Waste Audit Study -- Building Construction Industry, May, 1990
(13) Waste Audit Study -- Fabricated Metal Products Industry, August, 1989
(14) Waste Audit Study -- Gold, Silver, Platinum and Other Precious Metals Product and Reclamation, June, 1990
(15) Waste Audit Study -- Mechanical Equipment Repair Shops, May, 1990
(16) Hazardous Waste Reduction Assessment Handbook -- Auto Repair Shops, October, 1988
(17) Hazardous Waste Reduction Checklist -- Auto Repair Shops, October, 1988
(18) Hazardous Waste Reduction Checklist & Assessment Manual for the Metal Finishing Industry, September, 1989
(19) Waste Audit Study -- Printed Circuit Board Manufacturers, June, 1987
(20) Waste Audit Study -- Commercial Printing Industry, May, 1989
(21) Waste Audit Study -- Thermal Metal Working Industry, December, 1990
(22) Hazardous Waste Reduction Checklist & Assessment Manual for Pesticide Formulators, June, 1990
(23) Facility Pollution Prevention Guide, EPA/600/R-92/088, May, 1992

(g) Any generator that is a small business may alternatively complete the Compliance Checklist Form, September 1993, or January 1997, developed by the Department as the plan.

(h) If a generator owns or operates multiple sites with similar processes, operations, and wastes the generator may prepare a single multisite review and plan, report, or compliance checklist addressing all of these sites.

(i) If a generator owns a large site with multiple operations that are managed as independent businesses, the generator may prepare a separate review and plan, report, or compliance checklist for each independently managed business at the site.

(j) Generators subject to the requirements of this article pursuant to Sections 67100.4(a) and 67100.7(a) may prepare a single document combining the requirements for the plan and the report.

§67100.3. Availability Requirements.

(a) Every generator shall retain a copy of the current review and plan, report, summary progress report and compliance checklist at each site, or, for a multisite at a central location, and upon request, shall make it available to any authorized representative of the Department and any other officer or agency, conducting an inspection pursuant to Section 25185 Health and Safety Code.

(b) A copy of the plan, report and summary progress report and compliance checklist shall be made available locally for public review. This may be accomplished by making documents available at the generator's facility, at a public library or at the offices of any local governmental agency which is willing to act as a repository for this information. If any of the above documents contain trade secrets, then a copy which excludes trade secrets shall be made available locally for public review.

§67100.4. Plan and Plan Summary.

(a) On or before September 1, 1991 and every four years thereafter that hazardous or extremely hazardous waste generation exceeds the thresholds in Section 67100.2(a) of these regulations, each generator shall conduct a source reduction evaluation review and plan pursuant to Section 67100.5 of these regulations.

(b) Except as provided in Sections 67100.2(h) and 67100.2(i) of these regulations, a source reduction evaluation review and plan shall be prepared for each site.

(c) At the time a review and plan is submitted to the Department, the generator shall certify that the generator has implemented, is implementing, or will be implementing, the source reduction measures identified in the review and plan according to the implementation schedule contained in the review and plan. A generator may determine not to implement a source reduction measure selected in Section 67100.5(m) of these regulations only if the generator determines, upon conducting further analysis or due to unexpected circumstances, that the selected measure is not technically feasible or economically practicable, or if attempts to implement that measure reveal that the measure would result in, or has resulted in, any of the following:

(1) An increase in the generation of hazardous waste.

(2) An increase in release of hazardous chemicals to other environmental media.

(3) Adverse impacts on product quality.

(4) A significant increase in the risk of an adverse impact to human health or the environment

(d) If the generator elects not to implement the review and plan, including, but not limited to, a selected measure pursuant to Section 67100.5(m) of these regulations, the generator shall amend its review and plan within 90 days to reflect this rejection and include in the review and plan proper documentation identifying the rationale for this rejection.

§67100.5. Plan Format.

Except as provided in Section 67100.2(f) of these regulations, generators subject to the requirements of this article pursuant to Section 67100.2(a), shall prepare a plan with sufficient detail to convey an understanding of the source reduction evaluation review and analysis performed, using narratives, photographs, illustrations, figures or data as necessary, which includes, but is not limited to, all of the following:

(a) Name and location of the site, telephone number and Identification Number.

(b) Four digit SIC codes applicable to activities at the site.

(c) Type of business or activity conducted at each site.

(d) Length of time the company has been in business at the present site.

(e) Major products manufactured or services provided and, if necessary to convey an understanding of the business, their general applications or examples of their applications or end use.

(f) Number of employees.

(g) A general description of site operations with corresponding block diagrams focusing on quantity and type of hazardous wastes, raw materials, and final products produced at the site.

(h) Identification of all routinely generated hazardous waste streams in the current reporting year which result from ongoing processes or operations that have a yearly volume, or comparable weight exceeding five percent of the total yearly volume, or comparable weight of hazardous waste generated at the site, or, for extremely hazardous waste, five percent of the total yearly volume, or comparable weight generated at the site. Similar industrial processes or institutional activities generating similar wastes (with the same California Waste Codes) shall be considered a single waste stream for purposes of this subsection.

(i) All of the following information for each hazardous waste stream identified in subsection (h) of this section:

(1) An estimate of the weight, in pounds of hazardous waste generated.

(2) The applicable California waste code.

(3) The processes, operations and activities generating the waste(s), with corresponding block diagrams to illustrate the basis of generation including a listing of all input materials which contribute to the generation of hazardous or extremely hazardous waste (this is not meant to be a mass balance).

(j) An evaluation of source reduction measures available to the generator which are potentially viable. The evaluation shall consider at least all of the following approaches:

(1) Input changes.

(2) Operational improvement.

(3) Production process changes.

(4) Product reformulation.

(5) Administrative steps taken to reduce hazardous waste generation including but not limited to:

(A) Inventory control;

(B) Employee award programs;

(C) Employee training;

(D) In-house policies;

(E) Corporate or management commitment; and

(F) Other programs or measures.

(k) Consideration of the following factors for each measure evaluated in accordance with subsection (j) of this section (where a specific factor does not apply identify as N/A):

(1) Expected change in the amount of hazardous waste generated;

(2) Technical feasibility;

(3) Economic evaluation:

(A) Capital cost, operating cost, waste management cost;

(B) Return on investment (ROI), breakdown point, avoided cost, pretax payback period, or any other economic comparison method;

(4) Effects on product quality;

(5) Employee health and safety implications;

(6) Permits, variances, compliance schedules or applicable state local and federal agencies;

(7) Releases and discharges.

(l) Any pertinent information, such as waste stream constituents and concentration of constituents, needed to evaluate and implement source reduction measures.

(m) A specification of, and a rationale for, the technically feasible and economically practicable source reduction measures which will be taken by the generator with respect to each hazardous waste stream identified in subsection (h) of this section. The specification should include at a minimum, a narrative description of the factors in subsection (k) of this section and also address system capacity and efficiency. Photographs, illustrations, figures or data should be used to convey an understanding of the source reduction measure in sufficient detail to allow transfer of the measure to other generators with similar processes or procedures.

(n) An evaluation, and, to the extent practicable, a qualification of the effects of any source reduction measure selected in subsection (m) on emissions and discharges to air, water, or land.

(o) A list of each measure considered but not selected for a detailed evaluation as a potentially viable source reduction measure. For each measure rejected, explain the generator's rationale. This list shall be supplemented for waste streams where no measures were identified with a narrative demonstrating the good faith efforts undertaken to identify measures.

(p) A timetable for making reasonable and measurable progress towards implementation of the selected source reduction measures specified in subsection (m) of this section. It shall also include an implementation schedule for completing the evaluation of potentially viable source reduction measures and it shall prioritize processes and wastes for future research, development and source reduction analysis.

(q) All plans prepared after January 1, 1993 shall contain a four-year numerical goal for reducing the generation of hazardous waste streams through the selected source reduction measures specified in subsection (m) of this section.

§67100.6. Plan Summary Format.

§67100.7. Report.

(a) On or before September 1, 1991, and every four years thereafter that hazardous or extremely hazardous waste generation exceeds the thresholds in Section 67100.2(a) of these regulations, each generator shall prepare a hazardous waste management performance report pursuant to Section 67100.8 of these regulations.

(b) Except as provided in Sections 67100.2(h) and 67100.2(i) of these regulations, the hazardous waste management performance report shall be prepared for each site.

§67100.8. Report Format.

(a) Except as provided in Section 67100.2(f) of these regulations and in subsection (b) of this section, each generator shall prepare a report with sufficient detail to convey an understanding of the hazardous waste management approaches used at the site, using narratives, photographs, illustrations, figures or data as necessary, which includes, at a minimum, all of the following:

(1) Name and location of the site

(2) Four digit SIC code(s) for the site

(3) All of the following information for each waste stream identified pursuant to Section 67100.5(h) of theses regulations:

(A) An estimate, in pounds, of the quantity of hazardous waste generated and the quantity of hazardous waste managed, both onsite and offsite, during the current reporting year and the baseline year.

(B) A description of current hazardous waste management approaches and identification of all approaches implemented since the baseline year.

(C) An assessment of the effect, since the baseline year, of each implemented hazardous waste management approach on the weight of hazardous waste generated, the properties which cause it to be classified as a hazardous waste and/or the onsite and offsite management of hazardous waste. The report shall consider, but shall not be limited to all of the following approaches:

1. Source reduction;
2. Onsite or offsite recycling;
3. Onsite or offsite treatment.

(D) A description of factors during the current reporting year that have affected hazardous waste generation and onsite and offsite hazardous waste management since the baseline year, including, but not limited to, any of the following:

1. Changes in business activity;
2. Changes in waste classification;
3. Natural phenomena and;
4. Other factors that have affected either the quantity of hazardous waste generated or onsite and offsite hazardous waste management requirements.

(b) If the generator selects the current reporting year as the baseline year, the information required pursuant to subsection (a)(3) of this section shall be provided for the reporting year only.

§67100.9. Report Summary Format.

(a) Generators subject to the requirements of this article shall prepare a summary progress report and submit it to the Department of Toxic Substances Control on or before September 1, 1999 and every four years thereafter.

(b) Generators shall complete the Department of Toxic Substances Control's Form # 1262 (3/99) titled, "Summary Progress Report" as their summary progress report. This document is incorporated by reference.

(c) The director, in consultation with the Secretary for Environmental Protection, shall, within five years of the effective date of the regulations in this section, determine whether the regulations should be retained, revised, or repealed.

§67100.13. Certification Requirements.

(a) The review and plan, report, and compliance checklist, completed pursuant to this article shall be reviewed by an engineer who is registered as a professional engineer pursuant to Section 6762 of the Business and Professions Code, by an individual who is responsible for the processes and operations of the site, or by an environmental assessor who is registered pursuant to Section 25570 Health and Safety Code.

(b) The engineer, individual, or environmental assessor shall certify the review and plan only if the review and plan meet all of the following requirements:

(1) The review and plan addresses each hazardous waste stream identified pursuant to Section 67100.5(h) of these regulations.

(2) The review and plan addresses the source reduction approaches specified in Section 67100.5(j) of these regulations.

(3) The plan clearly sets forth the measures to be taken with respect to each hazardous waste stream for which source reduction has been found to be technically feasible and economically practicable, with timetables for making reasonable and measurable progress, and documents the rationale for rejecting available source reduction measures.

(4) The plan does not merely shift hazardous waste from one environmental medium to another environmental medium by increasing emissions or discharges to air, water, or land.

(c) The engineer, individual, or environmental assessor shall certify that compliance checklist has been completed.

(d) The engineer, individual, or environmental assessor shall certify the report only if the report meets the following requirement:

(1) The report identifies factors that affect the generation and onsite and offsite management of hazardous wastes and summarizes the effect of those factors on the generation and onsite and offsite management of hazardous wastes.

(e) The plan, report, and compliance checklist shall contain the following language signed and dated by either the owner, the operator, or the responsible corporate officer of the site or an authorized individual; who is capable of committing financial resources necessary to implement the source reduction measures:

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or the persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for making false statements or representations to the Department, including the possibility of fines for criminal violations."

§67100.14. Trade Secrets.

(a) Any information submitted to the Department pursuant to this article may be claimed as confidential by the generator. Any such claim shall be asserted at the time of submission by placing the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, the Department shall make the information available to the public without further notice. If a claim is asserted, the information shall be treated in accordance with 40 CFR Part 2 and the Health and Safety Code, Sections 25173 and 25244.23.

(b) If a claim of confidentiality is asserted, two versions of the document shall be submitted: one version with the confidential pages and one version without the confidential pages but with a clear indication of which pages are removed as confidential.

APPENDIX C
California Waste Codes

California Nonrestricted Wastes

Inorganics

121	Alkaline solution (pH <UN-> 12.5) with metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc)
122	Alkaline solution without metals (pH > 12.5)
123	Unspecified alkaline solution
131	Aqueous solution (2 < pH < 12.5) containing reactive anions (azide, bromate, chlorate, cyanide, fluoride, hypochlorite, nitrite, perchlorate, and sulfide anions)
132	Aqueous solution with metals (restricted levels and see waste code 121 for a list of metals)
133	Aqueous solution with 10 percent or more total organic residues
134	Aqueous solution with less than 10 percent total organic residues
135	Unspecified aqueous solution
141	Off-specification, aged, or surplus inorganics
151	Asbestos-containing waste
161	Fluid-cracking catalyst (FCC) waste
162	Other spent catalyst
171	Metal sludge (see 121)
172	Metal dust (see 121) and machining waste
181	Other inorganic solid waste

Organics

211	Halogenated solvents (chloroform, methyl chloride, perchloroethylene, etc.)
212	Oxygenated solvents (acetone, butanol, ethyl acetate, etc.)
213	Hydrocarbon solvents (benzene, hexane, Stoddard, etc.)
214	Unspecified solvent mixture
221	Waste oil and mixed oil
222	Oil/water separation sludge
223	Unspecified oil-containing waste
231	Pesticide rinse water
232	Pesticides and other waste associated with pesticide production
241	Tank bottom waste
251	Still bottoms with halogenated organics
252	Other still bottom waste
261	Polychlorinated biphenyls and material containing PCB's

271 Organic monomer waste (includes unreacted resins)
272 Polymeric resin waste
281 Adhesives
291 Latex waste
311 Pharmaceutical waste
321 Sewage sludge
322 Biological waste other than sewage sludge
331 Off-specification, aged, or surplus organics
341 Organic liquids (nonsolvents) with halogens
342 Organic liquids with metals (see 121)
343 Unspecified organic liquid mixture
351 Organic solids with halogens
352 Other organic solids

Solids

411 Alum and gypsum sludge
421 Lime sludge
431 Phosphate sludge
441 Sulfur sludge
451 Degreasing sludge
461 Paint sludge
471 Paper sludge/pulp
481 Tetraethyl lead sludge
491 Unspecified sludge waste

Miscellaneous

511 Empty pesticide containers 30 gallons or more
512 Other empty containers 30 gallons or more
513 Empty containers less than 30 gallons
521 Drilling mud
531 Chemical toilet waste
541 Photochemicals/photoprocessing waste
551 Laboratory waste chemicals
561 Detergent and soap
571 Fly ash, bottom ash, and retort ash
581 Gas scrubber waste
591 Baghouse waste
611 Contaminated soil from site clean-ups
612 Household waste
613 Auto shredder waste

California Restricted Wastes

711 Liquids with cyanides > 1000 mg/l
721 Liquids with arsenic > 500 mg/l
722 Liquids with cadmium > 100 mg/l
723 Liquids with chromium (VI) > 500 mg/l
724 Liquids with lead > 500 mg/l
725 Liquids with mercury > 20 mg/l
726 Liquids with nickel > 134 mg/l
727 Liquids with selenium > 100 mg/l
728 Liquids with thallium > 130 mg/l
731 Liquids with polychlorinated biphenyls > 50 mg/l
741 Liquids with halogenated organic compounds > 1000 mg/l
751 Solids or sludges with halogenated organic compounds > 1000mg/kg
791 Liquids with pH <UN-> 2
792 Liquids with pH <UN-> 2 with metals
801 Waste potentially containing dioxins

Source: California Code of Regulations, Title 22, Division 4.5, Chapter 11, Appendix XII. For most recent revisions, refer to: http://ccr.oal.ca.gov/.