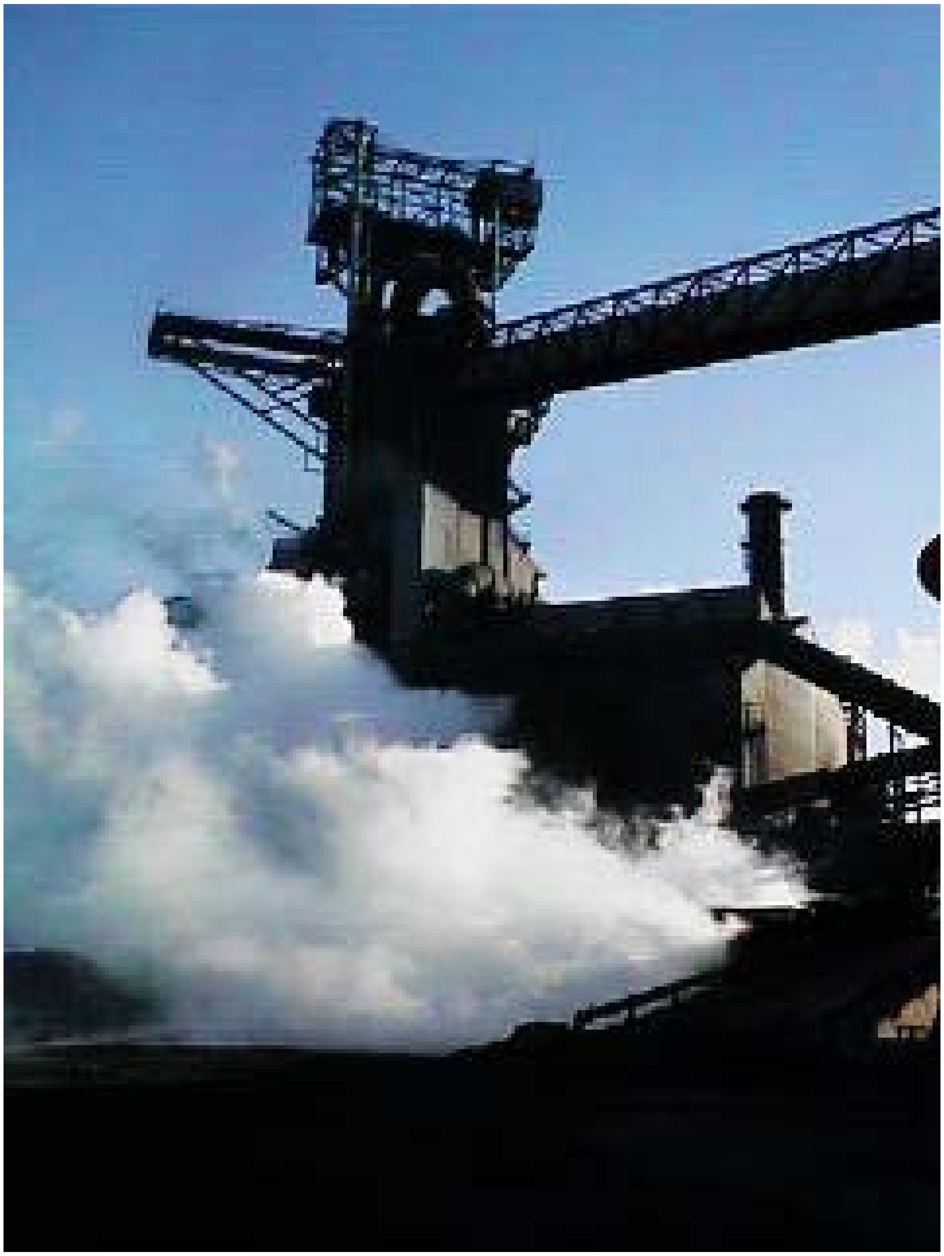
MERCURY AGREEMENT REDUCTION PROGRAM



International Steel Group, Burns Harbor, Indiana
Ispat Inland, East Chicago, Indiana
US Steel, Gary, Indiana

January 2004

TABLE OF CONTENTS

I. Executive Summary

On September 25, 1998 three Northwest Indiana steel mills entered into a unique voluntary agreement with Federal and State agencies and the Lake Michigan Forum in an effort to initiate a mercury pollution prevention initiative at these facilities. This project, coordinated by the Delta Institute, has provided essential information to formulate a methodology for identifying and eliminating the use of mercury in large industrial plants. The initial plan was designed to obtain a 33 percent reduction in mercury usage within two years, a further 33 percent reduction over the next five years, followed by putting a program in place for continued reductions setting a goal of 90 percent-plus reductions within ten years of the project initialization. This effort has resulted in the identification of additional mercury sources within the facilities as well as a concerted effort to exceed the planned reductions. The project has met with genuine enthusiasm in the plants, from management through line personnel and has exceeded initial expectations.

Broader policy efforts, such as the lake wide management planning process and the Binational Toxics Strategy, should help to recruit other companies and facilities to pursue similar work. The time and resources that have gone into this project need not be duplicated by others if a mechanism is put in place to amplify the result of voluntary projects and to share the technical information, such as the availability and effectiveness of substitutions for mercury-containing equipment. The mills hope that such a "tech transfer" function can be facilitated by government agencies participating in the Binational Toxics Strategy.

The mercury project also illustrates the need for greater awareness of the importance of reducing chemicals of concern, such as mercury, throughout the supply chain. Large industries will only be effective in this effort to the extent that suppliers are equally committed to providing cost effective and reliable mercury-free equipment.

II. Introduction

On September 25, 1998 International Steel Group (ISG) Burns Harbor LLC, formerly known as Bethlehem Steel Corporation's Burns Harbor Division, Ispat Inland Indiana Harbor Works, United States Steel Gary Works, the United States Environmental Protection Agency, the Indiana Department of Environmental Management, and the Lake Michigan Forum – a stakeholders group providing input into the Lake-wide Management Plan for Lake Michigan – signed a voluntary agreement known as the Mercury Pollution Prevention Initiative. The Lake Michigan Forum initiated this project as part of their efforts to stimulate pollution prevention efforts in the Lake Michigan basin. The project was coordinated by a nonprofit organization, the Delta Institute, through funding provided by the Joyce Foundation, a private philanthropic foundation headquartered in Chicago. A copy of the Mercury Pollution Prevention Initiative agreement can be obtained at the following Internet address http://www.lkmichiganforum.org/about/wp.php. These three steel manufacturing facilities produce a total of 16 million tons of steel annually, or about 20% of total U.S. production. Collectively they directly employ approximately 15,000 steelworkers, and are responsible for the indirect employment of an estimated 45,000 workers providing necessary supplemental services.

The ISG Burns Harbor Division is located in Burns Harbor, Indiana on Lake Michigan on 1200 acres of land. The company produces hot rolled and cold rolled sheets and coated sheets for the automotive, service center, container, office furniture and appliance markets. Plate products are also produced at the Burns Harbor plant. In 2002, this plant produced 4.7 million tons of steel.

Ispat Inland, located on Lake Michigan in East Chicago, Indiana, on 2200 acres of land produces hot rolled and cold rolled carbon and high strength low-alloy strip, sheets and coated products for use by automotive, appliance, office furniture, and electrical motor manufacturers. The Bar Products division makes special-quality and alloy bar products for automotive, cold-finishing, fastener, forging, industrial machinery, off-highway and agricultural equipment manufacturers. In 2002 Ispat Inland produced 5.8 million tons of steel at the Indiana Harbor Works.

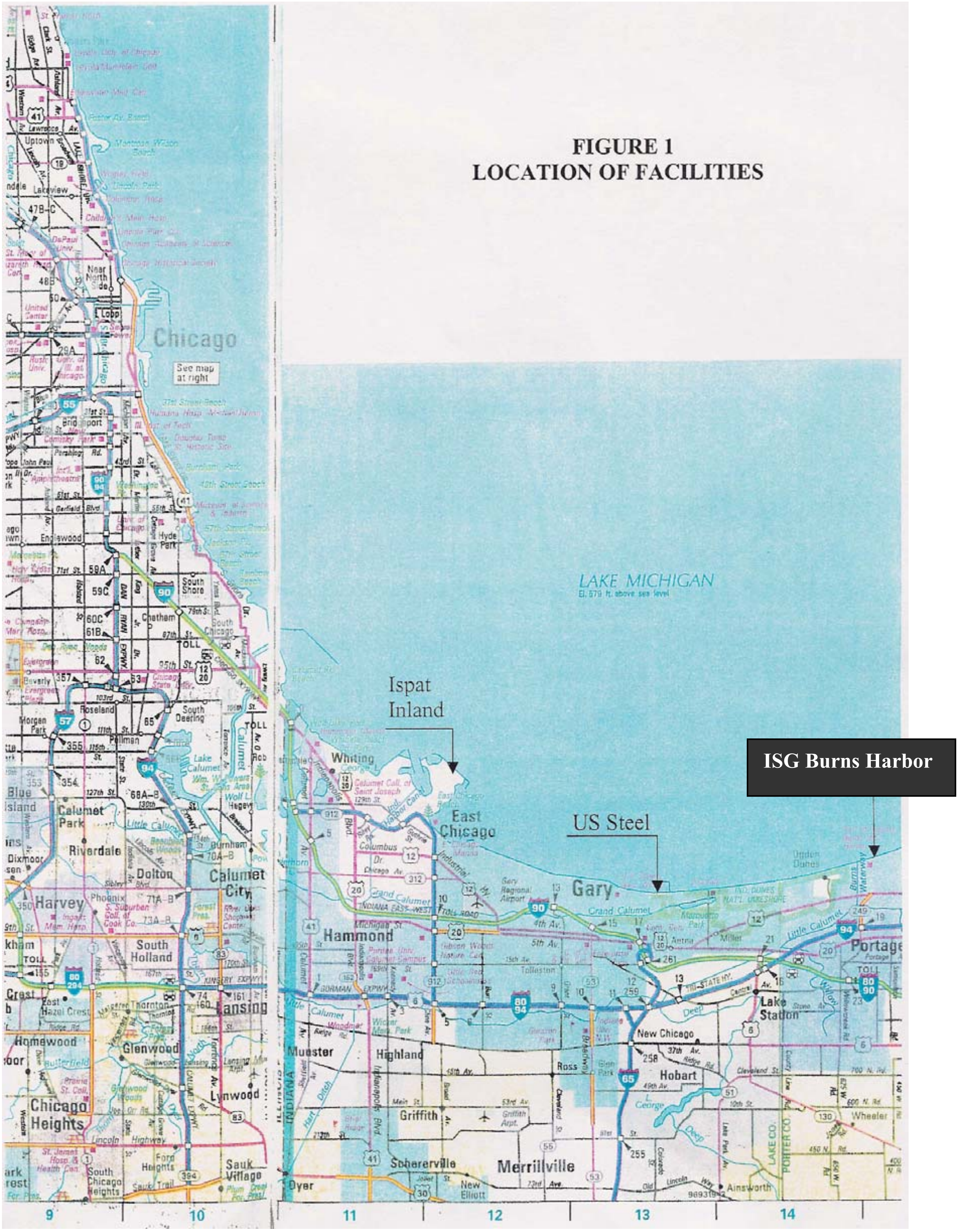
U.S. Steel is located on Lake Michigan in Gary, Indiana on 4,000 acres of land. The Gary Works produces hot rolled and cold rolled carbon and low alloy strip, sheets and coated products for use by automotive, appliance, and office furniture manufacturers. In 2002 the Gary Works produced 6.7 million tons of steel. Figure 1 - "**Location of Facilities"** provides the location of the three subject facilities.

The agreement called for the three participating companies to initiate a process consisting of three essential steps:

A. Conduct an inventory of current and on-going purchases of mercury and mercury-containing equipment and materials, mercury in use at the facilities in equipment, and liquid mercury in storage. In addition, determine the presence of mercury in significant waste streams and revert outputs.[1]
B. Identify, where possible, alternatives to mercury containing equipment and materials, and potential recycling options.
C. Prepare reduction plans that indicate reduction goals, planned actions to reach goals, including an implementation and reporting schedule.

[1] A detection limit of 0.01 ppm for solids and 0.0002 mg/l for liquids was agreed upon by the participating companies prior to testing. In addition, generally available data and vendor information was also used.

FIGURE 1
LOCATION OF FACILITIES



The preliminary inventory was conducted during 1999 with results reported in September, 1999 at the IJC Conference held in Milwaukee. This report presents an update of the current mercury inventory throughout the plants. Following the 1999 IJC Conference through the present time, the mercury identification process has been ongoing and has included additional areas such as abandoned facilities and production areas, which may have been converted to alternate use. This report also provides an update of the results of the Mercury Reduction Program.

III. Summary of Mercury Sources

The objective of this study was to initially inventory sources of mercury in these three plants as thoroughly as could be completed in a limited period of time. As previously noted, this effort was divided into three parts; mercury was identified in 1) purchased equipment and materials, 2) in use and in storage, and 3) in waste streams and revert or recycled outputs. The compiled data, similar for the three plants during the 1999 phase of this inventory, was combined and summarized in the figures and tables presented as the preliminary totals.

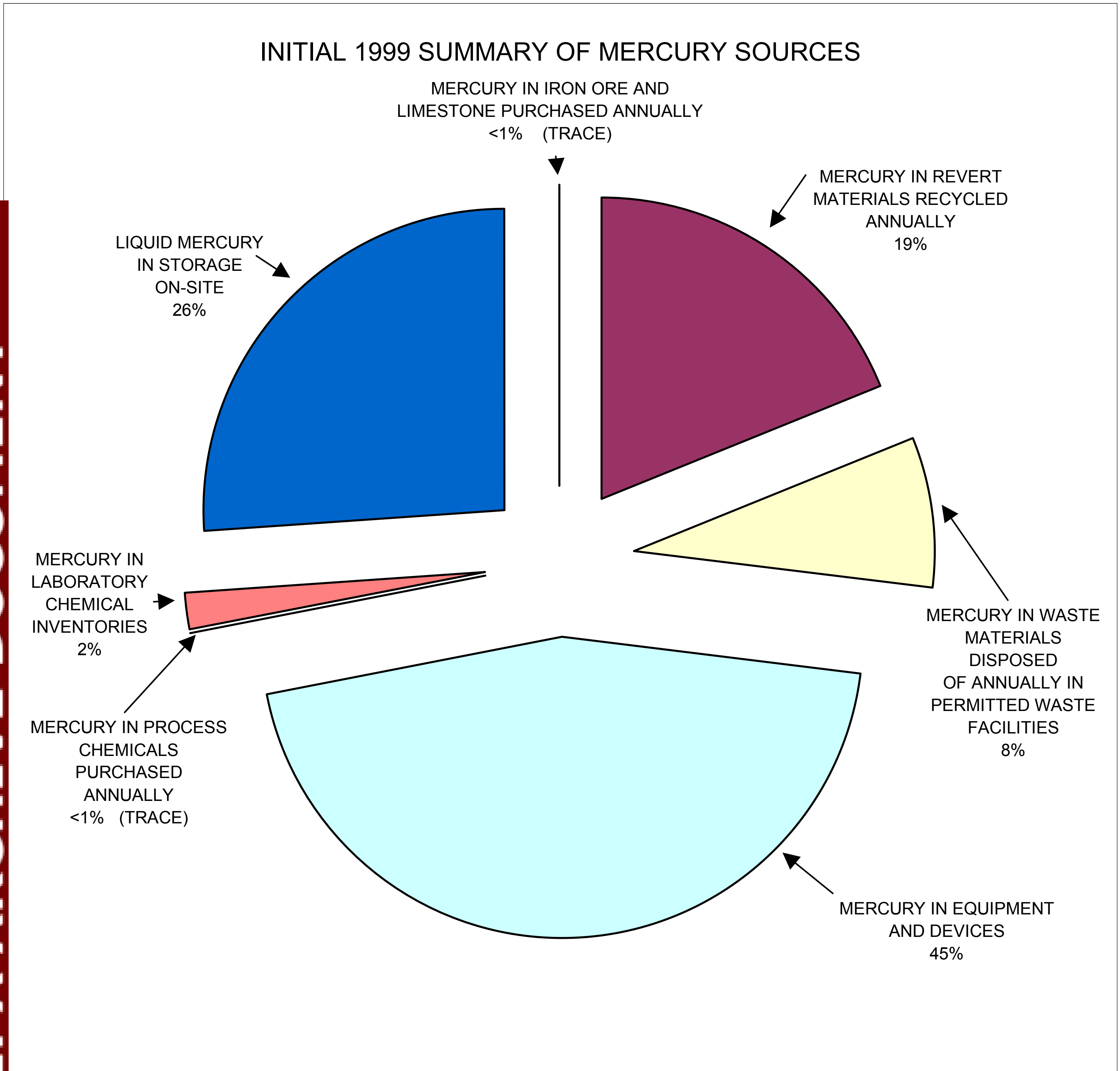
Mercury was found to be contained in a variety of materials at the three mills. Figure 2 – **Initial 1999 Summary of Mercury Sources** - provides a breakdown of the mercury sources as inventoried in 1999. This figure illustrates that approximately 70% all mercury believed to be present in the plants at that time was contained in equipment or in storage. **Figure 3 – Updated 2003 Summary of Mercury Sources –** provides an update of the initial inventory based upon activities conducted from October 1999 to the present time. This update illustrates that the mercury contained in equipment and in storage is approximately 90% of all the mercury present in the plants.

The mercury content of purchased chemicals, iron ore and limestone was found to exist in trace amounts only.[2] Iron ore, limestone and coal are all purchased in large quantities. All participating companies spent considerable time discussing coal but it was ultimately eliminated from the inventory because of the thorough analysis that coal combustion is receiving at the national level. More useful information on mercury in coal will be generated through these efforts than could be provided by the three companies. Furthermore, coal is an essential component of steelmaking for which no substitutes exist.

Annually the three facilities generate an estimated 106 pounds of mercury as trace quantities in solid waste that is disposed in permitted facilities. In general, by analyzing mercury inputs, with quantities recycled and disposed of, an order-of-magnitude mass balance can be determined that accounts for mercury in and out of the plants. A more detailed discussion of mercury sources, and difficulties encountered in the inventory process follows. **Table 1** provides data on the mercury sources at the three facilities that has been updated from the 1999 inventory. Appendix, **"Mercury Content Survey"**, provides a generalized overview of mercury content of materials that may be used by these mills.

[2] Trace < detection limit of 0.01 ppm for solids and 0.0002 mg/l for liquids.

FIGURE 2


INITIAL 1999 SUMMARY OF MERCURY SOURCES
MERCURY IN IRON ORE AND LIMESTONE PURCHASED ANNUALLY <1% (TRACE)
MERCURY IN REVERT MATERIALS RECYCLED ANNUALLY 19%
LIQUID MERCURY IN STORAGE ON-SITE 26%
MERCURY IN LABORATORY CHEMICAL INVENTORIES 2%
MERCURY IN WASTE MATERIALS DISPOSED OF ANNUALLY IN PERMITTED WASTE FACILITIES 8%
MERCURY IN PROCESS CHEMICALS PURCHASED ANNUALLY <1% (TRACE)
MERCURY IN EQUIPMENT AND DEVICES 45%

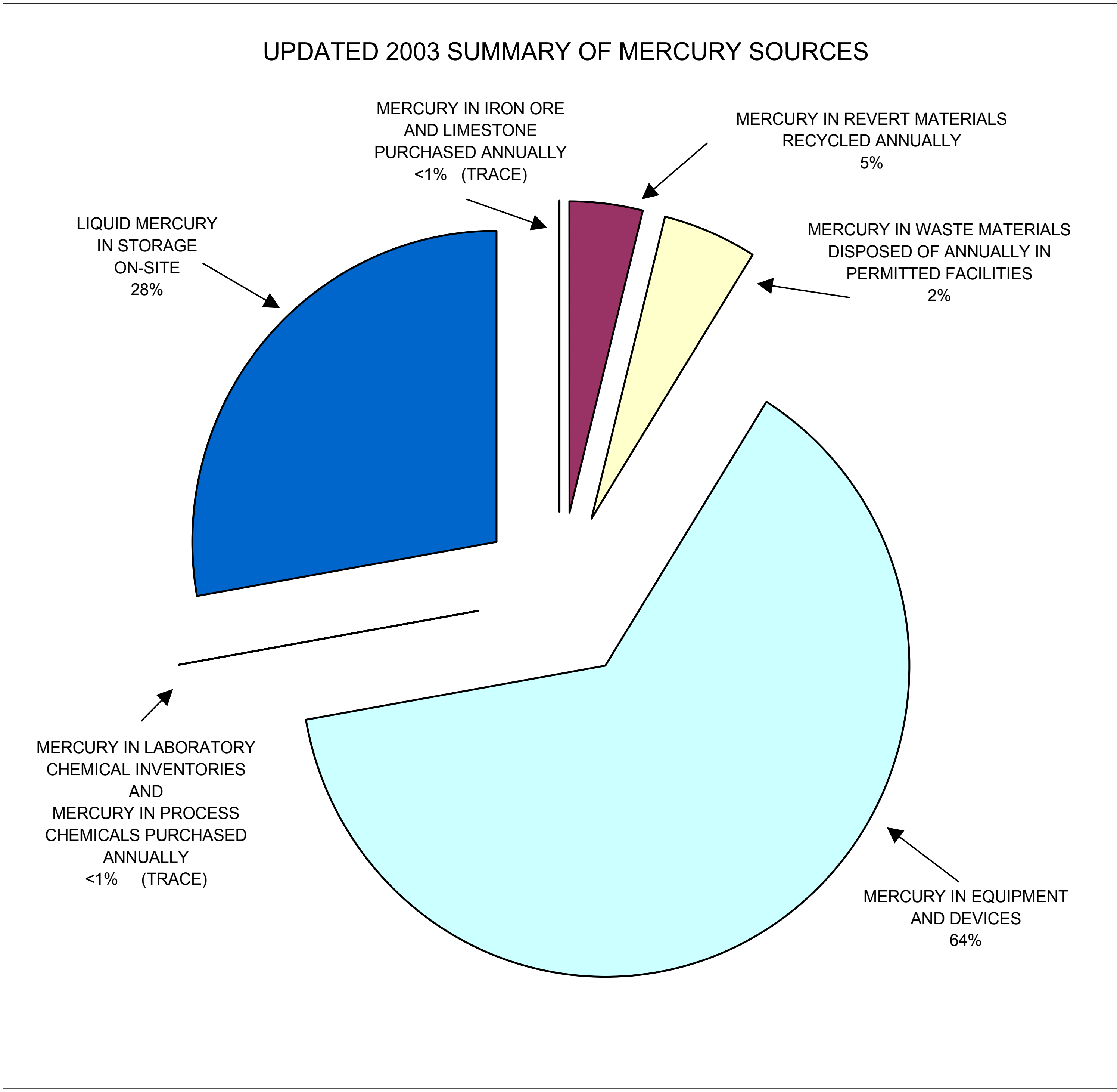

UPDATED 2003 SUMMARY OF MERCURY SOURCES
MERCURY IN IRON ORE AND LIMESTONE PURCHASED ANNUALLY <1% (TRACE)
MERCURY IN REVERT MATERIALS RECYCLED ANNUALLY 5%
LIQUID MERCURY IN STORAGE ON-SITE 28%
MERCURY IN WASTE MATERIALS DISPOSED OF ANNUALLY IN PERMITTED FACILITIES 2%
MERCURY IN LABORATORY CHEMICAL INVENTORIES AND MERCURY IN PROCESS CHEMICALS PURCHASED ANNUALLY <1% (TRACE)
MERCURY IN EQUIPMENT AND DEVICES 64%

FIGURE 3

TABLE 1
MERCURY POLLUTION PREVENTION INITIATIVE
2004 MERCURY INVENTORY SUMMARY UPDATE
ESTIMATED CUMULATIVE DISPOSITION OF MERCURY IN THREE NORTHWEST INDIANA STEEL MILLS

MERCURY SOURCE	TOTAL MERCURY (ESTIMATE IN LBS)
RAW MATERIALS PURCHASED ANNUALLY:	
◆ Iron Ore	Trace [1]
◆ Limestone	Trace
TOTAL	**Trace**
REVERT MATERIALS GENERATED AND RECYCLED ANNUALLY: [2]	
◆ Blast Furnace Pollution Control Device Dusts	6.6
◆ Blast Furnace Wastewater Treatment Sludge's, Slurries and Filter Cake	113
◆ Blast Furnace Slag	27
◆ Sinter	18
◆ Sinter Plant Pollution Control Device Dusts	54
◆ BOF, BOP, Q-BOP, and Caster Wastewater Treatment Sludge's, Slurries, Filter Cake and Scale	22
◆ BOF Ladle Skimmer Fines	Trace
◆ BOF Slag	Trace
◆ Scale Pit Scale	1.5
◆ Used Oil	Trace
TOTAL	**242**
WASTE MATERIAL GENERATED AND DISPOSED OF ANNUALLY	
◆ Sinter Plant Pollution Control Device Dusts	13.5
◆ Sinter Plant Quench Reactor Ash	2.2
◆ BOF, BOP, Q-BOP, Caster and Coke Plant Wastewater Treatment Sludge's, Slurries, Filter Cake and Scale	63
◆ BOF, BOP, Q-BOP and Caster Pollution Control Device Dusts	0.1
◆ Electric Arc Furnace Pollution Control Baghouse Dust	1
◆ Steel Finishing and Plating Sludge's	0.1
◆ Coke Plant Pushing Emission Control Device Dust	0.2
◆ Lime Kiln Dust	7
◆ Coke Plant Waste Ammonia Liquor (WAL)	3
◆ Blast Furnace Wastewater Treatment Sludge's, Slurries and Filter Cake	16.3
TOTAL	**106**

Note: A revert material is a non-product output which is generally recycled back to the process

[1] Trace is less than the detection limit of 0.01 ppm for solids and 0.0002 mg/L for liquids
[2] Disposed of in permitted facilities

TABLE 1 (Continued)
MERCURY POLLUTION PREVENTION INITIATIVE
2004 MERCURY INVENTORY SUMMARY UPDATE
ESTIMATED CUMULATIVE DISPOSITION OF MERCURY IN THREE NORTHWEST INDIANA STEEL MILLS

MERCURY SOURCE	TOTAL MERCURY (ESTIMATE IN LBS)
MERCURY-CONTAINING DEVICES AND EQUIPMENT (Universal Wastes Not Included)	
◆ Mercury Wetted Relays	14
◆ Mercury Switches (e.g. Motion, Tilt, Level, Pressure, etc.)	82
◆ Ignitrons (Mercury Arc Rectifiers)	1515
◆ Manometers, Barometers and Thermometors	46
◆ Mercury Gauges (e.g. Level, Pressure, etc.) and Flow Meters	1555
TOTAL	**3212**

Note: U.S.EPA designated "Universal Wastes" include mercury-containing lamps, batteries and thermostats

MERCURY SOURCE	TOTAL MERCURY (ESTIMATE IN LBS)
CHEMICAL PRODUCTS PURCHASED ANNUALLY:	
◆ Various Solvents	Trace
◆ Acidic Steel Surface Cleaning Solutions	Trace
◆ Alkaline Steel Surface Cleaning Solutions	Trace
◆ Steel Surface Coating Oils and Solutions	Trace
◆ Wastewater Treatment Chemicals	Trace
◆ Process Water Treatment Chemicals	Trace
◆ Process / Rolling Oils and Solutions	Trace
◆ Lubricants (Oils and Greases)	Trace
◆ Hydraulic Oils and Solutions	Trace
◆ Chlorine	Trace
LABORATORY CHEMICAL INVENTORIES	32
TOTAL	**32**

MERCURY SOURCE	TOTAL MERCURY (ESTIMATE IN LBS)
LIQUID MERCURY IN STORAGE	
◆ Mercury Collected From Obsolete or Broken Equipment	1303
◆ Mercury in Storage for the Maintenance of In-Service Equipment	113
TOTAL	**1416**

IV. Description of Current Activities, 2003

A. Update on Mercury Removal

Between 1999 and 2003, the three facilities that participated in this effort have removed, for recycling or disposal, approximately 3700 pounds of mercury from their facilities. Based upon the 2003-updated inventory this equates to roughly 80% of the mercury believed to be present in these facilities. The greatest contributor to this reduction was from the category of operating equipment and devices.

Mercury present in laboratory inventories makes up <1% of the total and efforts are ongoing to identify EPA and State acceptable substitutes for those laboratory procedures which currently require mercury devices, or use mercury as part of the analyses.

B. The Detailed Ongoing Inventory Process

In the beginning the three facilities determined that the process of identifying non-mercury equipment available to replace mercury-containing equipment would be expedited by a detailed survey of the existing mercury containing equipment. Specifically, each and every type of mercury containing device was to be identified in the mill's, including its' model number and plant purchase order identification number. This database was to provide information for the contact of the appropriate vendors to find out what substitutes might exist. Table 2 – **"Inventory of Mercury and Mercury-Containing Equipment/Devices, Departmental Summary"** provides the initial result from one operational area, which participated in this effort. For example, mercury containing pressure switches are commonly used in the mills, and number in the thousands (reference Pictures 1 and 2 – **Mercury Pressure Sensing Devices**). There are many different types, each type with its own specific replacement device. In general, for pressure switches a non-mercury replacement switch has been identified which utilizes a pressure-sensing diaphragm. Picture 3 –Mercury Operated Flow Meter, was also used with great frequency in industrial boiler houses and therefore is quite common. Ignitrons are an additional good example of a mercury-containing device in use in older facilities in these mills. (Picture 4 - **"Ignitron Rectifiers"** provide a picture of four such ignitrons in use at one of the mills' steel cold rolling facilities). Figure 4 –**"Ignitron Schematic**" provides a cut-away view of a General Electric ignitron. These units were recently replaced with solid-state rectifiers, which do not contain mercury (Picture 5 – **"Solid State Rectifier Replacements**"). Approximately 10 pounds of mercury was safely removed from service through this replacement. The three mills continue to work with plant personnel and their respective purchasing departments in establishing policies which require replacement with non-mercury devices where possible.

This detailed, exhaustive search for mercury devices and their non-mercury replacements continues to be a much more time consuming, lengthy process than was originally estimated. Many thousands of these devices exist in the plants, and consequently it is taking hundreds of worker hours just to locate and inventory these devices. In many areas the age and operating status of the facility has played a large part in the availability of workers and accessibility to areas to conduct these inventories. For example, the process of mercury equipment identification has located mercury-containing Balance Piston Valves housed in coke oven gas lines between two large gate valves. Although they were not identified by nameplate, further investigation of these valves identified a sealed internal system of baffles containing approximately two hundred pounds of mercury per unit (see Pictures 6 and 7 – Coke Oven Gas Line Balance Piston Valve). Picture 8 – shows another device found to contain liquid mercury labeled as: "Airline™ Mercury Check Device".

As recognized earlier, this approach is the only way to systematically identify and track all of the mercury devices in these plants. The survey is ongoing, as certain facilities require extensive scheduling to complete. An updated mercury inspection sheet has been utilized to aid in the ongoing survey process, reference **Table 3 - "Inventory of Mercury Containing Devices by Location"**.

TABLE 2

ISPAT INLAND INC.
INDIANA HARBOR WORKS
INVENTORY OF MERCURY AND MERCURY-CONTAINING EQUIPMENT/DEVICES
DEPARTMENTAL SUMMARY

DEPARTMENT: #7 Blast Furnace

Description of Item	Item Location and/or Function	Manufacturer / Supplier	Manufacturer's Part and/or Model Number	Ispat IPN Number	Mercury Content Per Item	Total Number of Items	Total Mercury (Pounds)
LAMPS: (Fluorescent)	Various	GE / Graybar	F40LW/RS/WM	15053	30mg	2,047	0.13
LAMPS: (High Pressure Sodium)	Various	GE / Graybar	LU150/55	15470	12mg	903	0.02
			LU250	34955	15mg	25	0.001
			LU1000	3224	25mg	122	0.007
			LU70	206346	9mg	30	0.001
			LU400	14045	23mg	29	0.001
			LU150/MED	321810	12mg	45	0.001
			LU100	203099	10mg	3	0.00007
LAMPS: (Mercury Vapor)	Various	GE / Graybar	HR175DX39	15056	30mg	7	0.0005
LAMPS: (Metal Halide)	Various	GE / Graybar	MVR250/U	541765	26mg	11	0.0006
			MVR400/U	405572	62mg	8	0.001
			MVR1000/U	569939	100mg	16	0.002
SWITCHES: (Pressure)	J-2 Stand Air	Mercoid	PGW-153-R-P1	42967	UNK	1	---
SWITCHES: (Float)	Sump and Casthouse Hydraulics	Magnetrol	A-153-F	41940	UNK	2	---
SWITCHES: (Level)	Stoves	Magnetrol	89-7401-006	31991	UNK	1	---
SWITCHES: (Tilt)	R/M Chutes	Ramsey Engineering	20-39-25	31990	UNK	24	---
THERMOSTATS: (60-100)	R/M Mechanical Stores	Honeywell	T42M1023	276421	UNK	1	---
THERMOSTATS: (3-Stage)	R/M Mechanical Stores	Honeywell	T605A1016	711	UNK	1	---

Note: The above summary is based on information compiled by departmental personnel. Refer to the actual departmental inventory sheets for more detail.

Legend: NIP=No Information Provided…..UNK=Unknown…..NAP=Not Applicable…..NAV=Data Not Available

Table 3

Inventory of Mercury Containing Devices by Location

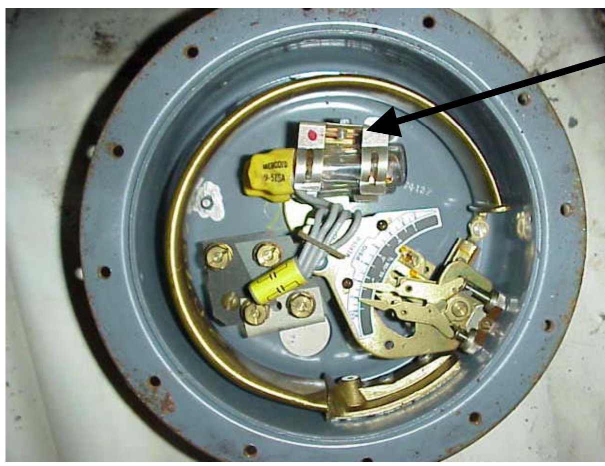
Mercury inspection sheets **Date:** ____________________

Inventory of Mercury Containing Devices by Location **Location:** ____________________

Item	Quantity	Location	Description	Removal date	Initials
Lamps					
Fluorescent bulbs					
High intensity discharge					
mercury vapor					
high pressure sodium					
metal halide					
Switches					
Tilt switches - mechanical					
Tilt switches - thermostats					
Silent wall switches - lighting					
Heating and cooling units					
Float switches - pumps & tanks					
Devices	***Note: check area for liquid mercury refill container***				
Flame sensors - gas fired appliances					
Flow meters - measuring water or steam pressure					
Manometers - measure air pressure					
Barometers - measure air pressure					
Thermometers					
Vacuum gauges					
Gas flow regulators - valves					
Ignitron tubes					
Arc rectifiers					
Air Line Check Device					
Miscellaneous					
Liquid mercury					
Mercury - Oxide / Chloride/ Sulfate/ Nitrate/ Iodide					
Zinc Formalin					

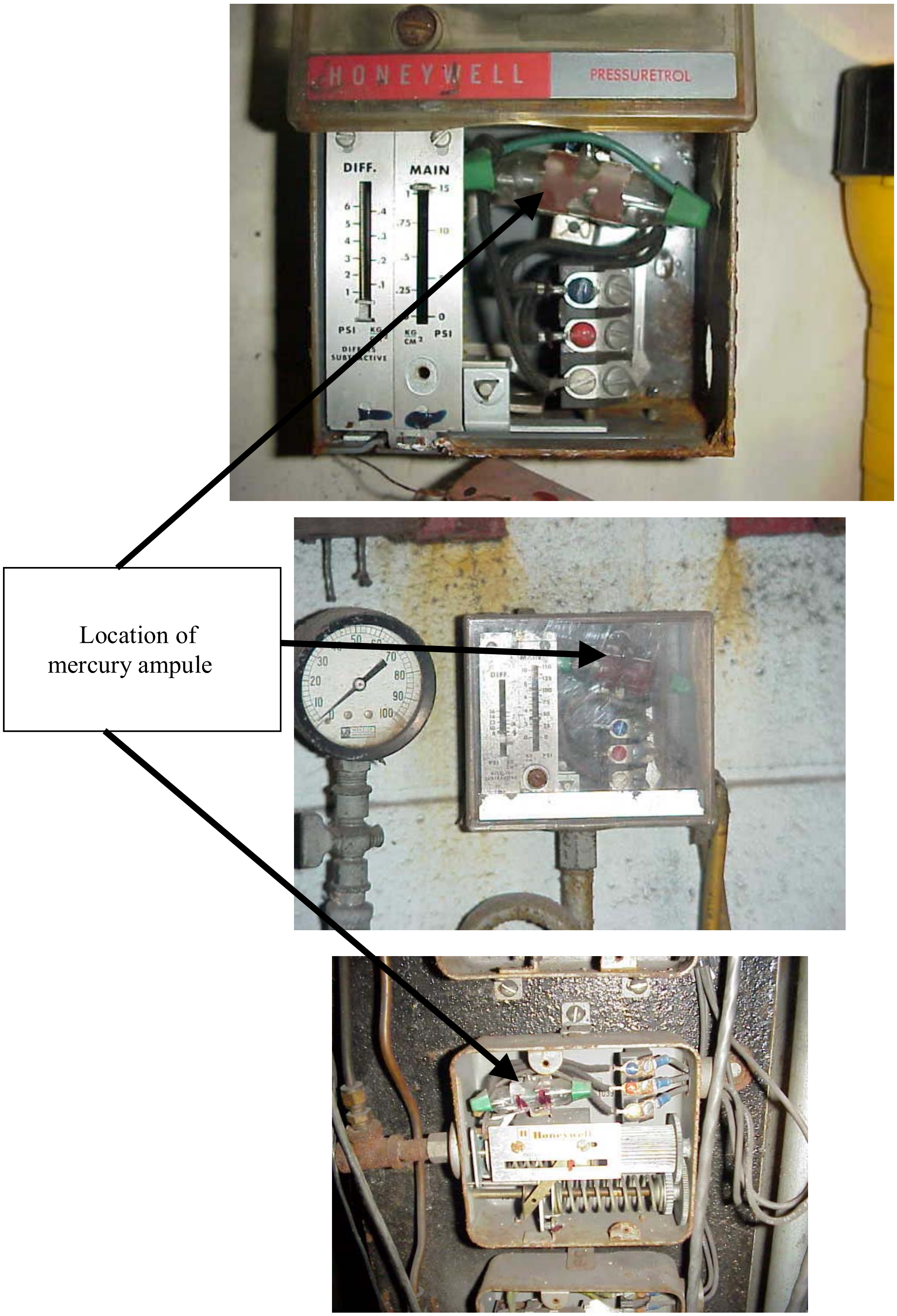
Picture 1 – Mercury Pressure Sensing Device

Location of mercury ampule in Gas Pressure Switch



Mercury containing ampule's after removal

Picture 2 – Mercury Pressure Sensing Devices



Picture 3 – Mercury Operated Flow Meter

Front view of recording device associated with mercury operated flow meter

Rear view - mercury containing flow meter

Picture 4 – Ignitron Rectifiers

Figure 4 – Ignitron Schematic

Pumpless-ignitron Rectifier

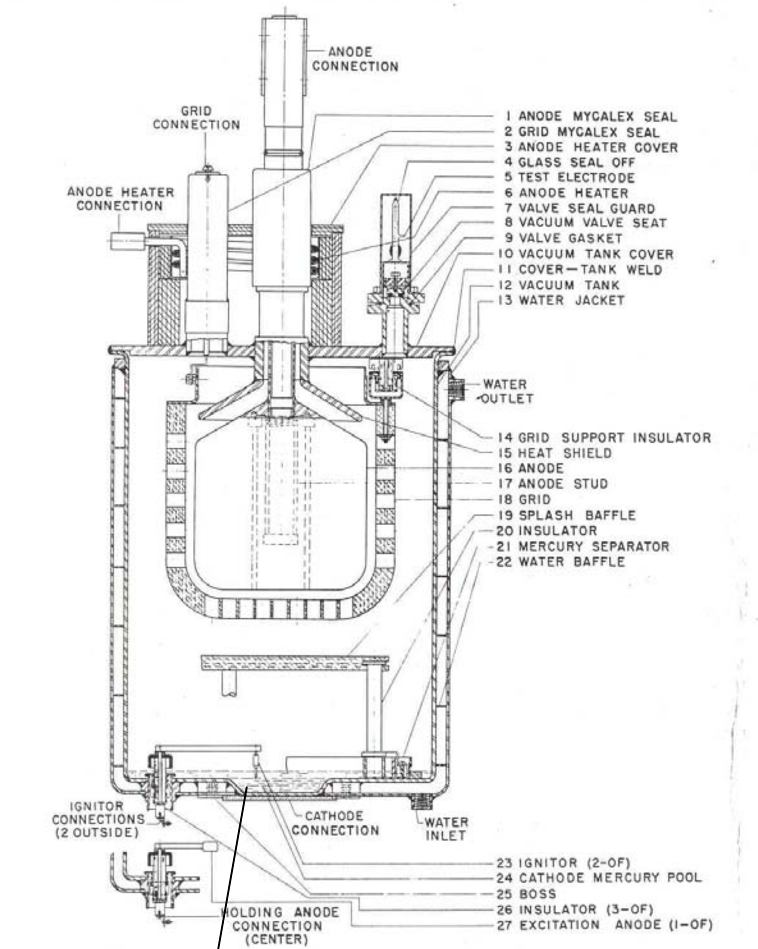


Fig. 1. Vertical section of a pumpless-ignitron tank (photo 1143081)

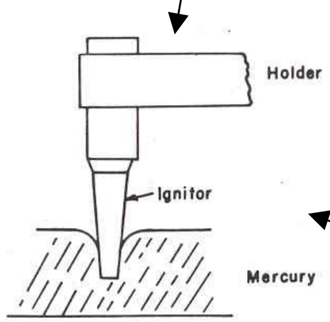


Fig. 2. Ignitor tip

Picture 5 – Solid State Rectifier Replacements

Picture 6 – Coke Oven Gas Line Balance Piston Valve

Liquid mercury contained in baffles mounted inside

Picture 7 – Coke Oven Gas Line Balance Piston Valve

Side and top of device removed to access mercury filled baffles

Picture 8 – Airline™ Mercury Check Device

Device attaches to a plant air-line – partially filled with liquid mercury

The fact that the inventory remains an ongoing process has not, however, delayed work on replacement of these mercury-containing devices. All three mills continue to work with operating personnel to determine the most high-risk and high-quantity mercury-containing devices in an effort to prioritize equipment replacement. This prioritization is a matter of replacing the devices in phases, as follows:

Phase 1: Replacement of devices that have immediate potential harm to the environment if damaged, (e.g. those close to waterways),

Phase 2: Devices have potential harm, but controllable in current setting, and

Phase 3: Devices pose no threat if inventoried and properly disposed when removed.

The substitution of specific mercury-containing ignitrons with solid-state rectifiers is an example of Phase 1 of this prioritized effort.

V. Mercury Reduction Program and Schedule

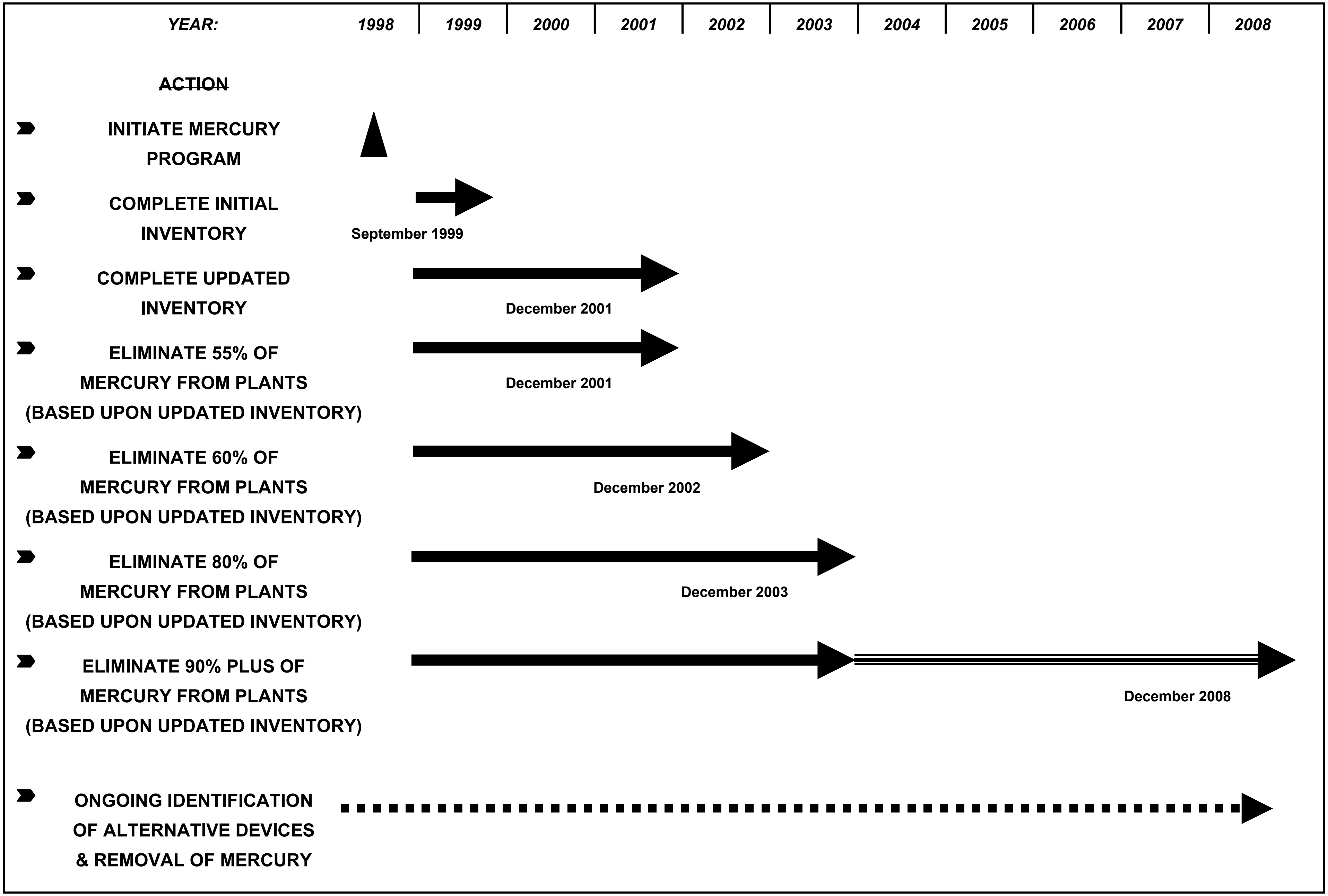
As the inventory and investigation into mercury usage in these plants continues it has become apparent that mercury exists in varying quantities in thousands of devices in operation today. Some of these devices, such as fluoresent lights, hold minuscule quantities of mercury, while others, like large ignitrons or flow meters, can hold many pounds each. The initial conclusion that it was physically and economically prohibitive to embark on an immediate replacement program for all mercury containing devices in current operation remains true. The plan has focused instead on the review of each area followed by the removal of as many mercury-containing devices as possible, combined with an employee awareness program for identifying mercury devices so they are not improperly discarded.

Years of operation have proven that by their design and nature, mercury-containing devices are very reliable. For example, some ignitron tubes installed in the 1930's remain totally functional and reliable today. However the program, that was initiated in 1999, continues to remove mercury from sensitive areas, such as next to waterways, and this effort in conjunction with replacement of failed or out-of-service devices has lead to significant mercury reductions. This ongoing mercury removal program continues to follow the three-phase prioritized list. As previously identified, some devices on older units that reside at locations of little environmental risk will remain in service as long as they remain functional, and for this reason it will take many years to completely eliminate mercury from usage. During this period of time, these facilities will continue to identify the location of each of these devices in the plants and keep an up-to-date inventory to prevent improper disposal. This inventory, in tandem with the prioritized removal and replacement program, will serve to minimize potential releases of mercury while the plants move to mercury-free devices.

In consideration of the above, and based on the work conducted at these facilities over the past years, an updated reduction program and schedule has been completed. (Figure 5 – "**2003 Mercury Program Reduction Schedule**"). As shown in the figure, the updated assessment estimates that approximately 4600 pounds of mercury existed at the three facilities at the beginning of the mercury reduction effort. These three mills have shown a significant, over 80% reduction in mercury by the end of calendar year 2003. For reasons previously discussed the total elimination of the remaining quantities of mercury present in the plants becomes a more difficult issue. None-the-less, these facilities are on target with their goal of a 90% plus reduction of mercury as of the end of calendar year 2008.

Figure 5

2003 MERCURY PROGRAM REDUCTION SCHEDULE



APPENDIX

MERCURY CONTENT SURVEY

Versar INC.

MEMORANDUM

TO: Tim Brown – Delta Institute
Mark Reshkin – Northwest Indiana Forum
David Bloomberg – U.S. Steel
Tom Easterly – Bethlehem Steel
Tom Barnett – Ispat Inland
Debbie Siebers – USEPA
Alexis Cain – USEPA
Dave Lawrence – IDEM
Kevin Hursey – Ind. Env. Mngmnt. Concult.

FROM: Stephen Schwartz

SUBJECT: Results of Mercury Content Survey

DATE: March 26, 1999

At our meeting on March 1, 1999, it was agreed that I would finalize the draft tables that I presented to you at the meeting. The finalized tables are attached. (However, if and when additional information becomes available, I can supplement the information in the table, and/or revise it again.)

To reiterate, the tables are a compilation of mercury content data the Versar was able to develop from: vendor lists supplied by the three steel companies; input from members of our task group; the US Geological Survey; and searches of the internet, technical data bases, and other sources. Included in the tables are a list of those vendors that were contacted but were unable to supply meaningful mercury content data (e.g., "our product contains no mercury").

In addition, the following is a list of contacts made that have promised additional information, but as of yet have not provided it (in spite of having made many calls to most of them):

- Amoco Oil
- Bayer Corp (hydrochloric acid)
- Beaver Oil
- Betz Dearborn (water treatment chemicals)
- Chlorine Institute
- Cutler-Hammer (electrical devices)
- EFL Atochem (oils, alkaline cleaners)
- Hibbing Taconite
- K A Steel Chemical (sodium hydroxide)
- Mobile Oil
- Pemco (viteous mold powder)
- PICO Chemical (lubricants)
- Rowell Chemical (aluminum sulfate)
- Sloss Industries (phenolsulfonic acid)

As noted in the draft, there are two types of data. The first type (shown in Table 1), for chemicals and raw materials, is in terms of concentration (parts per billion [ppb]). The second type (shown in Table 2) is for instruments/control equipment, such as manometers and thermometers, for which typical mercury content is given as the weight of mercury for each item (grams of mercury per item). It will be more difficult to evaluate the second type of data, since different sizes and designs of instruments will clearly have different amounts of mercury. Also, although we agreed that data on thermostats and switches were not necessary at this time, we did obtain data on those devices, which are also presented in Table 2.

In summary, and as noted earlier in the draft, it would appear that of the raw chemicals/materials used by the industry, the only materials with more than 50 ppb mercury content are sodium hydroxide from the mercury cell process (i.e., caustic soda – NaOH), and ferrous sulfate heptahydrate (i.e., $FeSO_4.7H_2O$). Both of these chemicals are used in relatively low quantities (compared to chemicals/materials used in blast furnace ironmaking, or BOF/EAF steelmaking). The caustic soda derived from the mercury cell process (at 20-300 ppb mercury) could easily be replaced by caustic soda from other sources (at less than 5 ppb mercury). The ferrous sulfate heptahydrate, if used at all as a coagulant for water or wastewater treatment, could be replaced by other coagulants, or by ferrous sulfate derived from pickling/descaling of steel.

In any case, for those currently used materials that the steel industry participants choose to evaluate further, relative to the reduction mercury sources, the mercury content of those materials should be verified on an individual basis.

With respect to the equipment and controls, there is significant mercury present (as elemental liquid mercury), but it is not normally discharged to the environment, unless disposed of as a solid/hazardous waste at the end of its functional life. A program to properly remove these items, and have them sent to mercury recyclers, would greatly alleviate the concern for inadvertently placing them in landfills.

Table 1: MERCURY CONTENT OF RAW MATERIALS AND SUPPLIES

Type of Material	Mercury Content (in ppb or ug/kg)	Vendor/Source Data	Purpose of Material	Comments
Limestone	12.0	Portland Cement Assn. Report Dated 1/15/97	Blast Furnace (BF) And Steel Making (SM)	Eric Males of Nat. Lime Assn. found this reference: Comparison of Trace Metal Concentrations in Cement Kiln Dust, Agricultural Limestone, and Sewage Sludges by H.M. Kanare
	<0.3	Unimin Corp.; New Canaan, CT; 800/243-9004		
Lime/Quicklime	No adequate response to inquiries		SM, and Water/wastewater treatment (WT)	Lee Lime Corp; Lee, MA; 413/243-0053; states: <0.3 ppb in leachate (TCLP???).
	<10	Marblehead Lime; Chicago Heights, IL; 708/757-6201, Dewey Stanley		
Ferroalloys	<50	GFS Chemicals; Powell, OH; 800/394-5501	SM	Result of phone call. No written documentation.
Sulfuric Acid	Mean: 50 range: 3 - 5,100	Indiana Dept. of Environmental Mngmnt	Pickling/descaling, WT	Memo from IDEM's Dave Lawrence, dated 2/15/99
Sulfuric Acid (laboratory grade)	<5	Fisher Scientific; Fair Lawn, NJ; 800/227-6701	Chemical analysis	Product specification
Sulfuric Acid (bulk)	<10	PVS Chemicals; 773/993-8800	Pickling/descaling, WT	Based on a contact made by Kevin Hursey of IEMC Chesterton, IN; 219/929-4487