

US EPA ARCHIVE DOCUMENT

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SEVENTH ANNUAL REPORT TO EPA

For the Year 2003

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The Chlorine Institute has been a proactive leader in the effort to reduce mercury emissions and use in the United States. This Seventh Annual Report to the U. S. Environmental Protection Agency (EPA) illustrates the chlor-alkali industry's progress to voluntarily reduce mercury use and emissions.

Since 1996, the Chlorine Institute and its members have worked cooperatively with federal and state authorities to voluntarily reduce mercury use by 50 percent by 2005 over the base years of 1990-1995. That goal has been met and exceeded. In addition, the Institute has reported to EPA on projects and initiatives underway to reduce mercury use and emissions. These efforts continue to this day.

In this report we will discuss the following items:

- The decline in the use of mercury in the chlor-alkali industry over the seven years since the commitment was originally made,
- An explanation of the difference between mercury purchases and mercury use,
- An explanation of why some facilities are adding mercury to their process inventory,
- An explanation of our new commitment to enhanced emissions monitoring of the cell rooms,
- An explanation of our new commitment for full accounting of the mercury we use,
- A summary of the activities undertaken in the past year, and
- A summary of our ongoing and new commitments.

MERCURY USAGE DECLINES

Mercury use is detailed in Table 1. **The overall mercury usage reduction to date over an eight-year period is 76%.** After adjusting for shutdown facilities, the reduction in mercury use by the chlor-alkali industry from the base period is 69%. Table 1 shows some modified mercury usage data for the 1998 – 2002 period. Although the changes for most years increased by a ton or less, for 2002 mercury usage increased over the previously reported figure by six tons. These

changes are the result of member companies adjusting their reporting of mercury use to ensure that all companies are calculating and reporting the data in a consistent and uniform manner.

Mercury use in 2003 increased by two tons from 2002. The Institute wishes to point out that we previously advised EPA that reductions would not be continuous or perfectly linear in nature. Some variation up or down was anticipated while there is a clear trend documenting declines in mercury use from the base period.

We believe that the steps we are taking to reduce mercury use and emissions will show significant improvement over the current levels when projects underway to advance cell-room technology are fully implemented over the next three years.

PURCHASES DO NOT EQUAL USE

Mercury purchases in 2003 were 219 tons. As explained in past reports, **mercury purchases do not necessarily equal mercury use.** Purchased mercury may be added to a site's mercury storage inventory having not yet been added to the process equipment. Process changes or different equipment may require more mercury be added to the process. Such mercury additions are required as part of programs to advance the cell room technology that are currently being undertaken at several facilities. Such programs will allow the facilities to operate longer between cell maintenance and/or allow the facilities to utilize equipment designed to minimize fugitive emissions. Both of these factors were involved in the purchases exceeding the use of mercury in 2003. These new technology advancements already underway at several facilities include:

- (1) **Enlarging the size of decomposers to reduce the need to open the equipment.** Increasing the size of the decomposers allows the sodium-mercury amalgam produced in the primary cell to be fully decomposed to sodium hydroxide because the larger vessel allows more time for the reaction to take place. Virtually sodium-free mercury is then returned to the cell. Increasing the physical size of the decomposers requires a significant one-time mercury addition to the cell's inventory, but the cell does not need to be opened as often, which reduces emissions. For example, at one facility decomposers are being enlarged, increasing the average amount of mercury in the inventory by nearly 1,700 pounds per cell. This facility has 106 cells, which results in increased mercury in-process inventory of nearly 90 tons when the project is fully implemented in 2006.
- (2) **Using better electrical current distribution equipment.** Better equipment allows facilities to operate their plants with improved electrical efficiency. However, in some facilities, the mercury inventory in the cells does not allow the enhanced electrical current distribution equipment to function properly; therefore a one-time mercury addition to inventory is required to maximize energy efficiency. In addition to reducing energy consumption, better electrical distribution allows for less frequent cell shorts. Cell shorts occur when the mercury cathode touches the anode. Such

shorts cause anode damage requiring eventual repair or replacement of the anode. Repair/replacement of the anode requires the cells to be opened. Each time a cell must be opened for maintenance, fugitive mercury emissions can occur. Hence this step to improve electrical efficiency has an additional benefit of reducing the frequency of cell openings, thus reducing fugitive mercury emissions.

- (3) **Upgrading equipment.** Projects to upgrade equipment have included installing new mercury pumps, mercury sumps and end boxes. This new equipment is larger in size and requires an increase in mercury inventory in the cell.
- (4) **Improving the reliability of cell room equipment.** These modifications include better construction materials (e.g., improved hydrogen coolers), or better sealants that reduce the potential for leakage, and therefore, reduce fugitive emissions. Other steps are underway to improve reliability, including better maintenance techniques that capture mercury during periods when the cells are open, and comprehensive maintenance programs to assess the need to do all needed cell maintenance during a cell outage to maximize the time until the next opening. Normally, these improvements do not increase mercury inventories.

MORE INVENTORY = LESS EMISSIONS

Some original equipment installed when the plants were initially constructed is now being replaced with new vessels and tanks (e.g., decomposers) that are two to four times larger in volume. These larger vessels and tanks do not need to be opened as frequently as their smaller predecessors, but they do require that more mercury be added to the working inventory to fill the increased volume. These processing improvements that involve the installation of larger equipment allow our industry's plants to lower emission levels.

In 2002, one Chlorine Institute member company made a presentation to the EPA and state officials in order to explain in detail its program to reduce mercury usage, mercury emissions and energy usage. This same company also made a presentation at the May 2003 Binational Toxics Strategy meeting.

Information is posted online pertaining to this facility's program at the following Web links:

1. <http://www.epa.gov/Region5/air/mercury/chlor/mercuryinventory.pdf>
2. http://www.epa.gov/Region5/air/mercury/chlor/mercurypresentation%20_1.pdf
3. <http://www.epa.gov/Region5/air/mercury/meetings/may03/sellers.pdf>

If EPA or other regulatory authorities want more information about these programs, the relevant Chlorine Institute member companies welcome the opportunity to discuss their detailed plans during site visits.

INDUSTRY TO ENHANCE AIR MONITORING

The Chlorine Institute is pleased to announce that all six producers that use mercury cell technology have committed to the development of new methodologies to more accurately measure and verify emissions from each cell room. Moreover, enhancements to our existing air monitoring program will be in place on or before the effective date of EPA's new MACT requirements in 2006. Some preliminary discussions have been held with the EPA's Office of Air (Emissions Standards Division) to see whether a cooperative program can be jointly pursued.

FULL INVENTORY ACCOUNTABILITY

The Chlorine Institute is concerned that the data presented in our voluntary annual reports to EPA have been either misinterpreted or mischaracterized by some groups. In order to further clarify the facts, we have added a new table to this report. Table 2 is a compilation of data for calendar years 2002 and 2003 showing the differences between mercury purchases, mercury use, reported toxics release inventory (TRI) emissions, and mercury contained in chlor-alkali products.¹

There is evidence indicating that the 30 tons of "unaccounted for inventory" is being accumulated within the plants. This unaccounted inventory represents only one percent of the total mercury inventory for the industry, but we are not satisfied with even this small percentage. That is why we are committed to fully account for the mercury we use.

It is important to note that each plant recovers mercury from the piping, tanks and processing equipment for recycling and reuse in the production process. Several companies have been tracking mercury inventories within their plants, one for decades. The best management practices have found that, because residual mercury is very heavy and dense, it will accumulate in the piping, tanks and processing equipment within the plants.

In addition, EPA conducted extensive monitoring of mercury emissions by a chlor-alkali facility in the year 2000. At that time, EPA determined that the emissions were well below the current regulatory requirements. This EPA study can be found online at the following link:

<http://www.epa.gov/Region5/air/mercury/Chloralkalireport.pdf>.

¹ We are presenting data for only these two years because data submitted in prior years include more than the nine facilities currently operating. The data submitted for 2001 and prior years (Fifth Annual Report and prior) include data from at least ten facilities and as many as fourteen facilities then operating, depending on the year. In 1996, when the original commitment was made, fourteen facilities were operating.

ADVANCING REGULATORY STANDARDS

While aggressively pursuing industry's voluntary efforts, the Chlorine Institute's mercury cell producers have actively participated in numerous activities to further reduce mercury use and emissions. A summary of the Institute's mercury task groups and their activities for 2003 are discussed in Appendices A and B.

Since issuing its Sixth Annual Report to EPA last year, the Chlorine Institute spearheaded industry's continued efforts to reduce mercury use and emissions.

Specifically, the Chlorine Institute and its member companies:

- Convened a panel of experts from industry, government and academia at the Mercury Issues Workshop held in conjunction with the Chlorine Institute's Annual Meeting in Houston.
- Updated and consolidated the two Chlorine Institute publications concerning mercury exposure and medical surveillance.
- Issued a guidance document on the removal of mercury from water effluent.
- Participated in technology sharing workshops in Brazil and India addressing global mercury issues associated with chlor-alkali plants.
- Reactivated the Chlorine Institute's Board Committee on Mercury Issues to address at the highest leadership level issues associated with the Chlorine Institute's mercury stewardship projects and issues related to the new Mercury MACT.
- Presented the Chlorine Institute's voluntary mercury use and emission reduction program to fellow participants of the USA/Canada Binational Toxic Strategy mercury reduction program.
- Participated in the Environmental Council of the States Mercury Workshop.

SUMMARY OF COMMITMENTS

The Chlorine Institute's member companies that use mercury cell technology are safe and perform above and beyond all applicable laws and regulations pertaining to mercury use and emissions. And we intend to continue this progress in the years ahead.

As an industry, we will continue to support the regulation of mercury by committing to four action steps:

- **Work with EPA to fully account for the remaining one percent of ‘unaccounted’ mercury in our process inventory,**
- **Further reduce the mercury we use,**
- **Develop methods to more accurately measure emissions from the cell rooms at each mercury cell chlor-alkali facility, and**
- **Further reduce air emissions from point sources by as much as 93% by implementing the extensive new work practices standards and fully complying with EPA’s new MACT requirements.**

ABOUT THE CHLORINE INSTITUTE

The Chlorine Institute Inc., founded in 1924, is a trade association of companies and other entities that are involved or interested in the safe production, distribution and use of chlorine, sodium and potassium hydroxides, and sodium hypochlorite, and the distribution and use of hydrogen chloride.

Because of chlorine's nature and its widespread and varied use, the promotion of its safe handling has long been an accepted responsibility of its producers, packagers, distributors and users. The Institute is the focal point for their joint efforts.

For more information on the Chlorine Institute’s mission, go to www.CL2.com.

Table I

Chlor-Alkali Mercury Cell Process – USA Only

	1990	1991	1992	1993	1994	1995	Average 1990-95	1996	1997	1998	1999	2000	2001	2002	2003
Total Mercury purchases, lb.	407,890	330,209	231,872	133,219	268,731	406,517	296,408	242,015	320,460	340,658	214,749	172,885	69,932	259,069	437,434
Total Mercury Purchases, tons	204	165	116	67	134	203	148	121	160	170	107	86	35	130	219
Total Mercury Used, lb.	443,024	350,702	296,292	207,077	291,077	330,448	319,715	273,659	232,056	210,213 ^R	177,968 ^R	156,403 ^R	61,506 ^R	71,052 ^R	75,401
Total Mercury Used, tons	222	175	148	104	146	165	160	137	116	105 ^R	89 ^R	79 ^R	30 ^R	36 ^R	38
Annual Chlorine Capacity, 1,000 tons	1,757	1,757	1,757	1,757	1,757	1,762	1,758	1,784	1,801	1,785	1,676	1,589 ^R	1436 ^R	1355 ^R	1,353
Total Number of Mercury Cells	762	762	762	762	762	762	762	762	762	762	706	682	646	594	594
Mercury Used, lb/ton of Chlorine Capacity	0.252	0.200	0.169	0.118	0.166	0.188	0.182	0.153	0.129	0.118 ^R	0.106 ^R	0.102 ^R	0.044 ^R	0.052 ^R	0.056

Notes: 1 ton = 2,000 lb; Mercury usage and annual chlorine capacity were slightly modified for the years 1998 - 2002 based on revised data submitted by members. {Revised data are indicated by ^R designation after the figures; See written report for a discussion and an explanation of the 2003 results.

Table 2

Mercury Purchases and Use Data (in Tons) for the Nine Facilities Currently Operating

	<u>2002</u>	<u>2003</u>
Mercury Virgin Inventory at on site storage (warehouse/room) as of Jan 1 [1]	67	46
Mercury Process Inventory as of Jan 1 [2]	2,478	2,593
Total Mercury Inventory as of Jan 1 [3] {[3] = [1] + [2]}	2,545	2,639
Mercury purchases in the calendar year [4]	130	219
Total Mercury Available [5] {[5] = [3] + [4]}	2,675	2,857
Mercury Virgin Inventory at on site storage (warehouse/room) as of Dec 31 [6]	46	165
Mercury Process Inventory as of Dec 31 [7]	2,593	2,654
Total Mercury Inventory as of Dec 31 [8] {[8] = [6] + [7]}	2,639	2,819
Total Mercury Used (Consumed) [9] {[9] = [5] - [8]}	36	38
Mercury Released to the Environment (TRI) [10]	8.2	8.1
Mercury Contained in Products [11]	0.2	0.1
Total Mercury Losses to Environment and Products [12]	8	8
Unaccounted for Mercury [13] {[13] = [9] - [12]}	28	30

Numbers may not add due to rounding

APPENDICES

Appendix A - Mission Statements of Various Groups

Mercury Issues Management Steering Committee (MIMSC)

The mission of the Mercury Issues Management Steering Committee (MIMSC) is to proactively address safety, health, and environmental issues that impact the manufacture and use of chlor-alkali products produced by the mercury cell process. The steering committee develops and promotes practices that will assist the users of this technology in the achievement of the goal to reduce mercury usage by 50 percent and in the continued protection of human health and the environment. MIMSC has established numerous technical task groups to carry out its mission.

The Mercury Emissions Measurement (MEM) Task Group

The mission of the Mercury Emissions Measurement (MEM) Task Group is to identify technically feasible methods to measure mercury emissions from cell room operations. As of June 2004, the task group is charged with assisting all mercury cell chlor-alkali facilities in the development and implementation of enhanced measurement techniques and methodologies to more accurately measure and track mercury emissions from each facility.

The Mercury Health Effects Task Group

The mission of the Mercury Health Issues Task Group is to address issues of concern pertaining to the health effects of employees potentially exposed to mercury.

The Mercury Water Quality Task Group

The mission of the Mercury Water Quality Task Group is to address issues concerning current and potential technologies and regulatory issues pertaining to wastewater effluents.

Mercury Public Policy Task Group

The mission of Mercury Public Policy Task Group is to address government actions that may affect mercury cell technology consistent with sound science, risk management principles, and cost/benefit analysis. This group was sunset in 2003. Its responsibilities are being assumed by the Mercury Issues Management Steering Committee.

APPENDIX B - Task Group Progress and Activities Reports for 2003

Mercury Emissions Measurement Task Group

This group focused on the review of the EPA's final MACT rule when it was unofficially issued in September, 2003. In late 2003, it began the task of determining how best to implement the final rule.

Mercury Health Effects Task Group

The task group updated two Institute publications, *Pamphlets 125, Guidelines: Medical Surveillance and Hygiene Monitoring Practices for Control of Worker Exposure to Mercury in the Chlor-Alkali Industry*, and *Pamphlets 156, Guidelines to Physicians in Conducting Mercury Medical Surveillance Programs*. The end product is a single publication, *Guidelines – Medical Surveillance and Hygiene Monitoring Practices for Control of Worker Exposure to Mercury in the Chlor-Alkali Industry*. A copy is enclosed.

Mercury Water Quality Task Group

This task group developed a guidance document, *Guidelines for the Optimization of Mercury Wastewater Treatment (Sulfide Precipitation Process) Systems*. A copy is enclosed. The remaining activity for this task group is to finalize a bibliography of reference documents for enhanced effluent treatment.

Mercury Issues Workshops

Workshops on mercury issues were conducted at both the 2004 Annual Meeting held in March in Houston and the 2003 Annual Meeting held in April in Chicago. The workshops are held in conjunction with the Chlorine Institute's Annual Meeting and address a variety of technical and regulatory issues affecting the industry. Approximately 60 people representing mercury cell chlor-alkali plants throughout the world attended both meetings.

Coalition Activities

The mercury teams participate in two industry coalitions addressing mercury issues: the Federal Water Quality Coalition and the Coalition for Mercury Management.