

Don Murray – Presentation to the Binational Toxics Strategy Workshop

Mercury Reduction for Lake Superior
Lake Superior Binational Program

Prepared by W. Donald Murray

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- The “Mercury Reduction for Lake Superior” project came about from a joint meeting between industry, the Lake Superior Binational Forum and the Lake Superior Binational Program government agency partners.
- They recommended that a more focused project to reduce mercury entering the Lake Superior watershed was needed.

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- Representatives of these three groups researched and prepared the booklet “Mercury Reduction for Lake Superior”.
- This booklet outlines recommendations on how the program should be delivered.

MERCURY REDUCTION FOR LAKE SUPERIOR



LAKE
SUPERIOR



BINATIONAL
PROGRAM

2005

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- The Forum provided a framework for delivery of the program based on advice from industry, which included the important principal that the program be implemented on a voluntary basis.
- The Forum also suggested providing advice from industry peers as the means to deliver the program.

From Mercury Brochure

- *What are we offering?*
- *This project offers non-regulatory pollution prevention technical assistance to conduct inventories, develop change-out plans and provide the opportunity to recycle all mercury.* Industry members of the Lake Superior Binational Forum, multistakeholder group of US and Canadian citizens will serve as mentors for this phase-out project. We offer
 - * Mentoring and advice from industry peers
 - * Guidance in conducting an inventory
 - * Information on potential mercury devices
 - * Information about disposal options
 - * Opportunities for mercury product collections
 - * Assistance in complying with laws
 - * Recognition as a mercury reduction partner.

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- Background on Don Murray
 - 26 years with the Ont. Min. of the Environment
 - Last 16 years District Manager Thunder Bay/Kenora
 - Active in Pulp and Paper issues, policy development
 - Known to mill managers and environmental coordinators at facilities in the basin
 - active on the Lake Superior Binational Forum
 - Five years as Manager of Env. Affairs at a large pulp and paper facility
 - Helped establish the Environmental Coordinators on Superior (ECOS) group
 - Implemented a large water/effluent reduction program and an odour reduction program
 - Chair of the Board of Directors for EcoSuperior
 - Chair of the Steering Committee for EarthWise Thunder Bay

Facilities to be Contacted

- The Forum wanted some focus on the Transportation sector
- A contact list was prepared with input from all the participating groups
- Included major industries on the north shore of Lake Superior, including some know to be ceasing operations
- Some small industry was included to assess the need for future programs

Contact List

- **Thunder Bay:**

- Abitibi-Consolidated – Ft. Wm. Div.
- Bowater Canadian Forest Products Inc. – T. Bay
- Cascades Fine Papers Inc. – T. Bay
- Ontario Power Generation – T. Bay
- City of Thunder Bay, Ontario
- Thunder Bay Harbour Commission – Keefer T.
- Thunder Bay Terminals
- ERCO Worldwide (closing in June 2006)
- Great West Timber
- Northern Hardwoods
- Cargill Grain Elevator
- Port Arthur Ship Building Co.

- **North Shore:**

- Lac Des Isle Mine
- Norampac – Red Rock
- K_C Terrace Bay
- Marathon Pulp _Kruger
- Williams Operating Corp. – Hemlo
- Newmont Operating– Hemlo
- St. Mary's Paper S.S.M.

- Algoma Steel S.S. M.

Initial Contacts

- Facilities were contacted by telephone to tell them about the program and convince them they should participate and arrange an initial visit – there was much initial skepticism
- In several cases an initial phone call was followed up with a mail out of the Mercury Brochure and other information
- Facilities had to be convinced that there was still mercury on their site and that participation in this program was in their best interest
- A workshop date was suggested

Workshops

- Initially 1 ½ -2 hours, later 1 hour
- Start on time, end on time
- Low tech, no overheads or PowerPoint

Workshop Agenda

Agenda – Mercury Reduction Meeting

Opening remarks -Don Murray

Review of the brochure “Mercury Reduction for Lake Superior”

Recycling efforts to reduce Mercury

- fluorescent tubes
- batteries
- wall thermostats
- others

Laboratory Practices

Purchasing Policies

Review of mercury containing equipment in use and potential for replacement

Wrap Up – Don Murray

In attendance:

Name

Signature

Phone No.

e-mail address

Why the Focus on Mercury

- Information on the **nine chemicals of concern** was presented as follows. Generally they are all bioaccumulative and build up in the sediments in the deep basins of Lake Superior. It will take a great many years for these contaminants to break down in the cold water which is devoid of sunlight. Each chemical is discussed as follows;

Pesticides – Chlordane, DDT, Dieldrin/Aldrin, Toxaphene

- banned from production in the mid 80's
- banned from sale in North America late 80's
- Binational Program instituted “clean sweeps” to collect pesticide residuals that farmers and gardeners may have in storage
- considered under control

Octachlorostyrene, Hexachlorobenzene

- contaminants formed during chlorination of organic chemicals to produce pesticides etc.
- levels have been decreasing with the decrease in use of the pesticides
- considered under control

2,3,7,8 TCDD (dioxins and furans)

- controlled through Federal regulations respecting the use of defoamers and treated wood chips (dioxin precursors)
- Federal regulations respecting dioxins concentrations in effluent required the Kraft pulp industry to switch from using elemental chlorine to chlorine dioxide for pulp bleaching. The switch has resulted in a greater than 99% reduction of dioxins in effluents entering Lake Superior
- generally considered under control

PCB's

- used extensively in electrical transformers and capacitors in late 1950's and 1960's
- in-use PCB equipment must be inventoried and reported to the Federal government
- once equipment becomes "waste" it is controlled by Provincial regulations, must be stored in licensed hazardous waste sites, can only be moved with "Director's Instructions" and must be destroyed only at approved hazardous waste disposal sites
- a big cost to removing the last "in use" PCBs is the cost of destruction and the cost of replacing expensive operating transformers and capacitors with non-PCB equipment
- the CCME had suggested 2007 as the date by which the remaining PCB equipment must be removed and destroyed. This date will likely be extended before it becomes law.

This left mercury

- .Mercury is different from the other chemicals in that it is an element which cannot be destroyed through treatment.
- Once it gets into the environment it can change form but can never decay. It can be methylated in sediments under certain conditions and becomes much more bioaccumulative.
- Short term, low dose exposures do not cause health problems. Long term, low dose exposures accumulate in the body and can lead to health problems (see example in the booklet).
- It is still legal to use mercury in many products such as thermostats and children's running shoes with flashing lights in the heels. Mercury that gets into landfill sites with the garbage will eventually leach or evaporate and spread throughout the environment.
- Mercury is controlled as a hazardous waste if collected in large amounts. Most mercury containing equipment goes into landfill sites as individual pieces of equipment.
- There is no legislation to control mercury use in consumer products in Canada.

Benefits for the Company

- Points raised during discussion included the following.
 - The program would provide public recognition for all companies that sign on and make serious efforts to reduce mercury equipment at their site.
 - There are Health and Safety benefits to a company that is proactive in identifying mercury sources and identifying them to their employees. Exercising “due diligence” by identifying sources of mercury will allow workers to take proper precautions when working on the equipment.
 - There would also be a lower potential for spills with the associated cleanup costs and the possibility of losing production during the clean up.

Recycling

- The recycling programs or lack thereof at the facility were reviewed.
 - Fluorescent Tubes
 - use of the company Fluorescent Lamp Recycling (FLR) or sending tubes back to the supplier
 - benefits of having documentation of tube recycling to demonstrate compliance with an Environmental Management System (EMS) or to government inspectors
 - good idea to allow employees to bring in tubes from home

Recycling

Batteries

- should collect everything from button batteries in portable testing equipment to Ni-Cad radio packs
- automotive batteries usually go to a scrap metal dealer
- one recycling company operating in the area is Clean Harbour's with facilities in Winnipeg, Manitoba and Sarnia, Ontario
- this is another program that can be offered to employees

Recycling

Thermostats

- these are found in most offices, lunch and meeting rooms and washrooms
- they typically contain 3-5 grams of mercury
- there could be hundreds in a large facility
- most suppliers of replacements will take the old ones back for recycling
- they can be replaced with an automatic set-back thermostat which can save on heating and cooling costs

Others

- discussion about any other material that is recycled at the site
- Companies were encouraged to contact the contractor if they have problems finding ways to recycle.

Laboratory Chemicals

- Many laboratory chemicals contain mercury in the formulation or as contaminants.
- Pollution Prevention methodology suggests looking for non-mercury or low mercury alternatives. One example is the Chemical Oxygen Demand (COD) test commonly done at pulp and paper mills. The waste from these test kits must be treated as hazardous waste with the ensuing costs for disposal. A new mercury-free COD test kit is available. It must be noted that employees will have to be properly trained on how to use the new kit and that they may be reluctant to learn new methodology.
- Other lab chemicals should be checked for mercury content and replaced with low, or mercury free replacements.

Purchasing Policies

- Any chemicals purchased in totes or larger quantities should be checked for mercury content. Material Safety Data Sheets (MSDS) only list the chemicals with concentrations above the 1% level. Mercury contamination would usually be much less than that. The purchasing department should prepare a letter to go to all chemical suppliers requiring a Certificate of Analysis for mercury (and other chemicals of concern). All chemical suppliers should be able to provide this information. The chemical salespeople at the mills may be unaware that this information is available. No chemicals should be accepted without knowing the concentration of mercury. Chemicals such as Caustic Soda and Sulphuric Acid are used in large quantities at Kraft mills and mercury contamination could be significant (Sappi Fine Papers experience mentioned in the brochure).

Purchasing Policies

- Purchasing officers may be of great assistance when dealing with suppliers when there are questions about equipment that may contain mercury. Once an inventory has been prepared, a list of any equipment that workers are not sure about can be forwarded to the suppliers to confirm whether or not the equipment contains mercury. Once a list of equipment containing mercury has been prepared the purchasing officer can contact the suppliers with a request for mercury-free replacement equipment. Experience has shown that most suppliers can suggest a reliable mercury-free replacement for equipment they sell.

Purchasing Policies

- It was explained to the participants that if they have problems finding mercury-free replacement equipment that they could call the contractor who would check with other contacts and provide assistance.
- Once mercury containing equipment has been identified and a replacement found, the purchasing department should look for any mercury containing parts in inventory and arrange for them to be returned for credit and replaced with the mercury-free parts.

Review of Mercury Containing Equipment in use and Potential for Replacement

Mercury is used in many applications because it has the following properties:

- very dense liquid
- conducts electricity
- expands linearly with temperature and pressure

Mercury is found around large boilers, in equipment such as manometers, flame detectors, and electrical switch gear. In other areas it is found in pressure, tilt, and motion switches, flow meters, sump pumps float switches etc

MERCURY CONTAINING EQUIPMENT IN THE INDUSTRIAL SETTING

Source: A Business Guide to Conducting a Mercury Audit, P3ERIE

1. Accustats
2. Barometers
3. Batteries: mercuric oxide, mercury-zinc, & mercury -cadmium
4. Catalysts for Urethane and Vinyl Production
5. Counterweights
6. DC Watt-Hour Meters
7. Displacement/Plunger Relays
8. Elemental Mercury for refilling mercury-containing equipment
9. Flame Sensors: sometimes found in pilot light and burner assembly on gas-fired furnaces, boilers, unit heaters, space heaters, industrial ovens and in central air conditioning systems
10. Flow Meters
11. Gas Extraction Apparatus
12. Gas Regulators
13. Gyroscopes
14. Hydrometers with thermometers
15. Hydronic and Warm Air Controls with tilt switches such as aquastats, pressurestats, firestats, fan limit controls and pressure/flow controls on air handling units
16. Lamps: florescent, high-pressure sodium, mercury arc, metal halide, ultraviolet and neon (except red, orange and pink)

MERCURY CONTAINING EQUIPMENT IN THE INDUSTRIAL SETTING

Source: A Business Guide to Conducting a Mercury Audit, P3ERIE

1. Level and Rotation Sensors
2. Manometers and Vacuum Gauges
3. Mercury Displacement Relays: sometimes found in street lighting, resistance heating, plastics molding equipment and motors
4. Mercury-Sealed Pistons
5. Microwave Relays/Transmitters
6. Perimeters
7. Pressure-trols
8. Pyrometers
9. Rectifiers
10. Ring Balances
11. Semiconductors, Solar Cells, Thin Film Transistors, Infrared Detectors and Ultrasonic Amplifiers: may contain mercury-cadmium-telluride, mercury-selenide or mercury-telluride that can contaminate electroplating baths
12. Shunt Trips
13. Stokes Gauges
14. Switches and Relays: fire alarm box switches, mercoild control Switches, pressure control switches (mounted on bourdon tube or diaphragm), silent light switches, relay switches, mercury wetted relays, and other float controls, tilt switches, etc.
15. Thermometers: including industrial dial face thermometers with capillary tubes
16. Thermostats and Thermoregulators
17. Transmitters
18. Wastewater Treatment Plant Pivot Arm Bearings

How to Perform an Inventory

- The most important aspect of the program was presenting the workshop attendees with enough information to convince them that there was likely much more mercury on their site than they believed.
- The experience of the three steels mills in Indiana was a good example. Initially, in 1999, these mills did an inventory and found about 1,300 pounds of mercury. Based on this inventory they made commitments to reduce mercury containing equipment. In a January 2004 follow up report, the amount of mercury on the inventory was up to almost 5,000 pounds with 3,000 pounds already recycled.
- Several of the companies that hosted a workshop had already completed mercury surveys and had sent mercury off site for recycling. Following the workshop they agreed that there was much more follow up to be done. With the lack of information on just how much mercury containing equipment might be left on the sites it is not possible at this time to report on how much mercury remains in use.
- Once the company personnel have agreed that there is mercury containing equipment and chemicals on their site the discussion turned to how to best perform the inventory.

How to Perform an Inventory

- Support from the most senior manager at the site is critical to the success of the program. amount of work they have to do. If employees believe that they don't have to take part in this program they won't.
- It was suggested that involving as many employees as possible will yield the best results.
- If the company has a newsletter an article should be prepared (by the environmental department but under the Managers name) that informs employees why the company is taking part in the program and how each of them can contribute to the success of the program. If there is no newsletter, a poster campaign, presentations to smaller groups of employees, tailgate sessions, etc. can be used to get the word out. Each work area should have a representative on a "Mercury Reduction Committee".
- Employees should be encouraged to report any equipment they "suspect" of containing mercury to their supervisor who will then forward the list to the environment department who would prepare the master list.
- The purchasing personnel can also ask the suppliers for potential replacement equipment which is mercury-free.
- Larger industries that have dedicated Environmental and Health and Safety staff were usually knowledgeable in performing audits and inventories. Smaller companies, usually with less than 30 employees, were not experienced in this type of work.

How to Perform an Inventory

- During all site visits, the companies were made aware that they can get the assistance of the contractor at any time. Some examples of the assistance requested include the following.
 - Tags that could be used to identify mercury containing equipment
 - Contacts for recyclers

Mercury Tags

Caution!

Contains Mercury

Report Leaks, Spills to Environment Dept.
Call Environment Dept. when Removing or
Replacing to ensure Proper Recycling”

The tags are printed on Tyvek to be flexible and strong enough to be used in mill and outdoor conditions. They can be used in areas where moisture is present and they resist rot, mildew and many harsh chemicals. They have a metal eyelet to allow attachment to equipment with a plastic wire tie.

Signing on to the Program

- This program is the best option that industry could ask for to control mercury.
- The cost to industry is a small amount of employee's time in preparing the inventory and tagging the equipment.
- The replacement equipment may be slightly more expensive but there will be no disposal costs for hazardous waste. The existing mercury equipment won't have to be replaced until it is worn out
- Workers will be better informed that the equipment they are using contains mercury.
- There will also be lower potential for spills and costly clean-ups.
- The goodwill from the community when the company is recognized for their efforts in a voluntary program is invaluable.

Signing on to the Program

- The site manager or senior employee present was asked to consider signing on to the program.
- The letter was to be sent to the contractor outlining the actions the company would take to perform the inventory and to replace the mercury containing equipment.

Status

21 companies were on the contact list

Signed On to the program 7

Workshop presented 3

Shutting down, no workshop 3

On strike, no workshop 1

Met to discuss previous programs 2

Not interested 3

No contact 1

Not Applicable 1

Recommendations

- For a completed list please see the Final Report
 - **Recommendation #1:** In all cases there will be a need for a follow up program to assess the success of companies in fulfilling their commitments
 - **Recommendation #2:** Any recognition should come after confirming that the companies have fulfilled their commitments and pending company approval.
- One question often asked was “what happens to the mercury when it is recycled?” As more and more equipment is replaced with mercury-free equipment and manufactures stop using mercury, where will the mercury end up? **It will be up to governments to find a means to take mercury off the market and store it in a safe manner.**

Recommendations

- **Recommendation #3:** There is still benefit in taking the mercury reduction programs to the next level.
- **Recommendation #4:** A mercury reduction program should be made available to municipalities in the basin.
- **Recommendation #6:** The head offices of the companies that are closing operations should be contacted to request that they complete a mercury survey before the sale of the property or that they remove all mercury containing equipment from these sites before any demolition.
- **Recommendation #7:** In several cases small companies asked for financial assistance in sending mercury equipment, such as batteries and thermostats, to a recycler. A program should be considered to hire a certified hazardous waste contractor to make a scheduled run through the area to collect mercury wastes from companies that have signed onto the program.
- **Recommendation #9:** The program should be expanded to smaller industries (e.g. grain elevators, sawmills) institutions (college, university, school boards, regional airports) and small businesses. This might better suit combined workshops for several industries or businesses with similar processes and equipment

Recommendations

- **Recommendation #10:** There is a need for educational programs to alert the public and small businesses to the mercury thermostats in their homes and offices; the alternatives, and how to safely and properly recycle this equipment. The recent Environment Canada program to rid school laboratories in the basin of mercury chemicals was successful because the program covered the costs of disposal for the school boards. Small businesses may need a similar incentive to rid their sites of mercury.
- **Recommendation #11:** Follow up with the Lake Freighters Association office in Toronto should take place to ensure that the ships working on Lake Superior have adequate precautions in place to contain mercury and are offered the opportunity to take part in the Mercury Reduction Program for Lake Superior.

Conclusion

- This was a successful first attempt at making businesses in the Canadian Lake Superior Basin aware that mercury containing equipment was prevalent throughout their sites, in equipment they had not considered in the past. There will need to be some follow up to assess how these companies have lived up to their commitments. If the program is to be expanded there should not be any expectations of collecting large amounts of mercury. However, if the Lake Superior Binational Program is to achieve the “zero discharge” goal, there will be a need for additional programs.
- Thanks to Environment Canada for funding this program and for giving me the opportunity to work on it.