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EIGHTH ANNUAL REPORT TO EPA
For the Year 2004

May 13, 2005

The Chlorine Institute continues to be a proactive leader in the effort to reduce mercury emissions and use in the United States. This Eighth Annual Report to the U. S. Environmental Protection Agency (EPA) illustrates the chlor-alkali industry's progress in voluntarily reducing 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- The decline in the use of mercury in the chlor-alkali industry over the eight years since the commitment was originally made.
- A discussion of mercury use and purchases within the chlor-alkali industry.
- A summary of the current status of the projects being undertaken to improve cell performance by several facilities. Some of these projects involve increasing cell mercury inventory.
- A summary of the status of the new commitments made in last year's report.
- A summary of other activities undertaken in the past year.

MERCURY USE AND PURCHASES

The overall mercury usage reduction to date over a nine-year period is 92%. Mercury use is detailed in Table 1. After adjusting for shutdown facilities, the reduction in mercury use by the chlor-alkali industry from the base period is 88%.

Mercury use in 2004 decreased by 24 tons from 2003. The reductions made in mercury use in 2004 may not be totally sustainable in the short term. While we believe mercury use will continue to trend downward in the long term, it is not unreasonable to expect some annual variability as we continue on this downward course to reduce mercury use in the chlor-alkali industry.

Mercury purchases in 2004 were 38 tons. As explained in past reports, **mercury purchases do not necessarily equal mercury use.** 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 are allowing the facilities to operate longer between cell maintenance and/or allow the facilities to utilize equipment designed to minimize fugitive emissions. These new technology advancements already underway at several facilities were detailed in the 2003 Annual Report. These advancements include the following:

(1) **Enlarging the size of decomposers to reduce the need to open the equipment.**

(2) **Using better electrical current distribution equipment.**

(3) **Upgrading equipment.**

(4) **Improving the reliability of cell room equipment.**

KEY PROJECTS CURRENTLY UNDERWAY

Below is a summary of key projects currently underway at six facilities that will result in an increase in mercury process inventories:

Plant 1 is installing new inlet and outlet sealed end boxes and mercury pumps on all cells. As of the end of 2004, it was 75% complete. In addition, the mercury film thickness maintained on the cell bed is being increased to compensate for cell bottom roughness for an improvement in cell operation and increased run time between cleanings (i.e., cell openings). Individual cell inventories are being increased from 13,500 lbs to 17,000 lbs. At the end of 2004, this mercury addition was 50% complete. Equipment modifications and mercury inventory additions are expected to be complete by the end of 2005.

Plant 2 is installing larger decomposers requiring an additional 2,200 pounds per decomposer. In 2004, 13 of these decomposers were replaced. As of January 1, the project is more than 90% completed. Replacement of the remaining decomposers will be done on an as needed basis between 2005 and 2007.

Plant 3 is installing larger decomposers requiring an additional 6,100 pounds per decomposer. In 2004, 16 of these decomposers were replaced. As of January 1, the project is nearly 40% completed. It is planned to replace approximately two decomposers per month with a projected completion in 2007.

Plant 4 is installing new sealed inlet and outlet end boxes, new mercury pump seal pots, and reduced primary cell slope to reduce mercury emissions. These process equipment changes require an additional 2,500 pounds of mercury

inventory to be added to each cell. In 2004, an increase in mercury process inventory of 40,000 pounds was required for this project. As of year end the project is 87% complete. This project is expected to be completed by mid 2005.

Plant 5 has embarked on a comprehensive technology upgrade installing larger decomposers, improved outlet end boxes, new mercury pumps and hydrogen coolers designed to reduce fugitive mercury emissions. The larger decomposers and improved end boxes requires an increase in mercury inventory in each cell of approximately 450 pounds. As of the end of 2004, this project was about 55% complete. All of the new mercury pumps have been installed. The project is expected to take several years to complete.

Plant 6 has a long term program to replace decomposers with larger vessels requiring about 3,100 additional pounds of mercury in the cell. The new, larger equipment is being installed as the existing decomposers reach the end of their useful lives. In 2005 one decomposer was replaced. It is expected that a maximum of 1 - 3 decomposers will be replaced each year for the foreseeable future.

TECHNOLOGY ENHANCEMENTS REDUCE EMISSIONS

These process changes allow for reductions of mercury emissions in two ways. First, because much of the newer equipment being installed is larger than the previously installed equipment, operating cycles between maintenance activities are being lengthened. These maintenance activities nearly always require equipment openings. Even though many improvements in techniques to reduce mercury emissions during equipment openings have been made, such emissions can not be totally eliminated. As a result, a lower number of openings results in reduced mercury emissions. Secondly, the newer equipment is typically better designed to reduce fugitive emissions. Sealless mercury pumps, sealed end boxes, and improved hydrogen cooler design are examples of equipment changes that are resulting in reduced fugitive emissions.

In addition to the above items, facilities are taking other steps to reduce mercury emission. These include the following:

- Improved collection devices to more effectively capture mercury during cell maintenance activities.
- New decomposer compression system design to improve efficiency of amalgam decomposition.
- New gasket materials to provide better seals on mercury containing equipment.

- The installation of additional collection devices such as weirs to cell room trenches to more efficiently recapture and reuse accumulated mercury.

- Process changes to reduce mercury carry-over with the water exiting the end boxes resulting in less mercury handling.

UPDATE ON 2004 COMMITMENTS

In last year's report, we made two new commitments to the Binational Toxics Strategy. Specifically, the Chlorine Institute members committed to

(1) Enhance Cell Room Air Monitoring

(2) Fully Account for Mercury Inventory

The following summarizes the status of these commitments:

Enhance Cell Room Air Monitoring - Several facilities have already completed evaluations of equipment to better measure mercury emissions from cell rooms. One facility has recently completed the installation of such equipment and has made specific additional commitments to the state and the regional EPA responsible for regulating the facility to measure cell room emissions in a more comprehensive manner. A second facility is in the process of installing new monitoring equipment and it expects to be operational by this summer. Three other facilities are in the latter stages of evaluating the equipment appropriate for their site specific conditions. It is expected that at least some of these monitoring systems will be operational by year's end. In addition, we have worked closely with EPA's Office of Air, which has decided to do extensive additional cellroom monitoring at two chlor-alkali facilities late this summer. We expect the results of the EPA tests to be available prior to next year's report. We also expect to be able to report on testing results done by individual facilities in next year's report.

Fully Account for Mercury Inventory - Data presented in our past voluntary annual reports to EPA have been either misinterpreted or mischaracterized by some groups. In order to further clarify the facts, last year we added a new table, Table 2, to this report. Table 2 is a compilation of data for calendar years 2002 thru 2004 showing the differences between mercury purchases, mercury use, reported toxics release inventory (TRI) emissions, and mercury contained in chlor-alkali products.[1] We stated then that we were not satisfied with the 30 tons of "unaccounted for inventory" reported in 2002 and 2003 even though this unaccounted inventory represents only one percent of the total mercury inventory for the industry. We committed then to fully account for the mercury we use. **In 2004, the "unaccounted for" mercury amounted to seven tons, a reduction of nearly 80% from the prior two years.**

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1. *We are presenting data for only these 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 reports) 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.*

As with mercury use, while we believe the "unaccounted for mercury" will continue to trend downward in the long term, it is not unreasonable to expect some variability as we continue on this course to fully account for mercury inventory and the mercury used by the chlor-alkali industry.

Facilities took several steps to improve their accountability for the mercury they use. These steps include the following:

- Several facilities took additional steps to more accurately measure their process mercury inventories. While this could be done in several ways, the primary means employed was to use a radioactive isotope to measure the mercury inventory.

- Several facilities embarked on programs to collect and recapture mercury from various areas of the process where it has accumulated and return this mercury to the cells. In many cases, this collection program is being implemented on a more frequent basis than was previously done. At least one facility increased the frequency of cleaning cell house sumps on a regular basis to recover and reuse accumulated mercury. Another facility added weirs to mercury cell room trenches to facilitate mercury collection and reuse.

OTHER 2004 ACTIVITIES

While aggressively leading the U.S. industry's voluntary efforts, the Chlorine Institute's mercury cell producers have actively participated in numerous activities to further reduce mercury use and emissions worldwide. A summary of the Institute's mercury task groups and their global activities for 2004 are discussed in Appendices A and B.

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

Specifically, CI and its member companies:

- Conducted a workshop with all mercury cell producers present to better address mercury accountability and accounting issues.

- Worked with EPA to assist it in its plan to conduct mercury emissions monitoring studies at two additional chlor-alkali facilities.

- Issued a bibliography of reference materials for the guidance document, *Guidelines for the Optimization of Mercury Wastewater Treatment (Sulfide Precipitation Process) Systems,* which was issued in 2003.

- Participated in follow up activities related to technology sharing workshops in Brazil and India addressing global mercury chlor-alkali issues.

- Conducted the 12th Annual Mercury Issues Workshop which addressed numerous technical issues such as cell room mercury vapor monitoring and air flow modeling techniques, mercury detection monitors, methods to manage the new MACT data requirements, and techniques to account for mercury use.

- Summarized CI's Seventh Annual Report at the fall meeting of the Binational Toxics Strategy Mercury Work Group meeting.

- Worked with the USA delegation in preparation of the 23rd Session of the UNEP Governing Council meeting held in February of this year. Endorsed the USA proposal and agreed to participate in the UNEP chlor-alkali sector partnership resulting from this meeting.

SUMMARY OF COMMITMENTS

CI'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. We wish to reiterate what we stated in last year's report.

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

- **Work to account fully for the remaining less than one-half of one percent of "unaccounted for" 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 CI

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 CI's mission, go to www.chlorineinstitute.org.

Table I

Chlor-Alkali Mercury Cell Process – USA Only

	Average 1990 - 95	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total Mercury purchases, lb.	296,408	242,015	320,460	340,658	214,749	172,885	69,932	259,069	437,434	75,982
Total Mercury Purchases, tons	148	121	160	170	107	86	35	130	219	38
Total Mercury Used, lb.	319,715	273,659	232,056	210,213	177,968	156,403	61,506	71,052	75,309 *R*	28,637
Total Mercury Used, tons	160	137	116	105	89	79	30	36	38	14
Annual Chlorine Capacity, 1,000 tons	1,758	1,784	1,801	1,785	1,676	1,589	1436	1355	1,353	1,363
Total Number of Mercury Cells	762	762	762	762	706	682	646	594	594	594
Mercury Used, lb/ton of Chlorine Capacity	0.182	0.153	0.129	0.118	0.106	0.102	0.044	0.052	0.056	0.021

Notes: 1 ton = 2,000 lb

Revised data are indicated by *R* designation – very minor change in 2003 mercury usage data due to revised figures provided by one facility.

Table 2

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

	2002	2003	2004
Mercury Virgin Inventory at on site storage (warehouse/room) as of Jan 1 [1]	67	46	166
Mercury Process Inventory as of Jan 1 [2]	2,478	2,593	2,654
Total Mercury Inventory as of Jan 1 [3] {[3] = [1] + [2]}	2,545	2,639	2,820
Mercury purchases in the calendar year [4]	130	219	38
Total Mercury Available [5] {[5] = [3] + [4]}	2,675	2,858 *R*	2,858
Mercury Virgin Inventory at on site storage (warehouse/room) as of Dec 31 [6]	46	166 *R*	96
Mercury Process Inventory as of Dec 31 [7]	2,593	2,654	2,748
Total Mercury Inventory as of Dec 31 [8] {[8] = [6] + [7]}	2,639	2,820 *R*	2,844
Total Mercury Used (Consumed) [9] {[9] = [5] – [8]}	36	38	14
Mercury Released to the Environment (TRI) [10]	8.2	8.1	6.8
Mercury Contained in Products [11]	0.2	0.1	0.1
Total Mercury Losses to Environment and Products [12]	8	8.1	7
Unaccounted for Mercury [13] {[13] = [9] – [12]}	28	30	7

Revised data are indicated by *R* designation after the figures (all minor changes due to revised figures provided by one facility).

Numbers may not add due to rounding

APPENDICES

Appendix A - Mission Statements of Various Groups

Mercury Issues Management Steering Committee (MIMSC)

The Mercury Issues Management Steering Committee is dedicated to continuous improvements in the protection of human health and the environment connected with the production of chlorine by mercury cell technology. The committee believes that the industry is in compliance with existing regulations governing releases of mercury to the environment, and that no significant harm to human health or the environment exists as a result of mercury releases from the chlor-alkali industry. However, driven by the industry's commitment to continuous improvement, the committee will strive for further improvements, always guided by sound science, risk management principles, and cost/benefit analysis.

The committee proactively addresses safety, environmental and health issues that will impact the manufacture and use of chlor-alkali products produced by the mercury cell process. The committee will develop and promote practices that will assist the users of this technology in the continued protection of human health and the environment.

The Mercury Emissions Measurement (MEM) Task Group

The mission of the task group is to identify methodologies to allow for more accurate measurements of mercury emissions from cell room operations and point sources and to provide guidance to members to help them implement the commitment to more accurately measure mercury emissions from cell room.

Mercury Emissions Measurement and EPA Interaction Task Group

Mission Statement

The mission of the task group is to interact with EPA as the agency develops its plans for cell room and other testing at two additional facilities.

Mercury Data Management Task Group

Mission Statement

The mission of the task group is to develop a management system to assist members in complying with the housekeeping provisions of EPA's Mercury MACT for mercury cell chlor-alkali plants. The team should determine whether a paper system should first be developed prior to consideration of a computerized system.

APPENDIX B - Task Group Progress and Activities Reports for 2005

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. It continues to provide guidance concerning how members can best implement the final rule.

Mercury Health Effects Task Group

With the publication in 2003, of the updated *Pamphlet 125, Guidelines – Medical Surveillance and Hygiene Monitoring Practices for Control of Worker Exposure to Mercury in the Chlor-Alkali Industry,* this group has been sunset. The Mercury Issues Mangement Steering Committee will follow health issues. If needed, the task group will be reactivated.

Mercury Water Quality Task Group

With the publication of the guidance document in 2003, *Guidelines for the Optimization of Mercury Wastewater Treatment (Sulfide Precipitation Process Systems,* and a bibliography of reference documents for enhanced effluent treatment in 2004, this group has been sunset.

Mercury Issues Workshop

Fifty four people attended the 12th Annual Mercury Issues Workshop held during the Chlorine Institute's 2005 Annual Meeting held in March in Baltimore. Topics discussed included the following:

- Cell Room Mercury Vapor Monitoring and Air Flow Modeling
- Mercury Detection Monitors
- MACT Data Management Program
- EPA's Reconsideration of the NESHAP for Mercury Cell Chlor-Alkali Plants
- European Mercury Issues Update
- Plant Water Recovery System
- Mercury Balance/Accountability Techniques

Coalition Activities

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