CHLOR-ALKALI INDUSTRY
2008
MERCURY USE AND EMISSIONS
IN THE UNITED STATES
(Twelfth Annual Report)

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INTRODUCTION and SUMMARY

The Chlorine Institute, Inc. ("Institute" or "CI") continues to be a proactive leader in the effort to reduce mercury use and emissions in the United States. This report for the 2008 calendar year illustrates the chlor-alkali industry's continuing progress in voluntarily reducing mercury use and emissions.

CI's member companies[1] that use mercury cell technology to manufacture chlorine are safe and perform above and beyond all applicable laws and regulations pertaining to mercury use and emissions. The chlor-alkali industry supports the sound management of mercury through the:

- Full accounting of mercury used;
- Continuing reduction of mercury usage;
- Accurate measurement of emissions from the cell rooms at each mercury cell chlor-alkali facility; and
- Further reduction of air emissions by implementing and complying with EPA's National Emission Standard for Hazardous Air Pollutants: Mercury Emissions from Mercury Cell Chlor-Alkali Plants ("NESHAP").

The Institute, over the past thirteen years, has pursued these management principles and will continue such efforts for the foreseeable future.

The remainder of this report will focus on the following:

- Status of chlor-alkali mercury cell facilities in the United States;
- Mercury purchases and use during the calendar year 2008; and
- Reductions in mercury emissions to the environment.

[1] In 1996, the Chlorine Institute volunteered to reduce mercury use by 50% over the base years of 1990 through 1995. Since then the Institute and its members have worked cooperatively with federal and state authorities to meet and exceed that goal. Since 1995, a thirteen year period, total annual mercury used by the chlor-alkali industry has been reduced by over 97%.

MERCURY CELL FACILITIES

As of the end of 2008, five mercury cell facilities were in operation in the United States[2]. Since 1996 three facilities have converted to membrane cell technology and six facilities have simply closed.

As of the date of this report two facilities are in the process of converting to membrane cell technology (both are scheduled for completion by the end of 2009.) One of these facilities closed its mercury cell circuit in November 2008 with the intention of restarting chlorine production when the conversion is complete in 2009. These actions will further reduce the chlor-alkali industry's mercury use and emissions. Based on the currently announced plans, only four mercury cell facilities will be in operation in the United States at the end of 2009[3].

MERCURY USE AND PURCHASES

Using 1990 to 1995 as the baseline, the chlor-alkali industry has reduced its mercury usage by over 97% (see Figure 1). Mercury use in 2008 was 8,477 pounds. Mercury use is detailed in Table 1 found in Appendix A.

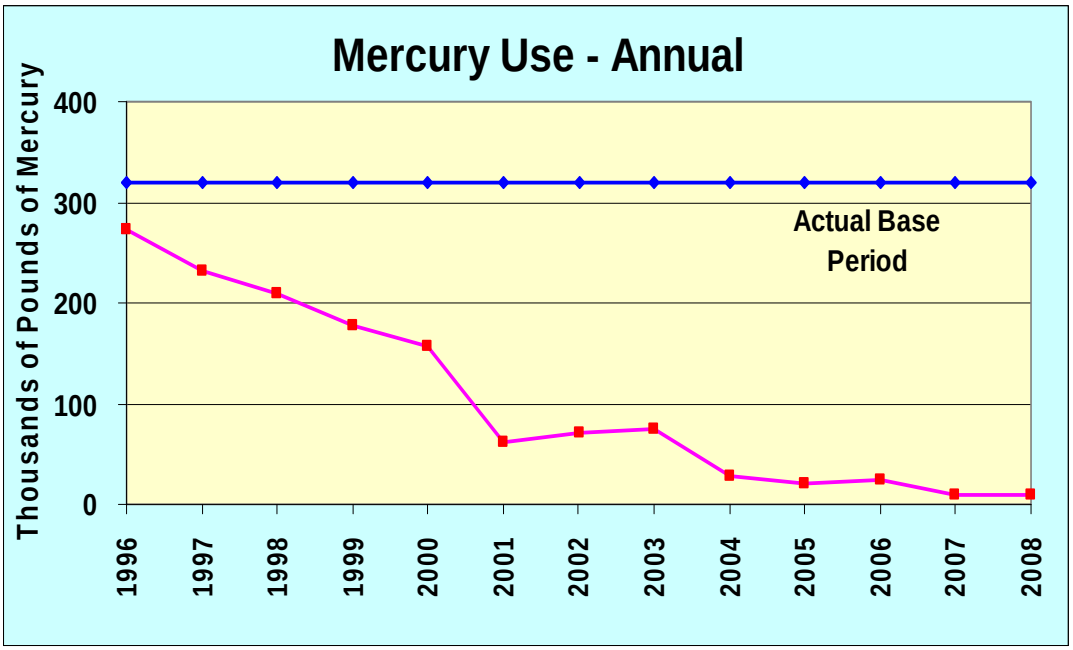

Figure 1

[2] In 1996 there were 14 operating mercury cell plants.
[3] In 2006 the World Chlorine Council ("WCC") estimated that approximately 135 mercury cell chlor-alkali plants in 44 countries existed world wide.

Chlor-alkali mercury use in the United States per ton of chlorine capacity for 2008 was 0.011 lb/ton chlorine capacity (see Figure 2).

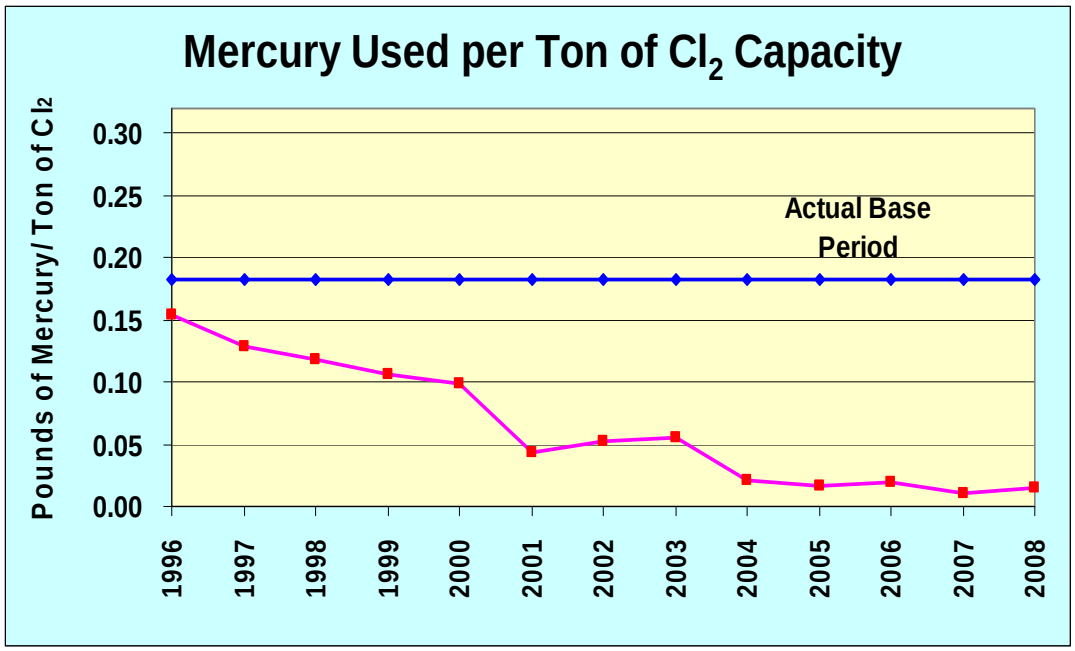

Figure 2

Figure 2 clearly shows that the chlor-alkali industry has significantly reduced its use of mercury, not just because of facility closures, but more importantly because of the industry's efforts to improve on the existing technology thus resulting in the more efficient utilization of mercury. This is reflected in a 94% reduction in the 2008 mercury used per ton of chlorine capacity when compared to the 1990 through 1995 baseline.

As is evident from both Figures 1 and 2, reductions in mercury use have slowed. This trend can be attributed to the effectiveness of past reduction efforts; nevertheless, the Chlorine Institute's goal continues to be zero.

Mercury purchases in 2008 were 2,798 pounds[4] (see Figure 3). As explained in past reports, mercury purchases do not necessarily equate to mercury use. Process upgrades can necessitate the use of higher volume equipment and longer piping runs which require that more mercury be added to the process. More mercury in the process does not equate to greater mercury emissions. In fact, most upgrades typically instituted as part of programs to upgrade cell room technology and improve system performance, also minimize mercury releases. Installation of new and better designed equipment minimizes fugitive emissions. Other upgrades allow the facilities to operate longer between scheduled cell maintenance activities. Less frequent cell maintenance means fewer openings of the cell and thus a reduction in mercury emissions. Annual mercury purchases rise or fall depending on the quantity of upgrades, the amount of virgin mercury in storage and the anticipated future need.

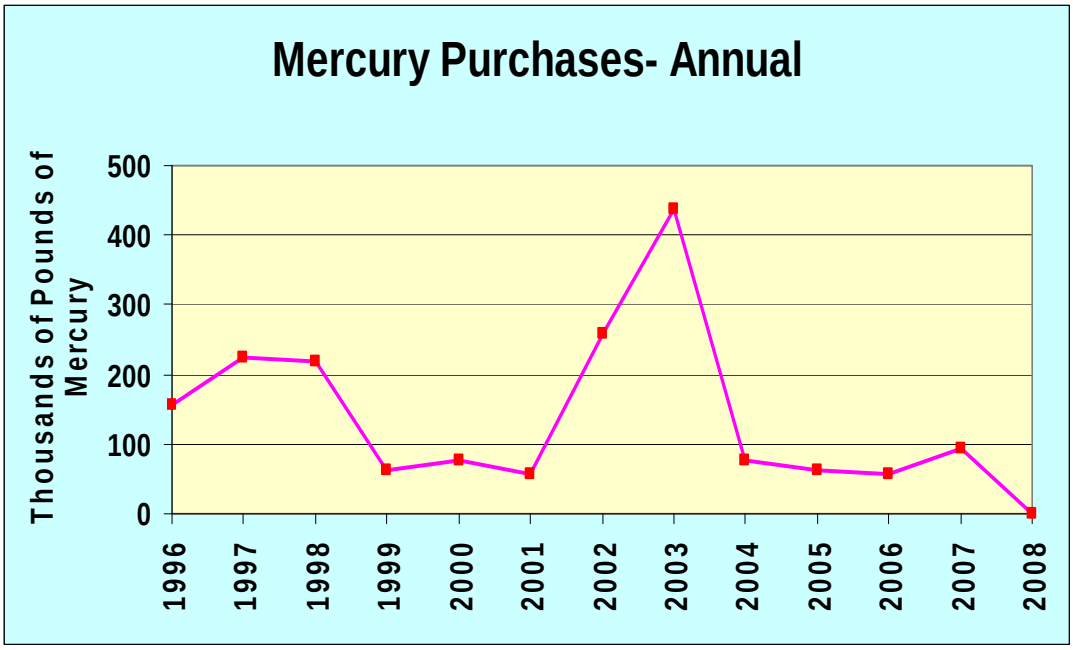

Figure 3

[4] This significantly lower amount of purchased mercury may be reflective of S906, the Mercury Export Ban Act of 2008, signed into law by President Bush on October 14, 2008. Public Law No: 110-414. This law was supported by the chlor-alkali industry as well as other industry and environmental organizations.

MERCURY RELEASES TO THE ENVIRONMENT

Mercury releases to the environment from the chlor-alkali industry were approximately 5,518 pounds (see Figure 4) in 2008. Mercury emissions are detailed in Table 2 found in Appendix A. This latest information shows an 83% reduction in the chlor-alkali industry mercury emissions[5] since 2001. The chlor-alkali industry mercury emissions are a very small portion (approximately 2.5%) of the total mercury releases occurring in the United States[6] and have fallen at a greater rate than the overall decline.

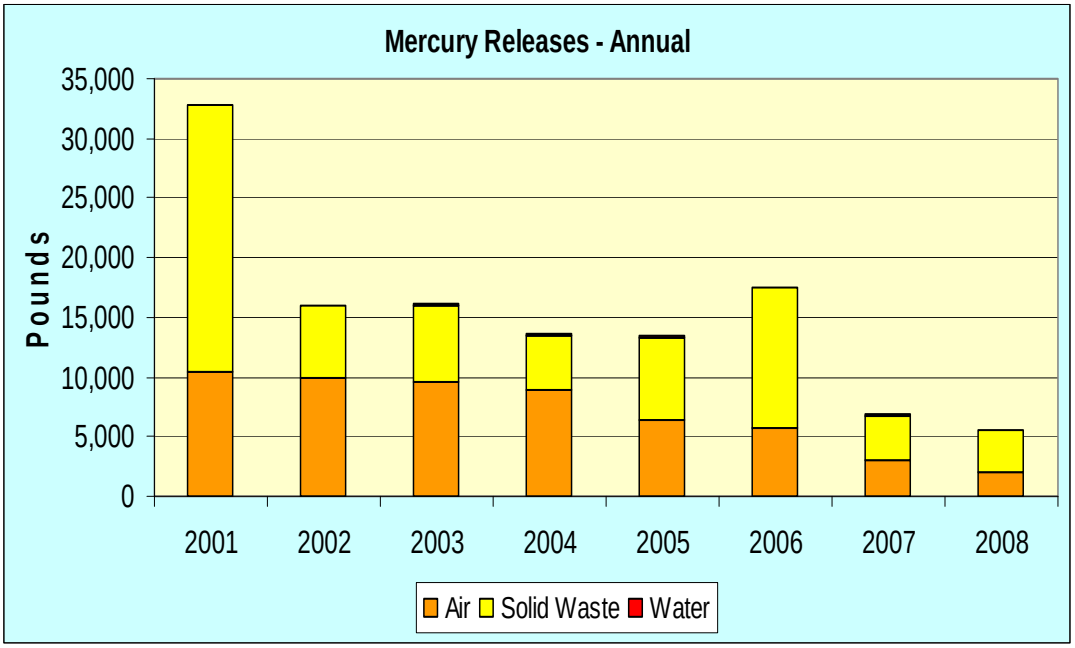

Figure 4

[5] Mercury releases directly to water are not easily depicted in Figure 4 since these quantities are less than 0.1% of the total.

[6] 2002 U.S. mercury releases estimated at 111.4 tons (Great Lakes Binational Toxics Strategy ("GLBTS") 2006 Progress Report, February 2007).

FACILITY SPECIFIC PROJECTS IN 2008

In general, 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 lengthened. Maintenance activities nearly always require equipment openings. Even though many improvements in techniques to reduce mercury emissions during equipment openings have been made, emissions can not be totally eliminated. Therefore, a lower number of openings results in reduced mercury emissions. Secondly, newer equipment is better designed to reduce fugitive emissions. Sealless mercury pumps, sealed end boxes, and improved hydrogen cooler design are examples of equipment changes that result in reduced fugitive emissions.

Below is a summary of key projects completed and/or started at mercury cell facilities during the 2008 calendar year. These projects resulted in reduced mercury emissions but may have also resulted in a short term increase in mercury purchases since sometimes these projects require an increase in mercury process inventories.

The following process modifications occurred in 2008[7]:

- Plant A - Continued to convert to new decomposers. Each new E-510 decomposer requires 1,200 pounds of additional mercury, and each new E-812 requires about 5,000 pounds of additional mercury.

- Plant B – Installed activated carbon beds in late 2007 to comply with Mercury Cell NESHAP. Units have been in continuous operation during 2008.

- Plant C – Continued to convert to new decomposers. Each new E-510 decomposer requires 1,200 pounds of additional mercury inventory to function properly.

[7] Plant designations (A, B, C, etc.) are purposely not applied to the same facilities from year to year.

INDUSTRY'S PAST EFFORTS CONTINUE TO PROVIDE ENVIRONMENTAL BENEFITS

Since 1996 the chlor-alkali industry's has taken many steps to reduce emissions. These changes have been detailed in prior reports but are summarized below because each of these past process improvements continues to pay dividends in the form of emissions reductions in every year that follows. Past activities have included the design, use and/or installation of:

- Improved collection devices to more effectively capture mercury during cell maintenance;
- New decomposer compression system design to improve efficiency of amalgam decomposition;
- New gasket materials to provide better seals on mercury containing equipment;
- Additional collection devices such as weirs to cell room trenches to more effectively recapture and reuse accumulated mercury;
- Process changes to reduce mercury carry-over with the water exiting the end boxes resulting in less mercury handling;
- More efficient electrical current distribution equipment;
- Larger decomposers, thus lengthening the time between scheduled maintenance (i.e. reducing the need to open the equipment);
- Enhanced cell-room emissions monitoring, including continuous emissions monitoring equipment in mercury cell rooms;
- Best practices for cell room operations to minimize or prevent emissions; and
- Upgrades of carbon beds to capture mercury emissions.

CONCLUSION

The Chlorine Institute continues to proactively address the environmentally sensitive use of mercury by the chlor-alkali industry. CI and its members believe that its voluntary efforts (The Institute's past commitment to the Binational Toxics Strategy[8] as well as its on-going commitment), no matter how they are measured, have been a total success. The Chlorine Institute will continue its efforts to reduce chlor-alkali industry mercury use and environmental releases in the chlor-alkali in the United States.

ABOUT THE CHLORINE INSTITUTE

The Chlorine Institute Inc., founded in 1924, is a non-profit trade association of companies and other entities 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 anhydrous hydrogen chloride.

Because of chlorine's nature and its widespread and varied applications, the promotion of its safe use and 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.

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[8] The Chlorine Institute submitted its final Annual Report to EPA on September 26, 2008.

APPENDIX A
Data Tables

Table 1
Mercury Purchase and Usage[1]
Chlor-Alkali Industry - Mercury Cell Process

	BASELINE (Average 1990 – 95)	1996	1997	1998	1999[2]	2000[3]	2001[4]	2002	2003	2004	2005[5]	2006	2007[6]	2008[7]	2009[9]
otal Mercury urchases[10], lb.	296,408	242,015	320,460	340,658	214,749	172,885	69,932	259,069	437,434	75,982	63,829	57,304	92,427	2,798	
otal Mercury urchases, tons	148	121	160	170	107	86	35	130	219	38	32	29	46	0	
otal Mercury Used, lb.	319,715	273,659	232,056	210,213	177,968	156,403	61,506	71,052	75,309	28,637	20,660	24,210	9,871	8,477	
otal Mercury Used, tons	160	137	116	105	89	79	30	36	38	14	10	12	5	4	
nnual Chlorine apacity, 1,000 tons	1,758	1,784	1,801	1,785	1,676	1,589	1,436	1,355	1,353	1,363	1,221[8]	1,206	932	591	
otal Number of Mercury ells	762	762	762	762	706	682	646	594	594	594	506	506	432	264	
otal Mercury Cell acilities Operating at nd of Year	--	14	14	14	14	12	11	9	9	9	8	8	7	5	4
ercury Cell Facilities losed	--	0	0	0	2	1	1	0	0	0	1	0	0	1	0
ercury Cell Facilities onverted to Membrane	--	0	0	0	0	0	1	0	0	0	0	0	1	1	1
ercury Used, lb/ton of hlorine Capacity	0.182	0.153	0.129	0.118	0.106	0.102	0.044	0.052	0.056	0.021	0.017	0.020	0.011	0.011	

otes:

Data is collected from only those plants in operation at the end of the calendar year.

Georgia Pacific Corp./Bellingham, WA and HoltraChem Mfg. Co./Reiglewood, NC closed.

HoltraChem Mfg. Co./Orrington, ME closed.

Occidental Chemical Corp./Deer Park, TX closed. Westlake CA&O Corp./Calvert City, KY converted to membrane cell technology.

Occidental Chemical Corp./Delaware City, DE closed.

PPG Industries, Inc./Lake Charles, LA converted to membrane cell technology.

Occidental Chemical Corp/Muscle Shoals, AL closed April 2008. Olin Corp. (formerly Pioneer)/St. Gabriel closed for conversion November 2008

In 2005 U.S. facilities accounted for approximately 12% of the global mercury cell chlorine production capacity (Page 47, *Summary of Supply, Trade and Demand Information on Mercury*, UNEP, November 2006).

Projections based on publicly available announcements. ERCO Worldwide/Port Edwards, WI scheduled for conversion to membrane cell technology in 2009.

Mercury sales by closed facilities are not considered as an offset against mercury purchases.

ton = 2,000 lb

Table 2
Mercury Balance and Release[1, 2]
Chlor-Alkali Industry - Mercury Cell Process (in tons)

		2002	2003	2004[4]	2005	2006[5]	2007[6]	2008
1	Mercury Virgin Inventory as of Jan 1	67	46	166	90	44	21	19
2	Mercury Process Inventory as of Jan 1	2,478	2,593	2,654	2,493	2,561	2,082	1,376
3	Total Mercury Inventory as of Jan 1 [3] = [1] + [2]	2,545	2,639	2,820	2,583	2,605	2,103	1,395
4	Mercury purchases during calendar year	130	219	38	32	29	46	0
5	Total Mercury Available [5] = [3] + [4]	2,675	2,858	2,858	2,615	2,634	2,149	1,395
6	Mercury Virgin Inventory at on site storage as of Dec 31	46	166	96	45	34	21	13
7	Mercury Process Inventory as of Dec 31	2,593	2,654	2,748	2,560	2,579	2,102	1,376
8	Total Mercury Inventory as of Dec 31 [8] = [6] + [7]	2,639	2,820	2,844	2,605	2,613	2,123	1,389
9	Mercury Transferred Out[3]	0	0	1	0	9	19	1
10	Total Mercury Used (Consumed) [10] = [5] – [8] - [9]	36	38	13	10	12	7	5
11	Mercury Released to the Environment (TRI)	8	8	7	7	9	3	3
12	Mercury Contained in Products	0	0	0	0	0	0	0
13	Total Mercury Losses to Environment and Products [13] = [11] + [12]	8	8	7	7	9	4	3
14	Unaccounted for Mercury [14] = [10] – [13]	28	30	6	3	3	4	2

Notes:

[1] Data is collected only for facilities in operation at the end of the calendar year.

[2] Numbers may not add due to rounding.

[3] Sent off-site for recovery, not returned during calendar year.

[4] 2004 ending inventory does not equal 2005 beginning inventory due to shutdown of Delaware City, DE facility.

[5] 2006 ending inventory does not equal 2007 beginning inventory due to conversion of Lake Charles, LA facility.

[6] 2007 ending inventory does not equal 2008 beginning inventory due to closure of Muscle Shoals, AL and conversion of St. Gabriel, LA facilities.