UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

PCB

MAY 7 1976

Mr. R. W. Flint
Plant Manager
W. G. Krummrich Plant
Monsanto Industrial Chemicals Company
Sauget, Illinois 62201

Dear Mr. Flint:

As a follow-up to conversations between Mr. Clarence Buckley, Supervisory Environmental Control Engineer of Monsanto and Mr. Howard Zar of my staff on April 28th and April 29th, enclosed find a copy of the report prepared by U.S. EPA in regard to its January 27, 1976 wastewater inspection of the W. G. Krummrich Plant. An additional report, ("Assessment of Wastewater Management; Treatment Technology and Associated Costs for Abatement of PCB Concentrations in Industrial Effluents", Versar, Inc. Task II Final Report, February 3, 1976, EPA-560/6-76-006) relating to the Krummrich facility has already been received by Monsanto according to Mr. Buckley. The Versar report contains a lengthy discussion of PCB waste handling at your facility and available treatment methods.

On the basis of our reading of the Versar Task II report, it is our recommendation that concentrations of PCBs in Monsanto's effluent discharges to the Sauget Sewage Treatment Plant be reduced to the 1 ppb level. Present discharge of PCBs are appreciably higher, averaging in excess of 0.5 ppm and rate in excess of 3 lbs/day (according to the Versar report).

We would appreciate your suggeations as to the proper way to resolve this matter as soon as you have had an opportunity to review these reports. A written response by May 17, 1976 would be appreciated. We would also like to schedule a meeting to discuss your response and also PCB air emissions at the facility, particularly from storage tanks. Please contact Mr. Zar or Mr. Fenner of my staff (312-353-1472) regarding the meeting and any questions that may arise.

Very truly yours,

Dale S. Bryson

Dale S. Bryson, Acting Director
Enforcement Division

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MAY 12 1976

Attachment

cc: Mr. Ronald Barganz, Illinois EPA

MONS 093622

REPORT ON
INVESTIGATION OF PCB MANUFACTURING FACILITY
MONSANTO INDUSTRIAL CHEMICALS COMPANY
W. G. KRUMMRICH PLANT
SAUGET, ILLINOIS 62201

JANUARY 27, 1976

PERFORMED BY

U. S. ENVIRONMENTAL PROTECTION AGENCY
ILLINOIS DISTRICT OFFICE
1819 WEST PERSHING ROAD
CHICAGO, ILLINOIS 60609

AND

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
REGION IV (SW)
117 WEST MAIN STREET
COLLINSVILLE, ILLINOIS 62234

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MAY 12 1976
REGION V

INVESTIGATION OF PCB MANUFACTURING FACILITY
ILLINOIS DISTRICT OFFICE, USEPA

I. Company Identification

Monsanto Industrial Chemicals Company
William G. Krummrich Plant
Sauget, Illinois 62201

Telephone: 618-271-5835

Receiving Waters: Mississippi River via the
Sauget, IL Wastewater Treatment Plant

Responsible Officials
R. W. Flint, Plant Manager
A. E. Leisy, General Manufacturing Superintendent
P. E. Heisler, Director of Environmental Control
W. B. Papageorge, Manager, Product Acceptability (St. Louis)

II. Date of Inspection and Sampling

January 27, 1976

III. Participants

Company
W. B. Papageorge, Manager, Product Acceptability (St. Louis)
R. W. Flint, Plant Manager (W. G. Krummrich Plant)
A. E. Leisy, General Manufacturing Superintendent
Paul E. Heisler, Director of Environmental Control
Clarence F. Buckley, Supervisory Engineer, Environmental Control
Robert L. Harness, Senior Engineer
Julio Munoz, Environmental Control Engineer II

Sauget Village Waste Treatment Association
James Dalton, Superintendent
Fred W. Albowitz, Supervisor, WWTP

Illinois Environmental Protection Agency (618-345-6220)
Lawrence Eastep, Environmental Protection Engineer

U. S. Environmental Protection Agency (312-353-5638)
R. Edwin Zylstra, Chemical Engineer, ASB, Region V
Charles J. Miller, Physical Scientist, ASB, Region V
John F. Connell, Sanitary Engineer, ASB, Region V
Kenneth Burch, Chemical Engineer, Solid Waste Branch, Region V
Joseph V. Slovick, Engineering Technician, Illinois District Office
Roscoe W. Libby, Supv. Physical Scientist, Illinois District Office(Author)

IV. Objective

To obtain information on PCBs being discharged from the Manufacturing and Incineration Facilities at the W. G. Krummrich Plant in Sauget, Illinois; and to and from the Sauget municipal wastewater treatment plant. To verify the existence of a certified SPCC plan.

V. Summary and Findings

The results of sampling for PCBs are as follows:

ILDO Sample Number C-76-	Location and Sample Description	Concentration PCB (ug/l) Aroclor 1016	Aroclor 1248	Aroclor 1254	Aroclor 1260
0349	W.G.K. Plant Process Effluent 1/	36	<0.1	16	<0.1
0350	W.G.K. Plant Incinerator Effluent	4.2	<0.1	<0.1	<0.1
0352	Sauget WWTP Influent	15	<0.1	<0.1	<0.1
0353	Sauget WWTP Effluent	24	<0.1	19	<0.1
0354	Reagent Blanks	0.2	<0.1	<0.1	<0.1

1/ W.G.K. - William G. Krummrich Plant

LOADINGS LBS/DAY PCB TYPE

ILDO Sample Number C-76-	Location and Sample Description	Flow MGD	Loadings Pounds/Day Aroclor 1016	Aroclor 1254
0349	W.G.K. Plant Process Effluent 1/	0.105	0.0315	0.014
0350	W.G.K. Plant Incinerator Effluent	0.206	0.0072	--
0352	Sauget WWTP Influent	12	1.5	--
0353	Sauget WWTP Effluent	12	2.4	1.9

1/ W.G.K. - William G. Krummrich Plant

Monsanto in a news release dated January 26, 1976 (Appendix 5) announced to their United States capacitor and transformer industry customers that they were going to phase out PCBs. This announcement has no date and is dependent on finding an acceptable substitute material.

Measurable amounts in pounds/day are being discharged from the Sauget wastewater treatment plant to the Mississippi River. PCB can and should be eliminated from the WWTP effluent.

The plant has a properly certified SPCC plan.

VI. Description of the Industry

The only plant that manufactures PCBs in the United States is the William G. Krummrich plant of the Monsanto Industrial Chemicals Company at Sauget, Illinois. Commercial manufacture of the Aroclor brand of chlorinated biphenyls was started in 1929. The products vary from oily mobile liquids to white crystalline solids and hard noncrystalline resins. Many of the PCBs in the environment were manufactured for uses such as fire resistant heat-transfer and hydraulic fluids, lubricants for high temperature and pressure uses, sealant and expansion media, and for uses in elastomers, adhesives, paints, inks, laquers, varnish, pigments, waxes, and noncarbon carbon paper. These uses have been discontinued and the only purposes for which PCBs are presently sold are for use in electrical capacitors and transformers.

Monsanto manufactures four grades of polychlorinated biphenyls for use in electrical capacitors and transformers as shown in the table below:

Designation	Appearance	Predominant Compound	Percent Cl_2	Specific Gravity	Distil. Range °C	Flash Point °C
1221	Clear mobile oil	Monochlorobiphenyl	20.5-21.5	1.18	275-320	141-150
1242	"	Trichlorobiphenyl	42	1.36	325-336	176-180
1016	"	Trichlorobiphenyl	42	1.36	323-356	168
1254	Light yellow viscous liquid	Pentachlorobiphenyl	54	1.54	365-390	None to B.P.

Manufacturing Processes

The manufacturing unit consists of 6 chlorinators, 3 cascade and 3 batch type. The units are charged with the proper type of biphenyl and a catalyst (ferric chloride). Anhydrous chlorine is introduced into the reaction vessel and the charge is recirculated with a pump. The temperature of the mixture is kept well above the melting point of mixture, but below 150°C to avoid sublimating the material and plugging the hydrogen chloride discharge line. The pressure is kept near atmospheric with the contact time of 12-36 hours depending on the type of Aroclor desired. The HCl is scrubbed with liquid Aroclor and the anhydrous gas is sent to another part of the Sauget complex for purification.

The process is controlled by hydrometer readings for the lower chlorine contents. The more viscous material having a higher melting point is measured at the hold point where the material crystallizes, or by the ball and ring softening point test.

The crude PCB material is held at an elevated temperature and airblown for several hours before being sent to the raw Aroclor storage tanks. A fraction of a percent of alkali (NaOH or lime) is mixed with the storage tank contents to neutralize any remaining HCl or $FeCl_3$. The air from the blower tank is vented to the atmosphere after being scrubbed with water. The scrubbed air is passed through a demister before release to the atmosphere.

The raw material is vacuum distilled to remove color and any traces of catalyst or hydrogen chloride. The vacuum is obtained by steam ejectors with the condensed steam being discharged to the plant sump. The residue (montars) are drummed and sent to be incinerated. Complete distillation and mixing of the distillate is necessary to obtain a uniform material of the desired composition.

To increase the electrical resistivity a few tenths of 1 percent dehydrated fuller's earth is mixed with the material at an elevated temperature followed by filtration through paper.

Incinerator

To achieve efficient destruction of PCBs a suitable balance between dwell time and temperature in the incinerator plus availability of excess oxygen must be obtained. The hydrogen chloride formed by combustion must be removed by suitable scrubbing devices. Two thousand degrees Fahrenheit plus 3 percent excess oxygen in the stack gas with a dwell time of 2 seconds or a 1.5 second dwell time at 2,700°F and 2 percent excess oxygen in the stack gas are required for efficient destruction of waste Aroclors.

The Monsanto Company employs a John Zink incinerator operating on 25 percent excess air (5 percent O_2) at temperatures in excess of 2,200°F.

The montars from the manufacturing process retorts, the bottoms from separator sumps, accumulation from drip pans, and waste Aroclors returned for destruction are pumped to the incinerator unit. Steam is fed to atomize the liquid waste stream before the fire pot. Combustion is obtained using natural gas and excess air. The combustion products are cooled by a quench pot followed by a venturi scrubber and a packed tower. The liquid wastes from the incinerator and the water phase from the sump are sent to the Sauget municipal wastewater treatment plant.

The incinerator is capable of handling 6,000,000 pounds per year. Drainage at the site is conveyed by trenches and piping to a 10,000 gallon underground basin. The water layer from this concrete sump is pumped continuously and combined with the scrubber, quench pot and packed tower effluents. The PCB fraction in the sump is periodically pumped to the waste storage tanks.

The combined scrubber flow and the water phase from the underground sump is metered and pH monitored before discharge to the sewer system.

VII. Description of the Survey

Sampling Locations

Process Effluent (C-76-0349)

This was a grab sample taken at the parshall flume before the effluent discharged to the plant sewer system at Building 246.

Incinerator and Water Phase from Concrete Sump (C-76-0350)

This was a grab sample obtained at the metering flume at the incinerator complex.

Sauget WWTP Influent (C-76-0352)

A grab sample obtained of the influent to the treatment plant.

Sauget WWTP Effluent (C-76-0353)

A grab sample was obtained from the final tank at the effluent weir.

Reagent Blank (C-76-0354)

The reagent blanks were made from water obtained at the Central Regional Laboratory.

General

Glass bottles were used for the collection of the PCB samples. All samples were handled using glass or stainless steel equipment. The stainless steel buckets and funnels were rinsed with reagent grade petroleum ether before use. Separate buckets and funnels were used for each sample.

The samples were split with the Illinois Environmental Protection Agency and Monsanto. Standard USEPA sampling, preservation and analytical techniques were used and chain of custody procedures were followed in the collection and transportation of the samples.

A meeting was held with Monsanto and IEPA personnel before the plant survey. This meeting coordinated the USEPA air, solid waste and water effluent efforts. Monsanto personnel were helpful and cooperative. The weather was moderate throughout the survey period with no rain. Flows were obtained by direct measurement at the process waste site and at the

incinerator. The 12 MGD flow at the Sauget WWTP is an estimate obtained from the WWTP personnel as the parshall flume at the plant influent was being bypassed during plant upgrading.

Air samples were taken by personnel of the Air Surveillance Branch and the Monsanto solid waste disposal site was inspected by Mr. Kenneth Burch from Region V Solid Wastes Branch. A copy of his checklist is attached as Appendix 6.

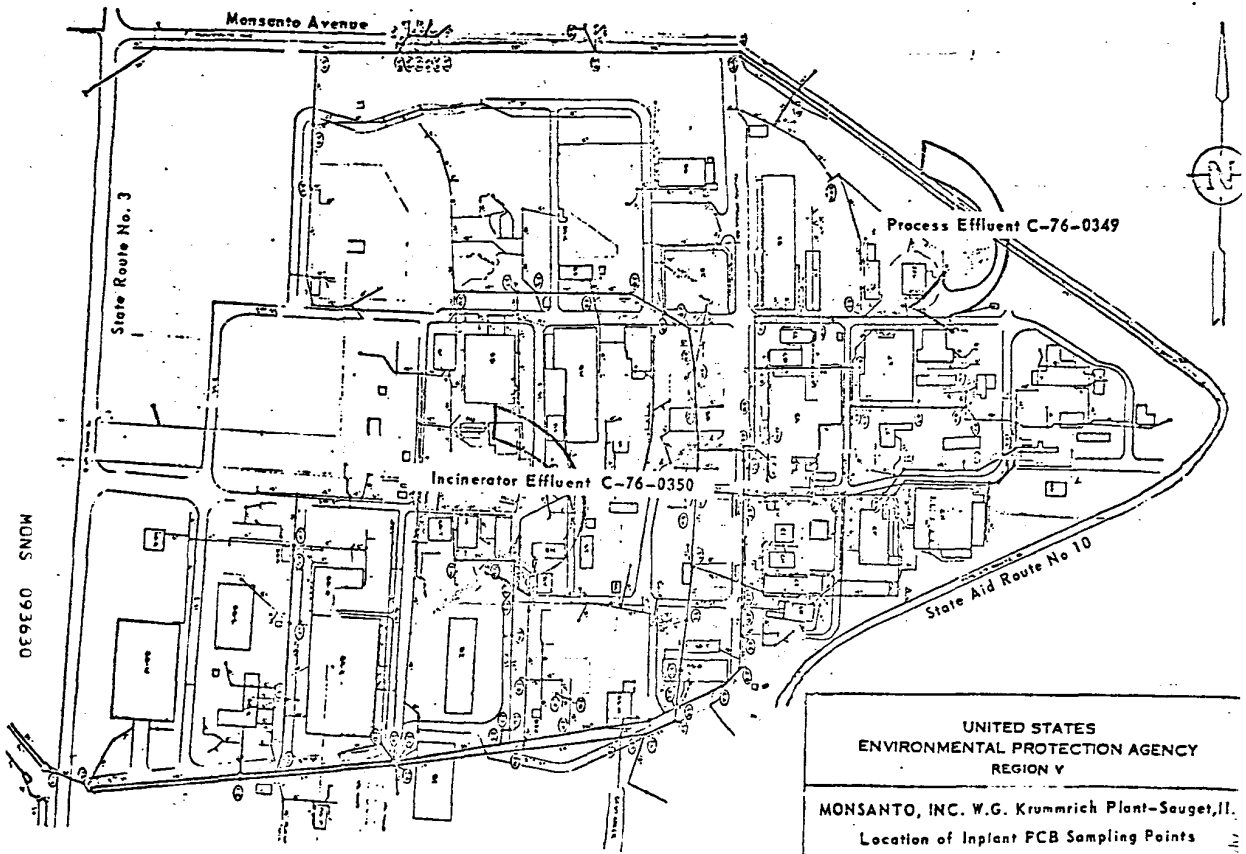
VIII. Recommendations

1. That alternate materials be found to replace PCBs in capacitors and transformers.

2. That zero discharge from the Sauget treatment plant to the Mississippi River be achieved. The substantially higher loadings from the Sauget WWTP may be due to a long existing accumulation in the plant sewer systems.

Appendixes
1. Location of Sampling Points
2. Flow Diagram - Incinerator
3. Flow Diagram for Process Manufacturing and Wastes
4. Location Map - W.G. Krummrich Plant
5. News Release dated Jan. 26, 1976
6. Checklist Prepared by K. Burch

MONS 093629

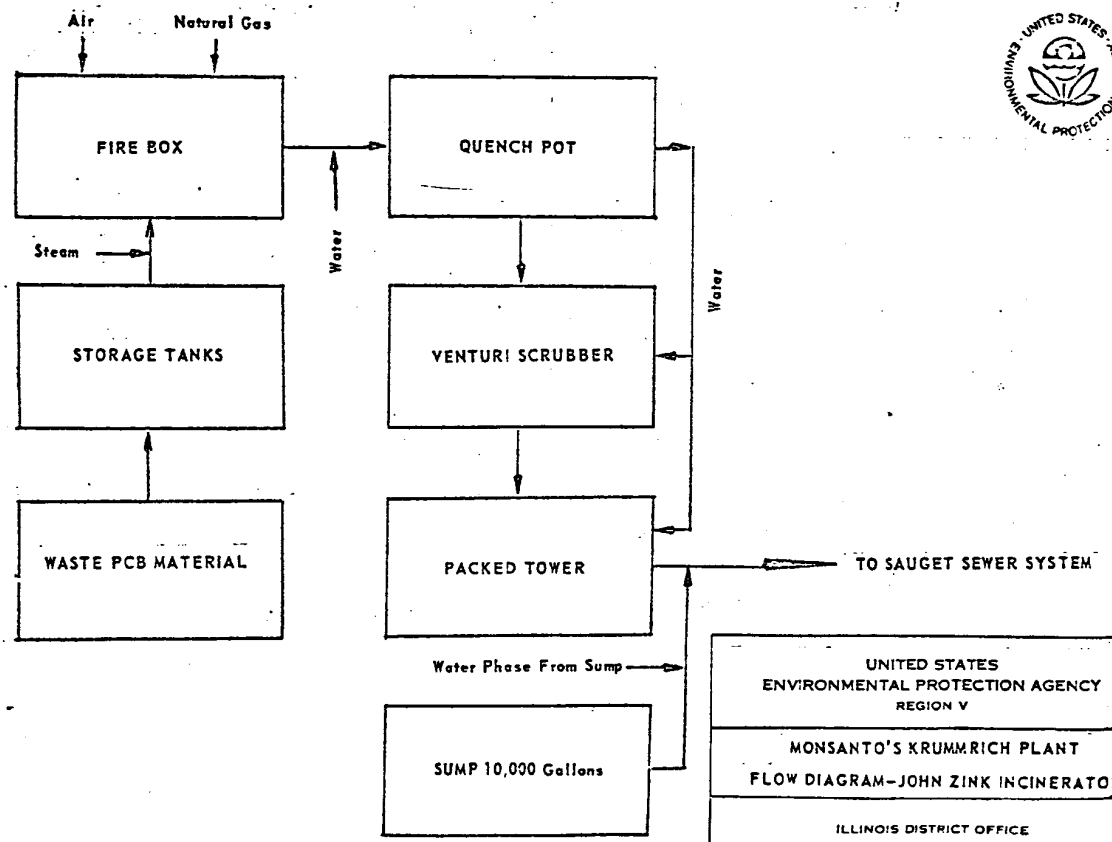


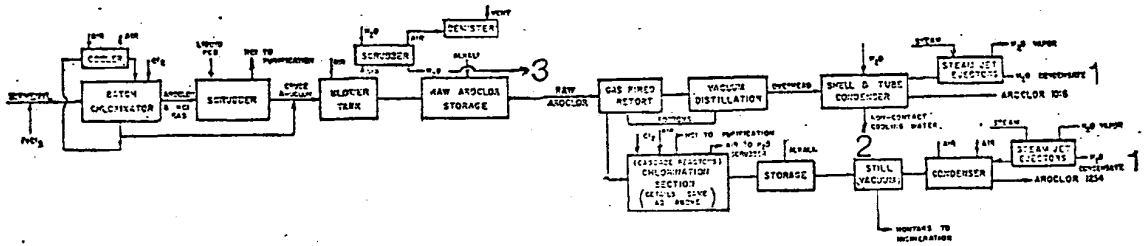
MONS 093630

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V

MONSANTO, INC. W.G. Krummrich Plant-Sauget,Il.
Location of Inplant PCB Sampling Points

ILLINOIS DISTRICT OFFICE
1819 W. PERSHING RD.


Air
Natural Gas
FIRE BOX
QUENCH POT
Steam
Water
STORAGE TANKS
VENTURI SCRUBBER
Water
WASTE PCB MATERIAL
PACKED TOWER
TO SAUGET SEWER SYSTEM
Water Phase From Sump
SUMP 10,000 Gallons
UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
MONSANTO'S KRUMMRICH PLANT
FLOW DIAGRAM–JOHN ZINK INCINERATOR
ILLINOIS DISTRICT OFFICE
1819 W. PERSHING RD.
CHICAGO, ILLINOIS 60609
Appendix X
MONS 093631



1 STEAM JET EJECTORS — Water Condensate

2 SHELL AND TUBE CONDENSER — Non-Contact Cooling Water

3 SCRUBBER — Water From Scrubber

→ Parshall Flume → TO SAUGET SEWER SYSTEM

PCB PROCESS PLANT WASTEWATER DISCHARGES

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V

MONSANTO'S KRUMMRICH PLANT-SAUGET, IL.

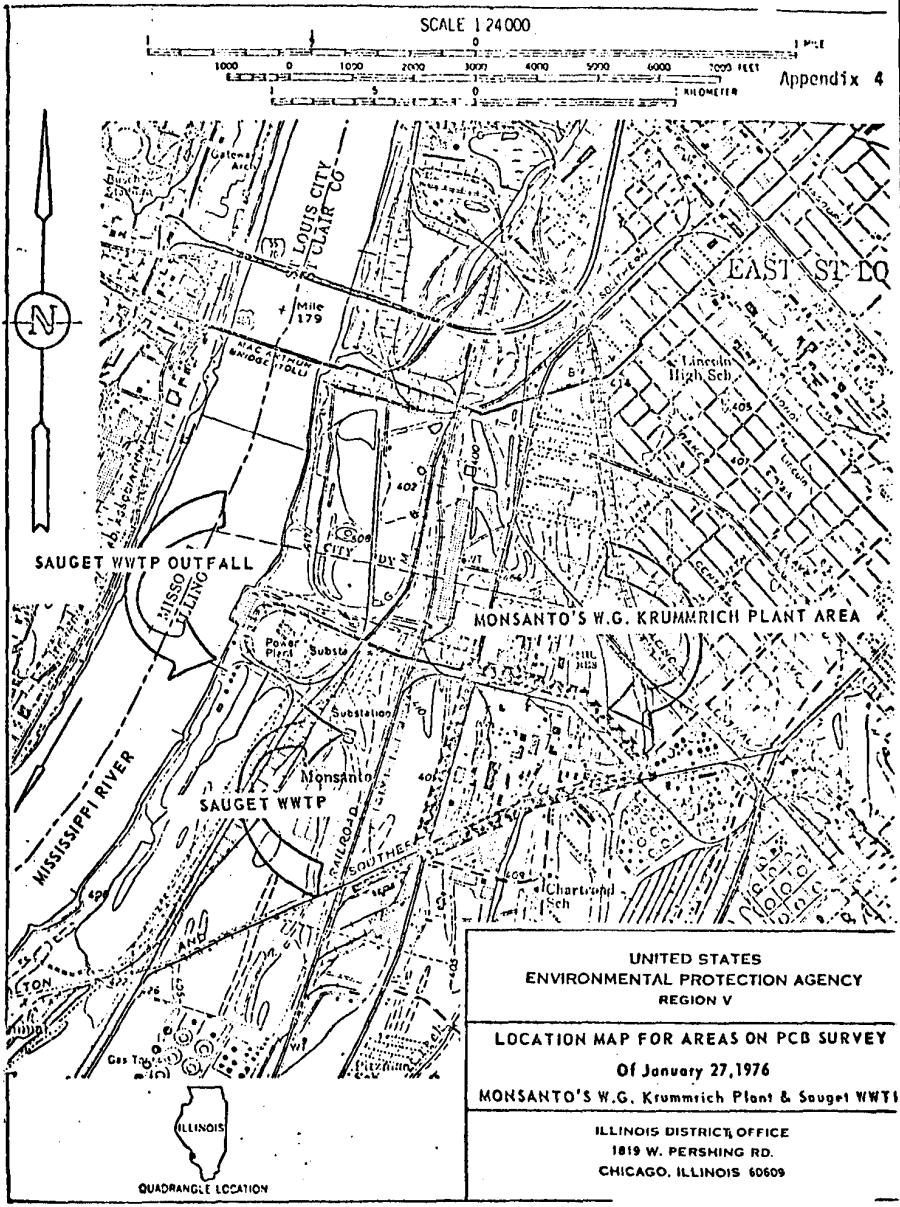
PCB Manufacture Process Flow & Water Discharges

ILLINOIS DISTRICT OFFICE
1819 W. PERSHING RD.
CHICAGO, ILLINOIS 60609

APPENDIX 3

MONS 093632

Appendix 4



UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V

LOCATION MAP FOR AREAS ON PCB SURVEY
Of January 27, 1976
MONSANTO'S W.G. Krummrich Plant & Sauget WWTP

ILLINOIS DISTRICT OFFICE
1819 W. PERSHING RD.
CHICAGO, ILLINOIS 60609

MONS 093633

by a Federal Interdepartmental Task Force in 1972, reduced Monsanto's annual PCB production by over 50 per cent.

"2. In our manufacturing area, we instituted controls, unique in the industrial chemicals industry, to minimize losses to the environment. We also installed a special high-temperature incinerator which completely destroys waste PCB by burning at temperatures above 2,000 degrees F. This service and other technical assistance is available to our customers on a continuing basis.

"3. Monsanto has been working for a number of years on non-PCB replacement products. These materials, designed to replace PCB fluids in capacitors and transformers, are currently being evaluated by electrical manufacturers in the United States."

Mr. Fitzgerald added that while the PCB issue is a difficult one to handle, the difficulty does not now, nor will it in the future, stem from any lack of effort or cooperation on the part of Monsanto. "The problems that we face collectively are rooted in the unique fire resistant and dielectric characteristics of PCBs, and the irreplaceable role they have played in electrical and industrial applications for the past 45 years," he said.

"The challenge is to replace them in an orderly manner without creating another hazard of equal or potentially greater consequences, while at the same time avoiding serious power and transportation disruptions. This is our goal. In the interim, we will continue to work with industry and government to ensure that the restrictive measures and controls we implemented in the early 1970s remain in force and are diligently pursued."

Appendix 6

Monsanto 1/2/76 Morning

Checklist prepared by K. Burch USEPA-V

Bob Harness / Landfill

Jan. 22, 1976 Checklist

OFF SITE DISPOSAL CHECKLIST

1. A. Nuclear Engineering & hauls & disposes of some (small amount) of toxic materials. Material is disposed of in Sheffield, Ill or Texas Geologists sites. This is the exception rather than the rule

B. ~~other~~ Materials other than Arclare are shipped to Nyon ~~to~~ Innovator via SLAY TRANSPORTATION

2. Yes

3. Yes

4. N/A

5. Only dept. of transp. regulations

6. Invoice from disposal firm

7. Separate packaging in drums.

8. Yes when a contaminated solid is received from a customer. Liquids are incinerated on site

9. No. Liquid PCB material leaved on site. Special label used on contaminated solid material drums (Special Residue Label)

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10. Each Bill of Lading contains a an Monsanto 24 hour phone ~~or~~ chemical # to call in case of emergency besides other pertinent info.

17. Treatment DISPOSAL PHASE

1. Primarily monsanto's incinerator
Monsanto has an on site landfill operated 5 days a week, day shift only, but is only for non hazard materials as determined by Monsanto's ~~lab~~ corporate medical lab.

2. Incinerator permitted by the State Air program
On site landfill does not require a landfill at present per Illinois law.
Incinerator must meet following conditions: APP # 02121, 10th 163121 A.
1. Std Ill conditions on form # APC-161
2. Type 5 waste not to exceed 650 lbs/hr to be incinerated

3. A. ~~Ins~~ Waste haulers only used to transport PCB contaminated material ~~either~~ ~~[illegible]~~ (NUCLEAR ENG to their own site.
B. Bill of lading

4. See end of report.

5. John Zink Liquid waste incinerator
model 1513/M-14

5 Continued from (2)

no treatment prior to incineration, some blending may be done to mix other wastes in to prepare a more easily handled material.

Combustion temp 2150° F to 2400° F

Dwell time 3 seconds

Excess air 25%

Temperatures, waste fed rates, O_2, are continuously measured

6. Liquid material is fed into the incinerator

fed rate 650 lbs/hr max

Stack tests indicate 0% organic emissions i.e. nondetectable

Interlocks such as temp, scrubber flow, blower, shut the unit down. ~~Has~~ Unit has shut down ~~but~~ and no recording of PCB burning is recorded.

8. Stack analysis are run quarterly

7. Quench column, venturi scrubber, packed scrubber, demister.

Quarterly tests on the system as a whole, not on individual units.

Scrubber water to sewer to Saugat ~~to~~ wastewater plant.

8. See #5 ~~or~~ ~~test~~ continuous sampling of scrubber water is tested daily.

9. Yes, loss of scrubber water shuts unit down. about Ten malfunctions will shut unit down

10. No ash from the unit

11. No PCB contaminated materials go to fill
Only solids to fill. One part of fillies for tunnel waste, and is for solid process waste.
Pretreatment of process waste is to recover material and Dry the waste so it is a solid

monitoring well indicate 20 - 30 feet to groundwater for under the Earth liner is compacted, no artificial liner
Clayey material is readily available.

12. See # 4
Archlor material becomes solid at normal temp.

13. Drawing manufacture ↓ See # 4 for stage, transfer, etc.
Dikes around entire area - recovery sump
PCB material pumped out & reused or incinerated

14. Incinerator personnel keep log of mat'l received
no disposal to an site landfill

15. Six monitoring wells testing done by State on annual or semi-annual visit. Monsa. to also run tests especially for organics
LPA can act on sample

15. fill in the past prior to 72 did dispose of SCB material

11. not at the fill

17. Site is fenced with a guard. Close to a phone &
18 first aid station.

19. Yes, but memento has its own fire dept & full time fire chief & some personnel. Yes

20.

#4