2.0 FACILITY DESCRIPTION

2.1 Site Location Profile

The Metachem facility is located at 745 Governor Lea Road in New Castle, Delaware. The facility property occupies approximately 40 acres and consists of two parcels located to the north and south of Governor Lea Road. Manufacturing operations are conducted on the northern parcel; administrative facilities are located on the southern parcel.

The site is located within the Delaware City industrial area. Motiva Enterprises borders the Metachem property to the south. The western portion of the property is bordered by Praxair. Undeveloped land, possibly owned by another industrial operation in the area, is located to the east of the manufacturing area. Immediately north of the manufacturing area is a portion of the property that is also undeveloped.

The Metachem facility is listed on EPA's National Priorities List. An interim remedial work plan has been submitted and a groundwater recovery feasibility study is underway.

2.2 Overview of Facility Operations

Metachem is an organic chemical manufacturer, SIC Code 2865, producing a variety of polychlorobenzenes. The manufacturing process involves the chlorination of benzene and subsequent distillation reactions to segregate commercial products and intermediates. Benzene is transported to the facility in tank trucks and stored onsite in aboveground storage tanks. Chlorine is piped into the facility from OxyChem.

The major products manufactured at Metachem are monochlorobenzene, parardichlorobenzene, metachlorbenzene, and 1,2,4-trichlorobenzene. Other isomers of dichlorobenzene and trichlorobenzene may also be produced as intermediates and are reprocessed. The manufacturing areas of the facility associated with production of these products are referred to as the Main Plant and the Tri Plant. Tetrachlorobenzene is also produced during chlorination and distillation processes for manufacture of the primary commercial products. Metachem reprocesses this byproduct into commercial products, primarily trichlorobenzenes, within the facility's hydrogenation process. The chlorobenzene products are distributed either in drum containers or by tank truck.

The Metachem facility also operates [redacted] to produce a solid form of paradichlorobenzene. This operation is referred to as the Para Plant. This material is packaged in bags for distribution.

Hydrochloric acid is produced as a byproduct and also sold as a commercial product.

A facility site diagram depicting the major processing and storage areas and equipment at the facility is provided as Figure 1. A process flow diagram of the chlorination and distillation process has been provided as Figure 2. Metachem's operates a batch manufacturing process. Figure 2 illustrates the current configuration of facility reaction and distillation equipment and reflects the flow of raw materials and intermediates through the manufacturing process. Final product or intermediate storage facilities are not noted in this diagram; however, a list of these storage tanks is provided in Table 3.

All wastewaters generated by manufacturing processes are treated on site. A flow diagram for the facility wastewater treatment system has been provided as Figure 3. Groundwaters recovered pursuant to Consent Order No. 88-11 JLL that have been processed through the onsite air stripper treatment system also enter wastewater treatment.

2.3 Environmental Permit Status

A list of the facility environmental permits reviewed by the audit team is provided as Table 4. Copies of these permits were obtained for review from Metachem's files and cross-referenced to those permits identified during the FOIA review at DNREC and EPA offices. Table 4 also identifies the facility processes and equipment referenced in these permits.

Table 5 includes an emissions inventory summary for Metachem as reported in the facility's annual emissions statements submitted for reporting years 1998, 1999 and 2000.

2.4 Raw Material/Feedstock Inventory

Table 6 summarizes the annual and monthly inventories for the raw materials used in facility manufacturing processes, chlorine and benzene, and the predominant products manufactured. Production inventories noted on this table include the monthly volume of chlorobenzenes manufactured, as based upon the difference of ending and beginning inventories, and the quantity of product shipped offsite as sales. Metachem determines its ending and beginning monthly product inventories using the measured volume of product stored. Product storage tanks are equipped with level indicators. [redacted]

2.5 Waste Inventory

Metachem generates a variety of hazardous and non-hazardous waste streams. An inventory of typical waste streams generated is provided as Table 7. Waste accumulation and storage areas identified during ENSR's on-site inspection are noted on the facility site diagram provided as Figure 1.

Metachem's container storage inspection logs include both waste containers and off-spec products that are awaiting rework. The logs do not specify which containers hold wastes, nor do they provide specific inventory amounts for either wastes or other materials, so waste inventory amounts shown in Table 6 are estimates based on the auditor's observations during the site visit. For purposes of the inventory estimates, 55-gallon containers were assumed to be full. The estimates of amounts stored in various larger containers (e.g. roll-off bins) are based on observed levels and notes in the inspection logs.

The only waste storage tank for which inventories are kept is T13AR. Table 7 lists the capacity of the other tanks in which wastes are stored.

2.6 Tetrachlorobenzene Inventory and Facility Tracking Programs

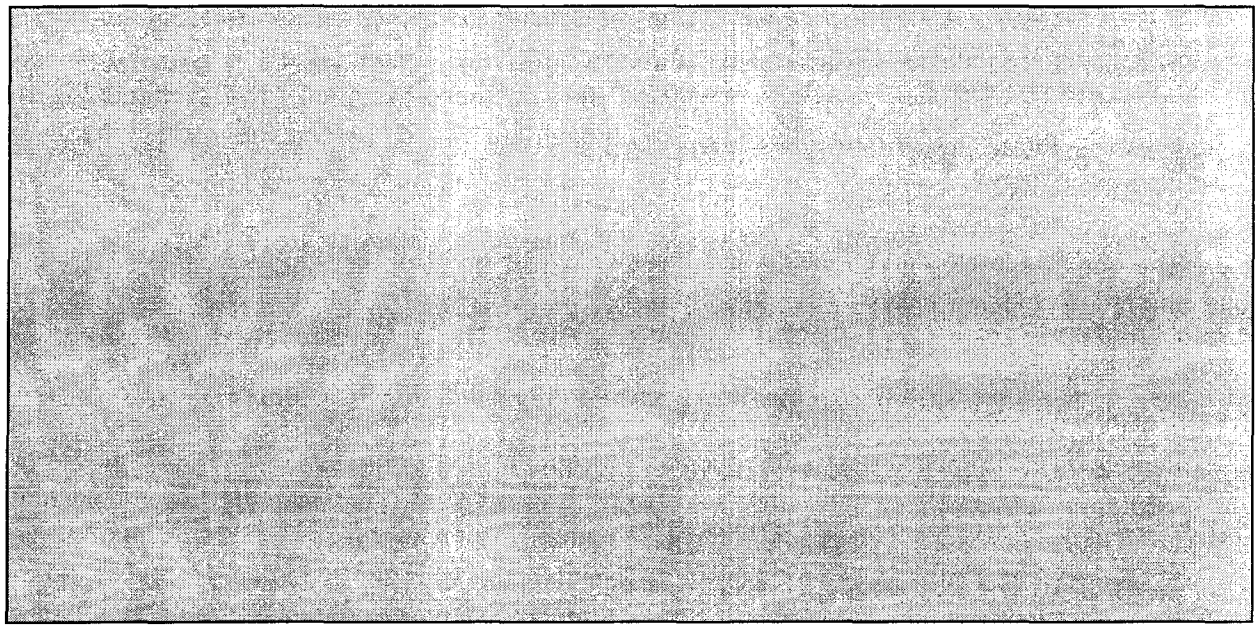
Item 9 of the Stipulation of Final Judgement requires that this audit include confirmation of the volume of tetrachlorobenzene produced [redacted]. Metachem must track its rate of [redacted] and assure that not less than 75% of the total volume [redacted] in calendar year 2001. Metachem tracks the monthly volume of tetrachlorobenezene produced as a manufacturing byproduct and entered into inventory and the rate at which tetrachlorobenzene is recovered. [redacted].

For this audit, ENSR evaluated Metachem's current methodology for determining the quantity of tetrachlorobenzene recovered. The purpose of this evaluation was to confirm that this methodology and the rate of tetrachlorobenzene recovery reported quarterly to the agency were based upon a reasonable approach. ENSR's evaluation is based upon a review of process flow diagrams, analytical results used to define speciation rates for the feedstock and products recovered during the hydrogenation process, and the current database system used by Metachem to calculate the processing and recovery rates for tetrachlorobenzene. ENSR reviewed the database information compiled by Metachem for the period of January 1, 2001 through June 30, 2001.

2.6.1 Tetrachlorobenzene Recovery Process

[redacted] is used to convert tetrachlorobenzene, a manufacturing byproduct, [redacted]. Vapor phase hydrogenation occurs through the reaction [redacted] The manufacturing process flow diagram provided as Figure 2 includes an overview of this process. A schematic for this process is provided below as Figure 4.

Figure 4: [redacted]



Before entering the hydrogenation process, the polychlorobenzene byproduct streams are distilled using column C-3 or C-4 to extract available products and then transferred to the hydrogenation feed tank, Tank T-2R. [redacted] The vent stream, [redacted] is cooled in a condenser to liquefy the organic product before being transferred to product tank T-31 where the liquids separate for recovery. The vent stream passes through a packed organic scrubber [redacted] Finally, muriatic acid is produced through the absorption of the hydrogen chloride into water in a packed column before the vent stream discharged to the atmosphere. Tetrachlorobenzene is primarily produced during chlorination of benzene at the Main Plant and chlorination of p-dichlorobenzene (p-DCB) and o-dichlorobenzene (o-DCB) to form trichlorobenzenes at the Tri Plant. The tetrachlorobenzene is contained within the byproduct streams of these processes. Based upon historical sampling and stoichiometric ratios, Metachem has defined the following conversion factors to calculate the quantity of tetrachlorobenzene produced during each process: [redacted]

[redacted]

Based upon production inventory and a review of the current tetrachlorobenzene recovery tracking database, Metachem calculates that during the period January – September 2001, [redacted] of tetrachlorobenzene was produced as a manufacturing byproduct.

2.6.2 Tetrachlorobenzene Processed and Converted

Metachem calculates the quantity of tetrachlorobenzene processed and converted using production data and stoichiometry. Operating parameters (i.e.; feed volume, feed rate, start/end time, and temperature) are entered into a production tracking database to calculate tetrachlorobenzene feed rate and an average feed flow rate for each production run. Product tanks are equipped with level gauges that automatically transmit feed volume and rate information to the control room. The concentration of tetrachlorobenzene in the feedstock is determined through sampling of the crude feed [redacted]

The mass of dechlorinated tetrachlorobenzene processed during each run is calculated using the following equation:

> Tetra processed (lbs./day) = [(Average feed flow rate (gpm)) x (60 min/hr) x (density lbs./gal) x (no. of hours) x (average tetra feed %)] / 100

The total monthly volume of processed tetrachlorobenzene is the sum of the volumes calculated for each run during the tracking period (monthly).

The volume of converted tetrachlorobenzene is that quantity of processed tetrachlorobenzene that is converted to less halogenated chlorinated benzenes in the hydrogenation process. Metachem calculates this volume using the following equation:

[redacted]

The total volume of tetrachlorobenzene converted is compared to the total volume of tetrachlorobenzenes produced over the period of review to determine the rate of recovery.

Metachem calculates that during the period from January – June 2001, 1,209,659 lbs. of tetrachlorobeneze was sent for re-processing. During this study period, 470,616 lbs. of tetrachlorobenzene were calculated to have been converted to benzene and/or other chlorobenzene products. The calculated recovery rate of tetrachlorobenzenes produced was determined to be 78.8% for this total period.

2.6.3 Tetrachlorobenzene Storage Inventory

The polychlorobenzene feedstock for the hydrogenation unit is stored in various intermediate storage tanks, as noted on Table 3. In May 2001, Metachem sampled the Main Plant and Tri Plant byproduct streams to determine their concentration of tetrachlorobenzene. Using these concentrations and the monthly inventory of each intermediate tank, Metachem tracks the quantity of tetrachlorobenzene in inventory. This inventory is also tracked using the Microsoft Excel database. Monthly inventories, in pounds, for January – September 2001 are as follows:

January 2001: 13,581,000

February 2001: 14,606,000

March 2001: 14,838,000

April 2001: 15,722,490

May 2001: 15,477,480

June 2001: 14,773,570

July 2001: 13,772,520

August 2001: 13,643,300

September 2001: 12,936,250

This inventory is considered to be work in progress. Intermediate feedstock which Metachem determines cannot be sent for recovery is removed from the process for storage in tank T13AR. Material stored in this tank is managed as a hazardous waste, waste code K085.