



Georgia-Pacific

MERCURY POLLUTANT MINIMIZATION PLAN

Georgia-Pacific LLC

Crossett Paper Operations
Crossett, AR

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Background

The purpose of this Mercury Minimization Plan is to describe measures identified by Georgia-Pacific to reduce the amount of mercury released to the environment through the use of education, technical assistance, and voluntary efforts. The plan is a compilation of the mercury reduction work to date and potential action items, and is designed as a working document to help guide the facility in its efforts to reduce mercury in the treated effluent from Outfall 001, as regulated by NPDES Permit No. AR0001210.

Site Description

Georgia-Pacific LLC operates a manufacturing complex located in Crossett, Arkansas. The complex is made up of three distinct operations; a paper mill, a plywood plant and a chemical plant. All three of these facilities have the potential to operate twenty-four (24) hours per day, seven (7) days per week, and fifty-two (52) weeks per year.

Mercury Overview

Mercury is a naturally occurring element observed in air, water and soil. It exists in several forms: elemental or metallic mercury, inorganic mercury compounds, and organic mercury compounds. All three forms of mercury can be converted to each other and back to their original form.

Elemental or metallic mercury is a shiny, silver-white metal and is liquid at room temperature. Mercury is a very dense liquid (13.6 g/mL), and the heaviest known elemental liquid, with a melting point of -39°C and a boiling point of 357°C. At room temperature, exposed elemental mercury can evaporate to become an invisible, odorless vapor. Elemental mercury, when uncontained, breaks into small droplets that can travel through small cracks or become strongly attached to certain materials.

Inorganic mercury compounds take the form of mercury salts and are generally white powder or crystals, with the exception of mercuric sulfide (cinnabar), which is red. Inorganic mercury compounds have been included in products such as fungicides, antiseptics or disinfectants.

Organic mercury compounds, such as methyl mercury, are formed when mercury combines with carbon. Microscopic organisms convert inorganic mercury into methyl mercury, which is the most common organic mercury compound found in the environment. Methyl mercury may accumulate up the food chain.

Mercury is an element that has many unique properties that also makes it a very useful material for industrial, agricultural, medical, and household applications. It is used in dental amalgams, thermometers, batteries, fluorescent light bulbs, pressure reading devices, and some electrical switches. Mercury is also used in certain industries, the largest of which include chlor-alkali

plants and mercury-cell sulfuric plants. Mercury has also historically been used in certain, mining applications, nuclear reactors, and as a preservative in certain pharmaceutical products. Mercury was formerly used as an anti-fungal agent for certain treated wood preservation processes, but has been phased out of this use. Due to mercury's human health effects and environmental persistence, it is being phased out in most commercial and industrial applications.

Mercury is widely distributed throughout the environment. Mercury is emitted from mining operations, mineral extraction operations, and commercial, industrial and institutional fossil fuel combustion sources. Once emitted into the atmosphere, mercury is rapidly dispersed. It can be re-deposited either in a particulate form (dry deposition), or along with precipitation (wet deposition). Vegetation will uptake mercury vapor along with other atmospheric gasses. Dry deposition is, in some areas, the largest single input of mercury into natural systems (USEPA, 1997a, Tsai and Hoenicke, 2001).

Section 2 Sources Identification

In this section, the potential sources of mercury at the complex, as identified through a literature search or chemical analyses are presented in Tables 2-1 through 2-3.

Potential Sources

Mercury is not used as an active ingredient or purposefully introduced in the industrial processes at the mill. However, mercury may be introduced in trace amounts in both raw materials and chemicals used at the mill. Mercury also has the potential for being present in equipment and manufacturing process materials. Through a literature research, it was found that mercury has the potential to be used or found in many different manners, including the following:

- Process chemicals and materials; as a contaminant
- Fuels; as a trace component
- Non-process chemicals; in trace amounts
- Raw materials; as a trace component
- Equipment; as a contaminant in materials (direct and indirect usage)
- Residual deposits; as a result of historical practices
- Atmospheric deposition (dry and wet deposition)

Process Chemicals

A literature review provided information on low-level mercury content in the most widely used process chemicals at the Crossett Complex. Mercury can be present in the process chemicals but is not listed on the Material Safety Data Sheets (MSDSs) since the mercury content is not ≥ 0.1 percent. As a result, chemicals can contain up to 1,000 parts per million (ppm) before notification on MSDSs is required.

The concentrations of mercury in the process chemicals can vary depending on the process used to manufacture the chemicals. For example, the mercury content in sulfuric acid is higher when sulfuric acid is produced from a secondary lead smelter than when it is produced from secondary copper smelters or petroleum refineries.

Similar to sulfuric acid, the mercury content in caustic depends on the process in which the caustic is produced. Caustic can either be produced by mercury cell, membrane cell,

rayon process, diaphragm process, or purified. Technical reports state that diaphragm grade caustic can potentially contain up to 1 part per billion (ppb) mercury.

The following table summarizes the most common chemicals and materials typically used at the Crossett Complex and the range of expected mercury content based on the literature review.

**Table 2-1
Range of Expected Mercury Content in Process Chemicals**

CHEMICAL	MERCURY CONTENT (ppb)	LITERATURE SOURCE
Sulfuric acid	0.023 – 335	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Caustic	0.00297 – 400	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Calcium Carbonate	<0.6 - 650	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Hydrogen Peroxide	<10	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Sodium Hypochlorite	0.075 – <2	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Dyes	<1-3	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Clay	0.1 - 420	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Starch	<0.1 - 200	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Alum	0.028 - 49	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds

Fuels

The primary fuels used at the Crossett Complex include bark, #6 fuel oil, natural gas and tire-derived fuel. Fly ash is co-mingled with bottom ash and wet-sluciced to the P3 sewer flowing directly to the ash settling basins, where ash is settled and mechanically removed. If the water used to wet sluice ash has an acidic pH, mercury could be desorbed from fly ash and discharged with ash settling pond effluent into the wastewater treatment system.

Due to mercury's boiling point (357°C), the mercury present in the fuels used at the mill is expected to be volatilized when fuels are combusted. Nearly all mercury is expected to exit the combustion zone in gaseous form (USEPA, 1997). However, some small proportion of the mercury can be absorbed onto fly ash particles (USEPA, 2001a).

The following table summarizes the reported mercury content in the fuels used at the Crossett Complex.

Table 2-2
Mercury Content In Fuels

CHEMICAL	MERCURY CONTENT	LITERATURE SOURCE
Bark	11.4 ppb	NCASI Boiler MACT Survey (2004)
Natural gas	0.15 lb/10 ¹² scf	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
No. 6 fuel oil	1.4 – 2.4 ppb	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds
Tire-derived fuel	2.0 – 25.4 ppb	NCASI (February 2010), Chemical-Specific Information for Mercury and Mercury Compounds

Non-process Chemicals

Mercury may be introduced into laboratory chemicals and materials either as part of the compound (mercury salts), as a contaminant or as a component (older paints and pesticides). Small, trace amounts of mercury may also be found in cleaning items and other non-laboratory chemicals (e.g., Ajax, Comet, etc.). Research from technical reports and other literature were used in the assessment of these chemicals. The following list is a summary of non-process chemicals used at the Crossett Mill.

- Laboratory Chemicals
- Housekeeping Chemicals

- Wastewater Treatment Chemicals (*e.g.*, nitrogen/phosphorus mixture, defoamer and polymers)

Due to the low volume of laboratory and cleaning chemical usage, they are not considered to be a significant source of mercury in the final effluent. Water and wastewater treatment chemical usage is high enough to warrant further consideration as a potential source of mercury in the final effluent.

Three chemicals are added to the wastewater treatment system: a nitrogen/phosphorus mixture, a defoamer, and an odor control chemical. Both the defoamer and odor control chemical are applied in very small quantities and are not major potential contributors of mercury in the treated effluent. The nutrient blend is stored in a 10,000 gallon, above ground tank and is dispensed at a rate of approximately 30 gallons per hour. This chemical is used in sufficient quantities to warrant consideration as a potential source of mercury in the treated effluent.

Mercury-containing Equipment

Mercury's properties make it useful in measurement and control applications. Equipment containing mercury may use mercury in a direct application to the device (*i.e.*, thermometers) or may use mercury in an indirect manner (*e.g.*, switch in a tank level device). A review of technical papers and information provided by the mill identified the list of equipment in Table 2-3 and the documented mercury content. The Crossett Complex currently has a management programs in place for batteries and lamps. Management programs for other equipment that may potentially contain mercury are also in place.

**Table 2-3
Mercury-Content in Equipment**

MERCURY-CONTAINING EQUIPMENT	MERCURY CONTENT	LITERATURE SOURCE
Fluorescent lamps	<0.01 – 0.038 ppb	Wisconsin Mercury Sourcebook: Paper Mills
Alkaline Batteries	Previously contained an average of 0.5% mercury. Alkaline manganese button cell batteries to contain no more than 25 mg of mercury.	Wisconsin Mercury Sourcebook: Paper Mills
Silver Oxide Batteries	Contain about 1% mercury by weight. Mercury use in these batteries is expected to be discontinued.	Wisconsin Mercury Sourcebook: Paper Mills
Mercury Zinc (Mercuric oxide) Batteries	Contain significant amounts of mercury. Mercury content totals about 33 to 50 percent by weight of the battery.	Wisconsin Mercury Sourcebook: Paper Mills
Thermostats	3,000 – 6,000 mg	Wisconsin Mercury Sourcebook: Paper Mills
Silent Switches	2,600 mg	Wisconsin Mercury Sourcebook: Paper Mills
Other Tilt Switches	2,000 mg	Wisconsin Mercury Sourcebook: Paper Mills
Thermometers	1,000 – 117,000 mg	Interstate Mercury Education & Reduction Clearinghouse
Manometers	28,000 – 74,000 mg	Interstate Mercury Education & Reduction Clearinghouse

Historical Practices

Historically, mercury was used widely in many industrial processes. Because mercury has a high specific gravity (13.6), it can potentially pool in low lying areas, such as a sump, trap or pipe, in wastewater treatment systems and remain in the pipe system for many years. Most of the mercury that is flushed through a wastewater treatment system adheres to the wastewater solids and very little is discharged to the surface water.

Once mercury enters a WWTP, most of it readily adsorbs to organic matter such as the wastewater solids (Wisconsin Mercury Sourcebook, 1997). As the wastewater solids settle in the wastewater treatment system, the mercury also settles. Mercury that is bound

to the wastewater solids has the potential to volatilize and be deposited elsewhere or to be resuspended. Mercury may also be resuspended should the settled solids be disturbed.

Atmospheric Deposition

Atmospheric deposition is a potential source of mercury. Mercury can be deposited both in particulate form (dry deposition) and along with precipitation (wet deposition).

The National Air Deposition Network operates an atmospheric deposition monitoring station in Franklin Parish (LA10) near Gilbert, Louisiana, approximately 85 miles south of Crossett. One of the parameters measured at this location is the mercury concentration in rainfall. From January 2009 through July 2010, the average mercury concentration in rainfall collected at this location was 11.1 ng/l. Mercury from atmospheric deposition can affect the wastewater treatment plant system through storm water runoff into the ponds and direct deposition of atmospheric mercury onto wastewater treatment ponds. At an estimated annual storm water drainage amount of 2.2 MGD into the wastewater treatment system, this can amount to approximately 0.0002 pounds of mercury per year into the wastewater treatment system from air deposition alone.

The City of Crossett

Georgia-Pacific receives discharges from the City of Crossett prior to treatment in the Aerated Stabilization Basin. A review of the current industrial users and any associated EPA Effluent Guideline categorization has been conducted to determine if mercury is a pollutant of concern. Current industrial users include:

- Ashley County Medical Center (40 CFR 460)
- Bemis
- P.J.'s Tank Wash (40 CFR 442)
- Sewell Oil
- Pinnacle Bio-Fuel
- Carastar

Of the above categories, only 40 CFR 442.11 (Transportation Cleaning Equipment) has mercury limitations. However, based on discussions with the City of Crossett, P.J.'s Tank Wash is no longer allowed to discharge any process wastewaters to the city sewers. Thus, there appear to be no users with current mercury limitations according to Parts 40 CFR 405 to 471.

As required by the current agreement between Georgia-Pacific and the City of Crossett any new industrial users will need to be reviewed by Georgia-Pacific prior to discharge. This review process will include reviewing EPA standards in 40 CFR Parts 405 through 471 to determine if mercury is a pollutant of concern for a particular industry.

Section 3

Mercury Monitoring

Mercury Monitoring and Sampling Plan

Georgia-Pacific will monitor the treatment plant influent and effluent as well as wastewater received from the City of Crossett at a minimum of once per quarter. Should significant potential contributors of mercury be identified in the City of Crossett sewer system based on source review, appropriate sampling requirements will be communicated to the City of Crossett.

GP will conduct a series of mercury sampling events at internal points in the GP Complex as required to identify any significant sources of mercury. These internal points will initially include the following:

- Intake Water
- Plywood Mill effluent
- Chemical Plant effluent
- Power and Steam
- Recovery/Recaust Area sewer
- Pulp mill effluent streams
- Paper Machine effluent streams

Sampling Approach

All samples will be collected using the ultra-pure sampling techniques as described in USEPA Method 1631E (or the latest approved version), and will use a specified Method Quantitation Limit of 0.005 ug/L as required by Part II.20 of Permit No. AR0001210. This sampling method requires two people, one designated as *clean hands* and the other designated as *dirty hands*. The *clean hands* person is responsible for handling the sample labels and outer sealable sample bags, and sampling equipment that does not directly contact the sample. The *dirty hands* person is responsible for handling the inner sealable sample bags, the sample bottles, and sampling equipment that comes into direct contact

with the sample. Special care will be taken during the sampling event to not expose the samples to anything that may contain mercury.

Analyses and Data Validation

Effluent and intake samples and field blanks will be analyzed in accordance with USEPA Analytical Method 1631E. All samples shall be shipped to an Arkansas Certified Laboratory for analysis in accordance with USEPA Analytical Method 1631E.

Section 4

Control Measures

Source significance will be considered, when selecting control measures. An effort to quantify or estimate load potential from each significant source should be made. This effort will assist in prioritizing sources for mercury reduction and elimination efforts. The following evaluation also addresses the technical and economic feasibility of methods for reducing mercury.

Pollution Prevention

All chemicals used at GP are subject to a review for applicable regulatory and internal GP requirements. Before new chemicals are ordered and brought onsite, they are reviewed using the New Substance Review (NSR) procedures in order to determine proper compliance assurances, management and reporting requirements associated with their use. Crossett Paper Operations utilizes the NSR procedures in order to determine the risks associated with their use. Any substance, including those used in the manufacturing process, must be evaluated to determine if it contains any chemicals that have restricted or limited uses set by the facility or business. This includes mercury and mercury compounds.

If a chemical or material introduces significant risk to employee safety or the facility's compliance with applicable regulations, the reviewer(s) will likely not approve its use. This may be a temporary action until engineering controls are put in place or a chemical is reformulated. The reviewer(s) will indicate why the products use is denied on the form and return the request to the requestor explaining their decision.

Additionally all engineering projects are reviewed to identify and address potential environmental impacts.

Housekeeping, Spill Control and Collection, and Education

The mills have various programs in place to minimize spills and releases throughout the mill, including methods for housekeeping, spill control and collection, and employee education.

Best management systems include tank and process vessel integrity testing, high level alarms, spill collection and control equipment, secondary containment, and area curbing. Work practices include risk assessments, preventive maintenance, surveillance and inspections. In addition, various plans and such as the Spill Prevention Control and Countermeasure "SPCC" Plan and the Storm Water Pollution Prevention Plan include specific initial and routine refresher training. Specific material related to mercury minimization will be included in training plans for future employee training.

Educational materials have been mailed to each residential user of the City of Crossett's wastewater treatment lagoons. Also, a collection point has been designated at the Crossett City Hall for collecting any mercury or mercury containing equipment from residents for proper disposal. Quarterly reminders will be printed on residential water bills reminding residents about the collection program.

Material Substitution

GP will request and maintain mercury analysis reports from suppliers of high-volume process chemicals purchased by the mill to demonstrate that the mercury concentrations in their chemicals are below industry average as reported through NCASI and other sources. Alternative sources for chemicals will be explored if the mercury levels are determined to be significantly higher than would normally be expected.

Sulfuric Acid

According to NCASI Technical Bulletin 902, *Mercury Substitution to Reduce Mercury Concentrations in Pulp and Paper Industry Final Effluents*, mercury concentrations in sulfuric acid can vary widely, based largely on the source of the acid. Lead smelters are generally considered to be the highest mercury-content acid providers. However, mercury content of the sulfuric acid from a provider or process-type can still vary depending on the raw materials used to produce the acid and whether or not the provider uses mercury removal treatment processes.

Caustic Soda

As with sulfuric acid, NCASI Technical Bulletin 902 provides some guidance on the mercury content of caustic soda from various process sources. Caustic soda from the mercury cell of a chlor-alkali plant is considered to be the highest concentration source. However, varying feed stocks and mercury treatment processes used at the supplier can also significantly impact the mercury content of caustic soda.

Waste Management Practices (Material Recovery, Waste Recycling, and Disposal Practices)

Programs to recycle fluorescent lamps and bulbs have been implemented at the Crossett Complex. These programs provide a safe and efficient guide to the disposal of spent lamps, many of which are Universal Waste governed by ADEQ & USEPA regulations.

The complex has also implemented a battery collection programs to promote responsible stewardship of the environment, protection of employee health, and to remain in compliance with both Federal and State regulations. Such batteries include, but are not limited to alkaline (AAA, AA, C, D, 6V & 9V), radio, cell phone, watch, and portable tool batteries. Each discarded battery is properly accumulated and packaged prior to

being transported to the appropriate disposal location. The containers accumulating the batteries and their locations are properly marked.

An up-to-date and detailed inventory of waste is maintained in addition to procedures for accumulating waste on-site, managing risks in transporting and disposing of wastes off-site, and effective training for employees handling waste.

The mills also have a procedure for the proper disposal of mercury-filled instruments.

Laboratory Practices

The laboratories located at the GP mills are a potential source for small quantities of mercury-containing chemical compounds. The laboratories already use low-mercury test kits for Chemical Oxygen Demand (COD) tests. The laboratories are provided with special “mercury-containing waste” collection receptacles so that these wastes can be properly collected and disposed. Laboratory employees are also trained in the handling of these materials to ensure that mercury containing wastes are disposed of appropriately. The laboratories have also replaced the majority of the mercury thermometers with alcohol-based thermometers.

Mercury Spill Clean-up Procedures

Mercury spills are reported to Shift Supervisors in addition to Environmental Compliance Staff. Procedures to clean up mercury spills using a mercury spill kit are used and waste materials are transferred to an appropriate container and disposed of as hazardous waste.

Tracking of Control Measures

Control measures will be tracked to determine the measure of performance and goal achievement for each type of source. Tracking may indicate the need to change course as necessary.

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