Hibbing Taconite Company

Voluntary Mercury Reduction Agreement

Date: 12/20/00

1. Introduction

Hibbing Taconite recognizes that the goal of industry participation with the Minnesota Pollution Control Agency (MPCA) in this mercury reduction agreement will reduce Minnesota mercury contamination. The Mercury Reduction Initiative's legislated goal is to reduce Minnesota mercury releases 60% by 2000 and 70% by 2005, using 1990 as a baseline. These are beneficial goals in the broader view of U.S. and worldwide mercury contamination. Hibbing Taconite will continue to conduct research to determine the feasible options that may allow it to reduce mercury releases from its facility.

As discussed in more detail in Section 3, the state's goal (using 1990 as a baseline) of mercury reduction presents Hibbing Taconite with a choice on where to focus its research efforts. Because Hibbing Taconite does not have baseline data from 1990, it could attempt to ascertain the mercury releases from this period, mercury releases that it believes are higher than 2000. However, Hibbing Taconite believes a more sound research approach is to focus on how to reduce its mercury emissions from the present value.

If a national/international program or agreement is signed after this State based agreement is implemented, it is Hibbing Taconite's need that its work be "credited" towards that broader goal. It must also be recognized that this document is dynamic and responsive. The agreement will be revised as either more is learned about mercury or adjustments are made to Hibbing Taconite's processes.

This voluntary mercury reduction plan is primarily based on the material presented in the taconite industry's options in the Mercury Advisory Council's Source Reduction Feasibility and Reduction Strategies Report (SRFRS). However, Hibbing Taconite's voluntary agreement only lists those options that are either chosen for reasons of feasibility or conducted to obtain more information. If Hibbing Taconite has made historical mercury reductions, these will be noted throughout each section.

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2. Hibbing Taconite Background

Hibbing Taconite Company, an unincorporated joint venture managed by Cliffs Mining Company, is located approximately 3 miles to the North of the City of Hibbing in St. Louis County. Hibbing Taconite commenced operations in 1976, with the major operating areas described below:

- Taconite ore mining (materials loaded and transported by haul trucks),
- Crushing (reducing the size of the blasted ore),
- Grinding (reducing the crushed rocks to a sand consistency),
- Concentrating (accomplished by magnetic separators, upgrading the 25% iron in the ore to 66% iron),
- Balling (the iron concentrate, with the addition of limestone and clay, is formed into 3/8 – 1/2 inch moist balls), and
- Pelletizing/Heat-hardening (allows for transfer by rail car and Great Lakes fleet without damage – the end result is a dry, round, solid, gray 3/8 – 1/2 inch ball).

Hibbing Taconite produces on average 8 million Dry Long Tons (DLT) of standard pellets per year. Since plant startup, Hibbing Taconite's annual pellet total has been as high as 8.6 million tons (1988) and a low of 4.1 million tons (1983). This annual production variation results from Hibbing Taconite's competition against a global market. On an annual basis, it is susceptible to global economic concerns and makes any prediction of future pellet production and mercury emissions extremely difficult.

Therefore, the primary means that Hibbing Taconite will use to track mercury emissions is a unit-basis factor (pounds Hg / million DLT pellets), as it is a better indicator if performance (mercury reduction) is improving than annual emissions (secondary means).

3. Taconite Ore Beneficiation

The process of upgrading the taconite ore is called beneficiation. Hibbing Taconite handles millions of tons of naturally occurring materials each year. Because these materials have trace mercury concentrations – similar to any common rock (ppb-part per billion), the cumulative effect is that there are measurable mercury releases from the pelletizing furnace. Through the process of heat hardening in the pellet furnace, the trace amounts of mercury (in the iron-bearing material, the clay, and the limestone) volatize from a solid to a gas. Hibbing Taconite uses a dry dust collector to remove coarse dust particles as a pretreatment before the furnace exhaust air goes through the wet (venturi-rod) scrubber to remove the finer dust particles, including some acid gas removal.

During 1996-1997, Hibbing Taconite participated in the research program with the Natural Resources Research Institute's (NRRI) Coleraine Minerals Research Laboratory (CMRL) to perform a mass balance of mercury from the pellet furnace. Based upon the analysis of the furnace inputs and outputs, NRRI calculated an estimated emission factor of **32 pounds Hg / million DLT pellets** at Hibbing Taconite.

In order to obtain a direct mercury emission factor, Hibbing Taconite performed a stack test during September 1998 with speciation. The Energy and Environmental Research Center (EERC), a leader in Midwest mercury testing, monitoring, and control development, performed the mercury emission stack test, the only stack test of its kind performed on a taconite pelletizing furnace to this date. The results of this study are that of the measured total **27.5 pounds Hg stack emission / million DLT pellets produced**, less than 0.05 pounds is particulate mercury, less than 1.9 pounds is oxidized mercury, and 25.5 pounds is elemental mercury. The study also demonstrated that 70-80 percent of the oxidized mercury was being collected in the wet scrubber, thus removing it from the furnace exhaust gas. The management of scrubber water will be discussed in the tailing basin section.

The opinion of the scientific community is that elemental mercury does not have a local or regional effect on mercury contamination, because of its long life in the atmosphere (greater than 1 year). Elemental mercury constitutes 93 percent of Hibbing Taconite's stack mercury content, thus indicating that its air releases are not affecting Minnesota mercury contamination. It has also been demonstrated that the existing pollution control devices do not remove the elemental mercury from the gas stream.

Historical Concentrator Improvements

The 1997 NRRI study also sampled the inputs (crushed crude ore) and outputs (concentrate and tailing) of the Concentrator during 1996 and 1997. The averages of these tests show that 81 percent of the mercury in the crude ore reports in the slurry to the tailing basin. Hibbing Taconite has invested in several projects in the concentrating process since 1989 that we believe may have reduced the amount of mercury in the concentrate.

This belief has basis in the 1997 NRRI study. In the study, another taconite mine had more mercury in its taconite ore but less mercury in its concentrate than Hibbing Taconite, thus resulting in lower mercury air releases. It is our opinion that the finer size material (grind) produced by its current Concentrator operations more closely resembles the other mine's process.

During the period 1989-2000, Hibbing Taconite invested in numerous upgrades in the Concentrator to produce historical concentrate levels. Throughout the 1990s, the silica particle grain and the iron particle grain are becoming similar in size as Hibbing Taconite continues to mine its ore reserves. This requires the ore to be ground to a finer consistency as discussed above.

The main difficulty in calculating the 1990-2000 reduction is that Hibbing Taconite does not have mass balance or stack test information from 1990 to serve as a baseline. That stated, it is difficult to "scientifically" demonstrate that the finer concentrate grind in 2000 contains less mercury than the coarser grind of 1990. However, the difference of the 1996 mass balance to the 1998 stack test provides evidence of a reduction of 4.5 pounds total Hg stack emission / million DLT pellets. As stated previously, NRRI's mass balance was performed during 1996-1997 and Hibbing Taconite does not have any other mass balance tests prior to this.

Voluntary mercury reduction action

1998 - Hibbing Taconite has conducted the only taconite industry speciated mercury stack test during 1998, which resulted in greater insight to the amount and form of the mercury being released.

2000-2001 – To ensure that the results of future mass balances can be confidently used, Hibbing Taconite will participate with other taconite facilities, the MN Department of Natural Resources, and the MN Natural Resources Research Institute to develop standards for mercury analysis of taconite materials, such as ore, pellets (unfired and fired), and tailing. Future mass balance studies can then use these reference standards to calibrate the laboratories results.

2001 - Hibbing Taconite will analyze the process materials sampled during the 1998 stack test to determine if the mass balance also demonstrates a decrease from 1996 to 1998.

2001-2005 - Conduct periodic samples of mercury concentrations in the pellet furnace input and outputs. The sampling will commence after the DNR Cooperative Environmental Research reference standard study has been completed. Results of the samples will be communicated in the annual report.

2001-2005 - Hibbing Taconite will participate in other taconite industry research. First, how have historical (and future) Concentrator investments affected the mercury concentrations in the concentrate? Second, what is the temperature dependence of mercury green pellet volatilization? Hibbing Taconite will evaluate each proposed project as research funds become available and cannot commit to specific projects beyond the current commitments.

2001-2005 - Hibbing Taconite will conduct an additional mercury stack test during the period to provide a direct measurement of mercury air emissions.

4. Tailing Basin

As discussed above, the majority of the mercury in the taconite ore is separated at the Concentrator, and reports as a solid particle (tailing) to the enclosed tailing basin. In addition, the pelletizing furnace scrubber water, which captures 70-80 percent of the oxidized mercury in the furnace exhaust, also reports to the tailing basin.

The tailing basin at Hibbing Taconite is a completely enclosed containment structure. The basin is divided by internal dams into smaller cells that allow the solids to separate from the water. A water pumphouse recycles over 120,000 gallons per minute for re-use in the process. The only discharge from the tailing basin is through engineered seeps that allow water to drain through the embankment to protect the exterior dam stability. Hibbing Taconite also has two siphon discharges that are used only for short durations to protect the exterior dam safety as required by MN Department of Natural Resources Rules. Hibbing Taconite samples all of the discharge points in accordance with the MPCA issued water discharge permit.

Research has also been conducted on the fate of the mercury in the tailing basin and the tailing basin water discharges at other taconite facilities using low-level detection mercury water samples in and around the tailing basin. These samples indicate that the mercury reporting to the tailing basin is not being released into the water outside of the tailing basin. In fact, the waters in these streams contain less mercury than nearby lakes and streams.

The next step is to perform testing inside the tailing basin to determine if the mercury in the water and tailing is being released (evading) as an air emission. Preliminary results indicate that the mercury in the tailing basin is not evading, and that amount deposited from the air is equal to the amount released from the land.

Voluntary mercury reduction action

Because other mines have already conducted low-level mercury water tests and have found the levels to not be of a concern, Hibbing Taconite will focus its limited research efforts elsewhere and not duplicate these tests at its facility.

2000 – Hibbing Taconite has partnered with other taconite facilities, the MN DNR, and the MPCA to sponsor the MPCA's screening study of the tailing basin flux. The MPCA will issue a preliminary and final report through the DNR.

2000-2005 – The implications that future process control methods (if feasible controls are discovered) have for the tailing basin mercury fate will play an integral role before, during, and after any such process control test is conducted.

5. Mercury Containing Products

Hibbing Taconite, a large industrial complex, has historically used many products that contain mercury. Such devices are thermometers; thermostats; pressure, tilt, and relay switches; batteries; and fluorescent and high intensity discharge (HID) lamps. Hibbing Taconite has previously used a chemical for iron determination (assay) that contained mercury (mercuric chloride). Through normal application, other materials (such as cleaners and dust control chemicals containing trace amounts of mercury) are placed on land and/or water. The MPCA also reviews these chemicals, and provides its comments and approvals for new product requests.

Historical Mercury Product Reductions

The use of mercuric chloride was phased out during 1995 through the action of Hibbing Taconite and the Cliffs Mining Services Company Research Lab to change the ASTM reference standard to a non-mercury method. The waste generated from the iron analysis resulted in the generation of twelve 55-gallon drums per year that contained approximately a total of **5 pounds of mercury** by weight. This material was shipped to a hazardous waste treatment facility.

Hibbing Taconite has also been recycling fluorescent and HID lamps since 1992. On average, Hibbing Taconite recycles 735 pounds (1700 4-foot lamps) of fluorescents and 440 pounds (500 lamps) of HID lamps per year. Assuming 45 mg per lamp during 1990, this equates to nearly **3 pounds of mercury per year**. In addition, improved handling practices have reduced breakage and potential releases.

Hibbing Taconite currently has approximately **45 pounds of mercury** collected during the last 9 years from replacing mercury-containing products. This material will be shipped out the first quarter 2001.

Voluntary mercury reduction action

2000-2001 – A mercury Purchasing Policy will be developed and implemented. This policy will inform HTC's suppliers of Hibbing Taconite's mercury reduction agreement, and require the supplier to identify their products as containing or not containing intentionally added mercury.

2000 – Hibbing Taconite will conduct an inventory of mercury containing products by site inspection, employee interviews, and review of engineering drawings.

2001 – A mercury product log will be developed to track the location of these devices and allow for proper waste management.

2001-2005 – HTC will develop a matrix to classify the risks of an environmental release, and proactively remove/replace those items identified as being a "high risk" for environmental release. Future mercury shipments will be documented to ensure HTC is keeping an accurate record of the efforts. Testing the low mercury containing (5 mg/bulb) fluorescent lamps is one part of this replacement practice.

6. Employee Outreach/Education

Hibbing Taconite recognizes that mercury education is the most important effort needed to change people's actions regarding mercury and mercury waste management. Because Hibbing Taconite was an initial member of the Minnesota Mercury Contamination Reduction Advisory Council, tremendous amounts of information have already been distributed at Hibbing Taconite and other taconite facilities through the presentations and materials handed out at the Mercury Advisory Council meetings.

Hibbing Taconite will make its employees aware of the importance of managing mercury products in the correct manner, and inform them of the potential health risks of mercury.

Voluntary mercury reduction action

1999-2005 – Hibbing Taconite will monitor progress and development of mercury control technology through continued involvement in state and federal workgroups.

2000-2005 – Hibbing Taconite started the operation (December 1, 2000) of an **onsite Mercury Recycling Center** for its **employees** to recycle their mercury containing products. The longevity of this recycling center is dependent upon the employees proper use of the Center. The items collected from this effort will be tracked separately from the rest of Hibbing Taconite's products to maintain a separate accounting of the items removed from the environment.

2000 – A mailing was sent to all employees on awareness of both mercury's background and of the Mercury Recycling Center's start of operations.

2001-2005 – Future employee educational materials will be distributed as needed, and mercury device (mercury for non-mercury thermometers) swaps may be evaluated and implemented.

7. Community Outreach/Education

As stated above, education is the key in order for Minnesota to make a difference in mercury contamination and mercury release reduction. Hibbing Taconite and the Iron Mining Association, have organized and held several meetings of groups interested in reducing mercury in the environment. Participants in this diverse group are the Western Lake Superior Sanitary District (WLSSD), St. Louis County and Lake County Solid Waste Departments, the Institute for a Sustainable Future, Minnesota Power, The Office of Environmental Assistance (OEA), and the taconite facilities.

The purpose of the meetings is to identify the existing solid waste collection programs specific to mercury, to identify the gaps in that collection effort, and to determine if taconite, and Hibbing Taconite in particular, could assist the County's efforts in any manner pertaining to collection and education.

Voluntary mercury reduction action

1999-2005 – Continue to discuss with the respective solid waste and interested parties how Hibbing Taconite can best add to their efforts without duplicating them.

1999-2005 – Continue to develop mercury awareness materials and provide information at industry trade group meetings. Inquire of local schools if they are interested in mercury awareness presentations. Partner with local schools on other environmental awareness issues (such as the GTE grant for the Hibbing High School).

2000-2005 – Continue to pursue mercury reduction efforts at healthcare and schools, possibly partnering with these facilities in the cost and/or knowledge required to replace the mercury containing devices.

8. Summary and Reporting

Hibbing Taconite's voluntary reduction efforts are extensive, both multi-media focused, and internal/external focused. To summarize the program, Hibbing Taconite is researching the items we do not know how to control, reducing the items we do know how to control, and educating its employees and the greater community. The research is focused on reducing mercury air releases from the present date, not the historical reduction from 1990 to 2000. A summary of the voluntary mercury reduction agreement action items is listed on page 8.

If either a voluntary mercury reduction agreement is issued on a national or international basis, or if the expanded programs should become a regulatory requirement, Hibbing Taconite's efforts during this state-specific program should be credited towards any future reduction requirements.

Annual reports will be submitted by March 31 documenting the mercury reduction activities and reduction amounts during the previous year. As of the date of this agreement, the format of the report has not been finalized, however, a proposed draft is provided on page 9.

Summary of Hibbing Taconite's Voluntary Mercury Reduction Agreement

Area	Year	Description	Outcome
Process – Pelletizing	1998	Ontario-Hydro mercury stack test	Obtain speciated Hg releases
Process – Mine wide	2000-01	Material reference standards	Will be used for more reliable future mass balance studies
Process – Pelletizing	2001	Pelletizing material mass balance	Will obtain results to verify if HTC reduced Hg releases 1996-1998
Process – Pelletizing	2001-05	Pelletizing material samples	Provide background on the iron ore concentrate variability and trending
Process – Mine Wide	2001-05	Industry-wide basic, applied research and technology investigations	Provide greater understanding of the feasibility of reducing mercury releases
Process – Pelletizing	2000-05	Pellet furnace mercury stack test	Provide another method to determine mercury air emissions
Process – Tailing Basin	2000	Tailing basin flux study	Provide details if mercury that enters the tailing basin will remain sequestered
Process – Tailing Basin	2000-05	Tailing basin mercury fate	If any process control strategy is implemented, the fate of mercury in the tailing basin will be accounted
Products	2000-01	Purchasing policy	Reduce the amount of new mercury products that HTC uses
Products	2000	Mercury product inventory	Allow an accurate accounting of devices in use
Products	2001	Mercury product log	Allows personnel to manage the devices properly
Products	2001-05	Mercury risk matrix	Allows for the removal of high risk items
Education	1999-2005	Mercury control scanning	Stay current on potential mercury control technology
Employees	2000-05	Mercury product recycling center	Reduces potential mercury release and contamination
Employees	2000-05	Mercury awareness mailings	Increases mercury awareness
Employees	2002-05	Mercury device swaps	Will be evaluated and implemented if reasonable
Community	1999-2005	State and county mercury waste meetings	Add to the mercury collection efforts and improve awareness
Community	1999-2005	Presentations	Increase mercury awareness in Minnesota
Community	2000-05	Healthcare/School mercury replacement programs	Reduce the amount of mercury in use in Minnesota

Hibbing Taconite Company Mercury Release Inventory

Rev 3 12/14/00

	Taconite Process			Iron Analysis Chemical			Mercury Products - Lamps			
Year	Mercury Emission Factor (lbs. Hg / MM DLT)	Pellet Production (MM DLT)	Mercury Releases (pounds)	Mercury Equivalent Used (pounds)	Mercury Releases (pounds)	Mercury Release Reduction (pounds)	Lamps Removed from Service (pounds)	Lamps Recycled unbroken (pounds)	Mercury Releases (pounds)	Mercury Removed From Landfill (pounds)
1990	32.2	8.15	262	5	0.5	0	1173	0	0.53	0.00
1991	32.2	8.02	258	5	0.5	0	1173	0	0.53	0.00
1992	32.2	7.80	251	5	0.5	0	1173	306	0.41	0.69
1993	32.2	7.24	233	5	0.5	0	1266	1187	0.16	2.69
1994	32.2	8.19	264	5	0.5	0	1177	1058	0.19	2.40
1995	32.2	8.39	270	2.5	0.25	0.25	1508	1458	0.06	1.54
1996	32.2	7.91	254	0	0	0.5	917	892	0.04	0.94
1997	32.2	7.48	241	0	0	0.5	1974	1913	0.08	2.02
1998	27.5	7.61	209	0	0	0.5	814	786	0.04	0.83
1999	27.5	6.64	182	0	0	0.5	939	914	0.04	0.97
2000	27.5	8.0	220	0	0	0.5	784	756	0.01	0.19
2001	27.5	7.9	217	0	0	0.5			0.01	
2002	27.5	7.9	217	0	0	0.5			0.01	
2003	27.5	7.9	217	0	0	0.5			0.01	
2004	27.5	7.9	217	0	0	0.5			0.01	
2005	27.5	7.9	217	0	0	0.5			0.01	
2000 mercury reduction			42			0.5			0.52	
2005 mercury reduction			45			0.5			0.52	

Actual

Planned

	Mercury Products – Devices				Mercury Products – Employees						
Year	Devices Removed From Service (pounds)	Devices Recycled (pounds)	Mercury Releases (pounds)	Mercury Removed from Landfill (pounds)	Devices Removed From Service (pounds)	Devices Recycled (pounds)	Mercury Releases (pounds)	Mercury Removed from Landfill (pounds)	Total Mercury Releases (pounds)	Total Mercury Releases Reduced (pounds)	Percent Mercury Releases Reduced (%)
1990	ND	5	0.75	5	Unknown	0	Unknown	0	264.0	0	0
1991	ND	5	0.75	5	Unknown	0	Unknown	0	259.7	4.4	2%
1992	ND	5	0.75	5	Unknown	0	Unknown	0	252.6	11.4	4%
1993	ND	5	0.75	5	Unknown	0	Unknown	0	234.4	29.6	11%
1994	ND	5	0.75	5	Unknown	0	Unknown	0	265.0	-0.9	0%
1995	ND	5	0.75	5	Unknown	0	Unknown	0	270.9	-6.8	-3%
1996	ND	5	0.75	5	Unknown	0	Unknown	0	255.3	8.8	3%
1997	ND	5	0.75	5	Unknown	0	Unknown	0	241.5	22.6	9%
1998	ND	5	0.75	5	Unknown	0	Unknown	0	210.0	54.0	20%
1999	ND	5	0.75	5	Unknown	0	Unknown	0	183.3	80.8	31%
2000		5	0.75	5	Unknown		0	0	220.6	43.4	16%
2001		5	0.75	5	Unknown		0	0	217.9	46.1	17%
2002		5	0.75	5	Unknown		0	0	217.9	46.1	17%
2003		5	0.75	5	Unknown		0	0	217.9	46.1	17%
2004		5	0.75	5	Unknown		0	0	217.9	46.1	17%
2005		5	0.75	5	Unknown		0	0	217.9	46.1	17%
2000 mercury reduction			8.25				0			43.4	16%
2005 mercury reduction			12				0			46.1	17%

Actual

Planned

Notes:

Taconite Process - MM = million, planned production for years 2001-2005 8.1 million WLT = 7.9 million DLT (2.5% water reduction)

Iron Assay Materials - 10% release factor because of the combination of incomplete product recovery & lost through the waste treatment facility process.

Iron Assay Waste Treatment – neutralization and metals recovery

Lamps - 4' bulbs 1990-1994 45 mg, 1995-1999 21 mg, 2000-05 5 mg; HID (mercury vapor & high pressure sodium) lamps 2x the mercury per period.

Lamps - breakage rate 1990-1994 10% fluorescent, 10% HID; 1995-2005 2% fluorescent, 5% HID – breakage 50% mercury available as a release.

Lamps - 2.5% mercury lost through recycling process; before recycling 15% lost through solid waste management (landfill)

Lamps - 1990-92 usage not recorded - the annual usage is the average usage from 1993-1999.

Mercury Devices - ND - Not documented, during the last 9 years, approximately 45 pounds of mercury has been removed from service ~ 5 lbs./year

Mercury Devices - 15% assumed to be released if not recycled.

Mercury Devices – Employees - Recycling Center started 12/1/2000