AO Form No. 110 (Rev. 5-68) Subpoena to Testify Before Grand Jury

United States District Court

FOR THE

CENTRAL DISTRICT OF CALIFORNIA

To Custodian of Records
Monsanto Industrial Chemicals Co.
800 North Lindbergh Boulevard
St. Louis, Missouri 63166

You are hereby commanded to appear in the United States District Court for the Central District of California at Room 1346, U. S. Court House /312 North Spring Street in the city of Los Angeles on the 4th day of May 1972 at 9:30 o'clock A. M. to testify before the Grand Jury and bring with you[1] all records for the period January 1, 1971 to the present relating to the manufacture, sale, and distribution of chlorinated hydrocarbon chemical compounds known as polychlorinated biphenyls (PCB's), including but not limited to the names and addresses of all distributors and sales agents in California, and the names and addresses of all persons, firms, and corporations purchasing said compounds for use or distribution in California. During said period, plus all correspondence with distributors, purchasers, or agents relating to any restrictions on the sale or use of said compounds.

This subpoena is issued on application of the United States of America.

71-3966

EMORY G. HATCHER
Clerk.

Date April 20 1972

TAMARA SAUNDERS
Deputy Clerk.

WILLIAM D. KELLER, U. S. Attorney By
DAVID H. ANDERSON, Asst. U. S. Attorney

1. Strike the words "and bring with you" unless the subpoena is to require the production of documents or tangible things, in which case the documents and things should be designated in the blank space provided for that purpose.

DOA:ms 600-[illegible]

RETURN

Received this subpoena at on and on at I served it on the within named by delivering a copy to and tendering* to the fee for one day's attendance and the mileage allowed by law.

Date _____ 19__

By _____

Service Fees
Travel _____ $
Services _____
Total _____ $

* Fees and mileage need not be tendered to the witness upon service of a subpoena issued in behalf of the United States or an officer or agency thereof. 28 USC 1825, or on behalf of a defendant who is financially unable to pay such costs (Rule 17(b), Federal Rules Criminal Procedure).

DSW 444162

STLCOPCB4057764

D. R. Pogue B2S F

May 2, 1972

RESPONSE TO D. A.
LOS ANGELES SUBPOENA

J. F. Stapleton	B2S A
P. S. Park III	B2N A
W. R. Corey	B2S L
H. S. Bergen	B2S L
W. B. Papageorge	B2N K

Attached represents information for our response to the California Grand Jury subpoena.

Quarterly PCB sales and sales to our top 20 accounts is intended for Monsanto.

D. R. Pogue

lb

Attachment

DSW 444163

STLCOPCB4057765

POLYCHLORINATED BIPHENYL PRODUCTS SOLD IN RIVERSIDE, LOS ANGELES AND ORANGE COUNTIES

Product	Percent PCB
Aroclor 1254	100
Inerteen 70 - 30	70
Inerteen 100 - 42	100
Inerteen PPO	60
Pydraul 312	47.4
Pydraul A 200	100
Pyranol A13B3B	.45
Santovac 2	100
Therminol FR 1	100
Therminol FR 2	100
Therminol FR O	100

DSW 444164

STLCOPCB4057766

LARGEST PCB ACCOUNTS

1971 Sales

General Electric Company
Schenectady, New York

Westinghouse Electric Company
New York, New York

ITE Circuit Breaker
Philadelphia, Pennsylvania

Federal Pacific Electric Company
Newark, New Jersey

Electron I. C. Components
Bridgeport, Connecticut

DSW 444165

Company/Location	Product	Pound Sales 1971	Pound Sales 1972 (3 mos.)
Ajax Hr Manufacturing City of Industry, California	Pydraul 312	2000	
Arnold Engineering Fullerton, California	Pydraul 312	93	
Certified Alloy Long Beach, California	Santovac 2	1800	
Delmar Die Casting Gardena, California	Pydraul 312	990	
Diecast Manufacturing South El Monte, California	Pydraul 312	490	
Dow Chemical Torrance, California	Pydraul 312	3000	
Drumheller Tool & Die Tujunga, California	Pydraul 312	500	
Edwards Lab Santa Ana, California	Santovac 2	2400	
General Motors-Delco Battery Anaheim, California	Pydraul 312	6000	
Harvey Aluminum Torrance, California	Therminol FR 1	6600	
Harvill Machine Corona, California	Pydraul 312	1000	
Harvill Machine Perris, California	Pydraul 312	2500	

DSW 444166

STLCOPCB4057768

Company/Location	Product	Pounds Sales 1971	Pound Sales 1972 (3 mos.)
Honeywell Incorporated Gardena, California	Pydraul 312	4000	
Hyatt Die Casting & Engineering Cypress, California	Pydraul 312	4190	
Intl Casting Products Gardena, California	Pydraul 312	4980	
ITT Cannon Electric Santa Ana, California	Pydraul 312	2500	
Jersey Maid Milk Los Angeles, California	Therminol FR 1	600	
Jiffy Packaging La Mirada, California	Therminol FR 1	8400	
Krad Associates Costa Mesa, California	Santovac 2	300	
Los Angeles Die Casting Los Angeles, California	Pydraul 312	6950	
Maclin Company Los Angeles, California	Therminol FR 1	180	
McCulloch Corporation Los Angeles, California	Pydraul 312	4000	
McCulloch Corporation Sante Fe Springs, California	Pydraul 312	1500	
Melco Wire Products Glendale, California	Santovac 2	120	
Neuschotz Engineering Los Angeles, California	Pydraul 312	1000	
Oak Manufacturing Los Angeles, California	Pydraul A 200	645	

DSW 444167

STLCOPCB4057769

Company/Location	Product	Pounds Sales 1971	Pounds 1972 (3 mos.)
Pennwalt Corporation City of Industry, California	Santovac 2	950	
Frito Lay Co Los Angeles, California	Therminol FR 2	600	
Phillips Die Santa Fe Springs, California	Pydraul 312	500	
Ranger Die Cast Lynwood, California	Pydraul 312	2000	
Red Point Corporation Burbank, California	Therminol FR 1	110	
Remet Corporation Long Beach, California	Santovac 2	600	
Remet Corporation City of Industry, California	Santovac 2	600	
Remet Corporation La Mirada, California	Santovac 2	1200	
Remet Corporation Los Angeles, California	Santovac 2	120	
Royal Industries Santa Ana, California	Therminol FR 1	820	
Hubbell Lighting Div. Burbank, California	Pydraul 312	2000	
Spartan Castings Buena Park, California	Pydraul 312	1000	
Standard Oil La Habra, California	Therminol FR 1	5400	
Systems Printers Santa Fe, California	Therminol FR 1	220	

DSW 444168

STLCOPCB4057770

Company/Location	Product	Pounds Sales 1971	Pounds 1972 (3 mos.)
Peat Div./Whittaker Norwalk, California	Pydraul 312	5480	
Withrow Die Casting North Hollywood, California	Pydraul 312	2500	
El Monte Chemical Company Pasadena, California	Therminol FR 2	600	
Buck Manufacturing Company Garden Grove, California	Inerteen 70 30	1030	674
UCLA Los Angeles, California	Santovac 2	420	
California Whsl Electric Los Angeles, California	Inerteen 70 30	120	
Continental Can Los Angeles, California	Therminol FR 1	600	
Crown Zellerbach Los Angeles, California	Therminol FR 1	600	
General Electric Company Anaheim, California	Pyranol A13B3B	3380	
General Electric Company Los Angeles, California	Pyranol A13B3B	2910	1170
Great Lakes Carbon Rosamond, California	Therminol FR 1	18000	
Arwood Corporation City of Industry, California	Santovac 2	600	

DSW 444169

STLCOPCB4057771

Company/Location	Product	Pounds Sales 1971	Pounds 1972 (3 mos.)
Industrial Whsl Electric Los Angeles, California	Pyranol A13B3B	675	
Western Precipitation Los Angeles, California	Therminol FR 1	1200	
K West Westminster, California	Pyranol A13B3B	130	
Larsen Hogue Los Angeles, California	Pyranol A13B3B	5400	
McDonnell Douglas Santa Monica, California	Pydraul A 200	1940	
Benjamine Moore Los Angeles, California	Therminol FR 1	2400	
Northrop Corporation Hawthorne, California	Inerteen PPO	2700	
Owens Illinois Los Angeles, California	Therminol FR 1 Therminol FR 2	1200 1200	
PPG Torrance, California	Therminol FR 1	4200	
Pryor Cabinet Shop Grover City, California	Therminol FR 1	110	
Airesearch Manufacturing Co Torrance, California	Therminol FR 1 Therminol FR O	110 7200	
Standard Felt Alhambra, California	Therminol FR 1	600	
Stresskin Pro Company Santa Ana, California	Therminol FR 1	1200	

DSW 444170

STLCOPCB4057772

STLCOPCB4057773

	Product	Pounds Sales 1971	Pounds 1972 (3 mos.)
Union Amsco La Mirada, California	Therminol FR 1	6000	
Union Oil Company Los Angeles, California	Pyranol A13B3B	130	
Union Oil Wilmington, California	Pyranol A13B3B	315	
U.S. Marine El Toro, California	Inerteen 100 42		1200
U.S. Gypsum Santa Fe Springs, California	Therminol FR 1	1200	
U.S. Gypsum Southgate, California	Therminol FR 1	6000	
Vons Bakery El Monte, California	Therminol FR 1	220	
Westinghouse Electric Compton, California	Inerteen PPO Inerteen 70 30	674 2020	674
Wynn Oil Company Azusa, California	Aroclor 1254	24000	
Ansco Electric Prod Los Angeles, California	Therminol FR 1	1800	

DSW 444171

POLYCHLORINATED BIPHENYL SALES

BY QUARTER 1971 - 1972

	1971				1972
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.
Therminols	37,530	17,130	15,220	9,110	
Pydrauls	29,720	24,533	7,505		
Santovac 2	1,500	2,270	2,400	3,480	
Aroclor 1254	24,000				
Dielectrics	4,854	2,555	8,105	3,970	3,710
TOTAL	97,604	46,488	33,230	16,560	3,710

DSW 444172

POLYCHLORINATED BIPHENYL SALES

BY QUARTER 1971 - 1972

	1971				1972
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.
Therminol FR 1	28,530	16,530	15,220	9,110	
Therminol FR 2	1,800	600			
Therminol FR O	7,200				
Pydraul 312	29,720	22,593	6,860		
Pydraul A 200		1,940	645		
Santovac 2	1,500	2,270	2,400	3,480	
Inerteen 100 - 42					1,200
Inerteen 70 - 30		1,030	1,350	790	1,340
Inerteen PPO	674		2,700		
Inerteen A13B3B	4,180	1,525	4,055	3,180	1,170
Aroclor 1254	24,000				
TOTAL	97,604	46,488	33,230	16,560	3,710

DSW 444173

Largest PCB Accounts - 1971 Sales

1. General Electric Company
   Schenectady, New York

	Pounds
Aroclor 1248	95,700
Aroclor 1254	325,480
D 50P508 S-1	1,416,000
Aroclor 1260	826,440
Capacitor 21	13,520
Aroclor 1016	1,323,840
Aroclor 1242	4,222,900
Pyranol 1492	248
Inerteen 70 30	1,348
Pyranol A13B3B	917,840
Total Dielectric	9,143,316
Pydraul 312	2,500
Therminol FR 1	36,600
Santovac 2	360
TOTAL General Electric	9,182,776

DSW 444174

2. Westinghouse Electric Company
New York, New York

Inerteen 70 30	158,009
Inerteen 54201 CM	5,475,905
Inerteen 100 42	116,630
Inerteen PPO	15,244
Inerteen 54201 KA/KJ/A9	41,568
Inerteen 54201 CF	98,000
Aroclor 1242	648,500
Aroclor 1016	295,689
Total Dielectric	6,849,545
Therminol FR 1	3,000
Pydraul 312	2,500
TOTAL Westinghouse	6,855,045

3. ITE Circuit Breaker
Philadelphia, Pennsylvania

Inerteen 70 30	2,188,622
TOTAL ITE Circuit Breaker	2,188,622

4. Federal Pacific Electric Company
Newark, New Jersey

Aroclor 1016	371,400
Aroclor 1242	845,400
Inerteen 70 30	242,344
TOTAL Federal Pacific	1,459,144

DSW 444175

5. Electron I. C. Components
Bridgeport, Connecticut

Aroclor 1016	549,000
Aroclor 1242	671,100
Aroclor 1248	600
Aroclor 1254	26,400
Total Dielectrics	1,247,100
Aroclor 1254	27,000
TOTAL Electron I. C. Components	1,274,100

6. Sprague Electric Company
North Adams, Massachusetts

Aroclor 1016	187,100
Aroclor 1242	951,500
Aroclor 1254	7,200
Total Dielectrics	1,145,800
Santovac 2	720
TOTAL Sprague	1,146,520

7. Sangamo Electric
Springfield, Illinois

Aroclor 1016	290,280
Aroclor 1242	655,220
Aroclor 1254	30,600
Total Dielectric	976,100
Aroclor 1232	550
TOTAL Sangamo	976,650

DSW 444176

8. Aerovox Corporation
New Bedford, Massachusetts

Aroclor 1016	284,100
Aroclor 1242	568,000
Aroclor 1254	90,600
Total Dielectrics	942,700
Aroclor 1254	3,600
Total Aerovox	946,300

9. National Cash Register
Dayton, Ohio

Aroclor 1242 - Plasticizer Grade	852,540

10. Mallory Capacitor
Indianapolis, Indiana

Aroclor 1016	379,340
Aroclor 1242	420,198
Total Dielectrics	799,538
Aroclor 1242	44,680
Total Mallory	844,218

11. Electrical Utilities
LaSalle, Illinois

Aroclor 1016	87,160
Aroclor 1242	702,460
Total Dielectrics	789,620

DSW 444177

STLCOPCB4057779

12. McGraw Edison Company
Elgin, Illinois

Aroclor 1016	180,840
Aroclor 1242	552,200
Aroclor 1254	600
Total Dielectrics	733,640
Pydraul A 200	2,580
Pydraul 312	6,000
Aroclor 1254	600
Total McGraw Edison	742,820

13. Transco Company
Chicago, Illinois

Inerteen 70 30	592,640

14. General Motors
New York, New York

Pyranol A13B3B	360
Inerteen 100 42	700
Total Dielectrics	1,060
Pydraul 312	559,140
Pydraul A 200	12,175
Therminol FR 1	8,785
Santovac 2	3,600
Total General Motors	584,760

15. Allis Chalmers
Pittsburgh, Pennsylvania

Inerteen 70 30	499,128

DSW 444178

16. Ford Motor Company
Dearborn, Michigan

Pyranol A13B3B	14,340
Inerteen 70 30	674
Total Dielectrics	15,014
Pydraul 312	444,660
Therminol FR 1	14,400
Therminol FR 2	4,800
Total Ford	478,874

17. Jard Company Incorporated
Bennington, Vermont

Aroclor 1016	142,400
Aroclor 1242	331,800
Total Dielectric	474,200

18. Niagara Transformer
Buffalo, New York

Inerteen 70 30	393,000

19. Research Cottrel
Bound Brook, New Jersey

Inerteen 70 30	346,436

20. Goodyear Tire
Akron, Ohio

DSW 444179

Pyranol A13B3B	16,020
Total Dielectrics	16,020
Therminol FR 1	289,960
Therminol FR 2	600
Santovac 2	300
Total Goodyear	306,880

STLCOPCB4057781

CPC

On April 21 Monsanto was served with a subpoena to appear in the U.S. District Court for the Central District of California (Los Angeles) to testify before the Grand Jury and bring records on manufacture, sale, and distribution of PCB's. We are specifically commanded to furnish names of all distributors and sales agents in California as well as purchasers of PCB's for use or distribution in California. We are to appear May 4, 1972.

Through subsequent discussions with the U.S. Attorney, the area under consideration has been restricted to the California Counties of Los Angeles, Orange, and Riverside. We will submit records of PCB sales during the period January 1, 1971, to the present.

In anticipation of this legal action we have already notified our heat transfer and dielectric customers of the possibility of this development and we are now advising our hydraulic fluid customers who purchased products containing PCB's during the early part of 1971. Earlier we had refused to reveal similar information requested by the EPA Regional Office in San Francisco on the grounds that this information was considered confidential.

for Bd. of Dir.
4/27/72
mc

DSW 444180

UNITED STATES DEPARTMENT OF JUSTICE

WASHINGTON, D.C. 20530

Address Reply to the
Division Indicated
and Refer to Initials and Number

NOTICE TO WITNESSES ON BEHALF OF UNITED STATES GOVERNMENT

ALLOWANCES:--Under Title 28, United States Code, Section 1821, witnesses are entitled to the following fees:

(a) $20 for each day's attendance and time spent traveling from place of residence to the place specified in the subpena, and return.

(b) 10¢ per mile for going from and returning to place of residence for witnesses within the United States, mileage to be computed in accordance with the Rand McNally Standard Highway Mileage Guide. For travel between Territories and possessions, or to or from the continental United States, witnesses shall be entitled to actual expenses of travel at the lowest first-class rate available at the time of reservation for passage, by the means of transportation actually used.

(c) $16 per day for expenses of subsistence, in addition to the $20 fee in (a) above, if the witness is attending at a point so far removed from his residence that he cannot return thereto from day to day.

These rates do not apply to Government employees nor do they apply to witnesses in Alaska.

ATTENDANCE:--The subpena tells the witness where to appear. Before reporting to a courtroom, it is necessary for the witness to report to the office of the United States Attorney so that his attendance may be properly recorded. This should be done each day on which the witness is asked to be in attendance. When a witness has been advised that his attendance is no longer required, he should also report to the office of the United States Attorney as soon as possible, so that arrangements may be made for payment of fees.

PAYMENTS:--Before payment is made to a witness, he must execute a Certificate of Attendance form, which is also signed by a member of the United States Attorney's office. The office of the United States Marshal is responsible for issuing the payment check.

APPEARANCE IN ANOTHER CITY:--If a witness has insufficient funds to travel to court, he should so advise the U. S. Attorney's office of the trial district immediately and request an advance. The Assistant U. S. Attorney handling the case will then request the Marshal serving the subpena to advance one way transportation and, if necessary, the first day's attendance fee. The witness should be required to sign a Form USM-24, indicating his need for the advance. Any amount advanced will be deducted when the final payment is made by the Marshal.

Form DJ-109
(Rev. 2-19-69)

DSW 444181

STLCOPCB4057783

Cal. Counties

L. A.

Orange

Riverside

DSW 444182

4/24/72

PCBs

1972

The attached letter was sent out April 22 to over 1900 Monsanto customers who appear on our sales runs as having purchased the following PCB-containing products:

Therminol® FR Heat Transfer Fluids
Aroclor®, Inerteen or Pyranol Dielectric Fluids

We are sending it to your attention in case your customers bring the matter up.

Heat Transfer

Last December we announced discontinuation of PCB sales for heat transfer purposes (namely Therminol FR Series). Please note that we still carry our non-PCB heat transfer fluids (Therminol 55, 66, 77 and 88). We still have the services of a conversion team available to assist customers in changing out FR systems.

Dielectrics

We now sell only to capacitor and transformer manufacturers and then only if that manufacturer has signed a Hold Harmless Agreement which is backed by assets and/or insurance considered meaningful protection by Monsanto.

We have discontinued sales of transformer and other dielectric fluids to customers who either "topped-up" or refilled transformers or whose business did not qualify them as original dielectric equipment manufacturers. We have notified all such customers on record of this decision and directed them to approved OEMs for their requirements. You may meet some customers who may not feel too happy with this decision since many industrial concerns use askarel (PCB) transformers. We stand by our decision and these customers should still be able to obtain fluid since OEMs representing over 95% of Monsanto's dielectric fluids sales have full approval to continue buying from us.

Customer Questions

We stand ready to answer customer questions and render assistance where we can. Direct inquiries to:

1. Heat Transfer Conversions : (314) 694-2514 - Ask for conversion engineer.
2. Dielectrics : Paul G. Benignus (314) 694-2513

DSW 444183

3. PCB Legislation and
Environmental Control : W. B. Papageorge (314) 694-4051

If you have further questions, please call me at (314) 694-2520.

Thank you.

Cumming Paton

/pep

DSW 444184

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

April, 1972

Dear Sir:

Since early 1970 we have been advising your company of significant developments relating to the polychlorinated biphenyl (PCB) environmental situation.

As you know, many pollution control agencies conduct monitoring programs to evaluate the presence and impact of many materials on the environment. Some of these programs include PCB.

Recently a representative of a governmental pollution control agency contacted Monsanto requesting information concerning PCB sales. Specifically, he asked for names and addresses of PCB customers in his area, with the quantities of PCB product sold to each. He stated that this information was being requested because significant amounts of PCB were being detected in the discharge from sewage treatment facilities in his area.

He was informed that Monsanto considers information of this type confidential and, therefore, does not disclose it outside the Company. He subsequently informed us that the request for information was being sent to the local federal district attorney for appropriate action.

As we have pointed out on numerous occasions to representatives of government and of private groups, Monsanto has long had a policy, which it continues to follow, of treating information concerning its customers as confidential information. However, you should be aware that, because of governmental or judicial orders or requirements or because of a change in circumstances resulting from the unique nature of the PCB problem, Monsanto may at some future date be obligated to disclose such information to qualified persons.

DSW 444185

STLCOPCB4057787

We wish to strongly re-emphasize with you the importance of avoiding direct or accidental PCB contamination of feed, food and packaging material and of preventing PCB's from escaping into the environment. We direct your attention to the recent FDA notice of proposed rule making on PCB's published in the Federal Register, Vol. 37, No. 54, pp 5705 and following, dated March 18, 1972.

If PCB's are still present at your locations you are urged to thoroughly review your procedures and inspect your facilities to insure that extreme care is taken in the handling, use, storage, and disposal of these materials.

Sincerely,

WB Papageorge

W. B. Papageorge
Manager
Environmental Protection

DSW 444186

Thermnol

① Coastal Chemical, Abbyville La
resale to offshore & some on short - marked price

② McKesson Chemical - 2 gulf coast customers
New Orleans, La
resale at list price

Pydraulo (PCB's NOT Sold in '71 or '72)

Petroleum Distributing Co - Pydraulo
Houston Texas
only Air-compressor ACA, WG Code A 6'25A - 10% cut

Air-Draulics - PCT's only Pydraulo
Phoenix, Arizona
Sept 10, '71

DSW 444187

STLCOPCB4057789

Electrical / Heat Transfer

1. March 6, '72 – C Paton

To about 130 food & food related accounts. Approximately 95 signed replies received to-date. (Therminol)

2. March '72 – J Roder

To Therminol original equipment manufacturers

3. Feb 28, 72 – T Gossage

To transformer (Askarel) users and Service Shops purchasing Askarel from Monsanto.

4. Febt '72 – T. Gossage

To ~~Act~~ Approved transformer mfgrs with agreement on indemnity. About 6 firms.

5. Feb 4, '72 – H. Bergen

To capacitor & transformer manufacturers – hold harmless requirement. Approximately 15 accounts.

6. 12-15-71 – H. Bergen

To all Therminol FR-1, FR-0, FR Lo-Temp customers with sales 1970-71.

DSW 444188

7. Aug. 71 – J. Roder
To equipment mfrers re: Therminol FR

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

March 6, 1972

Office of the President

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Dear Sir:

We have previously advised your company of our discontinuation of the sale of Therminol® FR series heat transfer fluids and urged you to discontinue their use in applications where the potential for food contamination existed. We feel certain that you no longer use these fluids.

However, we are maintaining records of the actions taken by our customers in this regard, and to update these records we ask if you will please confirm that you have discontinued the use of Therminol FR fluids in your plant(s). Please confirm by signing one copy of this letter and return it to Monsanto in the enclosed self-addressed, stamped envelope. The other copy is for your files.

Should you still retain any drums of used or unused Therminol FR, we suggest these be safely disposed of by high temperature incineration. Monsanto will absorb the cost of return freight to Sauget, Illinois and also the cost of incineration. If you wish to avail yourself of this service, please so indicate and give us a name that we should contact. Thank you for your cooperation and understanding.

Sincerely,

C Paton.

Cumming Paton, Product Manager
Heat Transfer, Dielectrics
and Process Fluids

We have discontinued all Therminol® FR usage at our plant(s).

Signed _____

Title _____

Date _____

We are interested in your incineration service. Please contact _____ at _____ regarding return of Therminol FR for incineration.

DSW 444189

STLCOPCB4057791

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

March, 1972

Gentlemen:

In August, 1971 you were informed that the Therminol® FR series heat transfer fluids, namely FR Lo-Temp, FR-0 and FR-1 had been discontinued for all new systems. We did continue to supply the Therminol FR series heat transfer fluids into existing systems as makeup where we were assured that its use was in a non-food related system.

In a continuing effort to prevent any PCB from entering the environment, last December we notified our U.S. customers that the sale of all PCB-containing Therminols, namely Therminol® FR Lo-Temp, FR-0 and FR-1, was being discontinued. We are currently extending discontinuation world-wide. We are suggesting that these remaining systems be drained completely, flushed to remove PCB, and refilled with non-PCB fluids. The most likely Monsanto candidates would be Therminol 55 and Therminol 66. We are also asking that all PCB materials be returned to us for disposal.

In most cases this conversion can be accomplished with very little change to the system. It is important, however, to realize that the new fluids are not fire resistant and that protective devices may be necessary for these fluids just the same as for other combustible fluids. Suggestions regarding fire protection and other conversion details are included in the attached "Therminol Conversion" bulletin. We hope this will be helpful to you in answering any questions you receive as co-suppliers in Therminol FR systems.

We again want to ask your cooperation in this period of system conversions and appreciate your continued use and recommendation of the non-PCB containing Therminols, namely 55, 66, 77 and 88.

Should you have questions please contact your local Monsanto representative or me at this location.

Very truly yours,

J. J. Roder
Product Supervisor
Heat Transfer Fluids

cs
Enclosures:
Conversion Bulletin
Applications Unlimited
Pump Seal Bulletin

DSW 444190

STLCOPCB4057792

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

Feb 28, 1972

Dear Sir:

We are writing to advise you that Monsanto has adopted certain policies with respect to the further sale and delivery of all polychlorinated biphenyl (PCBs) products including those sold under tradenames such as Aroclor®, Inerteen®, Pyranol®, and under the generic term askarel.

Studies have indicated PCBs may be accumulating in the environment. In some instances PCBs have been found in food or in the food chain. Because of Monsanto's concern over this problem, we have discontinued sales of PCBs in all applications except as dielectric fluids for use in transformers, capacitors, and other electrical equipment and components. In the past, Monsanto has sold these fluids direct to transformer repair shops and to anyone requiring the fluid for top-up of an existing transformer. Monsanto has decided to discontinue direct sales to transformer repair shops and for transformer top-up. For your future requirements of dielectric fluids, we suggest you contact the manufacturer of the transformer for which you desire the fluid.

We sincerely regret any hardships that this decision may cause you, but it has been taken in an effort to continue to make available these products for important electrical applications. If you have any questions relative to this decision, please telephone (314) 694-2513, or write directly to Mr. Paul Benignus, Monsanto Company, P. O. Box 14617, St. Louis, Missouri 63178.

Very truly yours,

T. L. Gossage
Marketing Director
Specialty Products Group

/bi

DSW 444191

STLCOPCB4057793

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

Feb 7, 1972

Dear Sir:

We have recently been in communication with you concerning Monsanto's policy to restrict the sale and delivery of polychlorinated biphenyl (PCBs) products including those sold under tradenames such as Aroclor®, Inerteen®, Pyranol®, and under the generic term askarel.

As you are aware, effective January 15, 1972 Monsanto discontinued sales and delivery of these products to manufacturers of transformers and capacitors, except those who have entered into special agreements to indemnify Monsanto with respect to these products. You have entered into such an agreement.

In the past Monsanto supplied these PCB-containing askarel products to transformer repair shops, and to companies needing these products for top-up of existing transformers. These sales have now been discontinued. Future inquiries from these companies owning or desiring to repair a transformer of your manufacture will be referred to you as the source for additional askarel fluids.

In the event you desire to supply top-up product to your customers or to repair shops, Monsanto intends to make these products available to your company or to your designee upon receipt of your order. In either case, the sales will be to you and we will invoice you. If you choose to ship directly from your own stocks to your customers, we will be happy to make available to you all information we have on proper packaging of these products. Please contact us concerning your instructions for referral of these customers to you. If you have any questions, or if you

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wish to meet with representatives of Monsanto concerning the program Monsanto intends to follow, please telephone (314) 694-2513 or write directly to Mr. Paul Benignus, Monsanto Company, P. O. Box 14617, St. Louis, Missouri 63178.

We sincerely regret any inconvenience that this decision may cause you, but it is taken in an effort to continue to make available these products for these important applications within the framework of our overall sales policy.

Very truly yours,

T. L. Gossage
Marketing Director
Specialty Products Group

/bi

DSW 444193

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

February 4, 1972

Dear Sir:

We are writing to advise you that Monsanto has adopted certain policies with respect to its further sale and delivery of all polychlorinated biphenyl (PCB) products used as dielectric fluids including but not limited to those sold under tradenames such as Aroclor®, Inerteen®, and Pyranol®, and under the generic term askarel.

Effective immediately Monsanto will sell and deliver these products only to manufacturers of electrical equipment or components who utilize the products as dielectric fluids and who have entered into agreement to indemnify and hold harmless Monsanto in the use of these products. The two copies of such an agreement are attached. The acceptance by Monsanto of such an agreement is subject to receipt of financial and other information from you (such as evidence of adequate insurance protection) which, in Monsanto's opinion, makes the agreement meaningful.

As you are undoubtedly aware, studies indicate PCBs may be accumulating in the environment. In some instances, PCBs have been found in food or in the food chain. For your information, attached is an article by Carl G. Gustafson of the Federal Water Quality Administration appearing in "Environmental Science & Technology" which deals with this subject. Because of Monsanto's concern over this problem, we have discontinued sales of PCBs except for use as dielectric fluids in electrical equipment and components.

If you desire to continue purchase of these products from Monsanto, please have the attached copies of agreement signed by an authorized officer on behalf of your company and forward a fully signed copy, together with your most recent audited financial statement and any other information which you feel will assist Monsanto in its evaluation.

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If you have any questions please telephone (314) 694-2455 or write directly to Mr. H.S. Bergen, Monsanto Company, P.O. Box 14617, St. Louis, Missouri 63178.

We sincerely regret any hardships that this decision may cause you but it is taken in an effort to continue to make available these products for these important electrical applications.

Very truly yours,

Howard Bergen

Howard Bergen, Director
Specialty Products Group
Monsanto Industrial Chemicals Co.

/bi

Enclosures

DSW 444195

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

SPECIAL UNDERTAKING BY PURCHASERS OF POLYCHLORINATED BIPHENYLS

Monsanto Company ("Monsanto") manufactures certain polychlorinated biphenyl products ("PCB's") which _____ _____ ("Buyer") desires to purchase. While Buyer desires to purchase PCB's because of certain desirable flame resistant and insulator properties, Buyer acknowledges that it is aware and has been advised by Monsanto that PCB's tend to persist in the environment; that care is required in their handling, possession, use and disposition; that tolerance limits have been or are being established for PCB's in various food products.

Monsanto has therefore adopted certain restrictive policies with respect to its further production, sale and delivery of PCB's, including the receipt of undertakings from its customers as set forth below, and Buyer is willing to agree to such undertakings with respect to sales and/or deliveries of PCB's by Monsanto to Buyer.

Accordingly, Buyer hereby covenants and agrees that, with respect to any and all PCB's sold or delivered by or on behalf of Monsanto to Buyer on or after the date hereof and in consideration of any such sale or delivery, Buyer shall defend, indemnify and hold harmless Monsanto, its present, past and future directors, officers, employes and agents, from and against any and all liabilities, claims, damages, penalties, actions, suits, losses, costs and expenses arising out of or in connection with the receipt, purchase, possession, handling, use, sale or disposition of such PCB's by, through or under Buyer, whether alone or in combination with other substances, including, without implied limitation, any contamination of or adverse effect on humans, marine and wildlife, food, animal feed or the environment by reason of such PCB's.

DSW 444196

Attachment B

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All existing contracts for the sale of PCB's by Monsanto to Buyer are hereby amended to contain the provisions set forth above.

Nothing herein shall create or imply any duty or obligation of Monsanto to sell or deliver any PCB's to Buyer. No conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing specifically referring to this agreement and signed by the party to be bound and no modification or variance of the above undertaking shall be effected by the acknowledgment or acceptance of any sale document, purchase order, shipping instruction or other forms containing terms or conditions at variance herewith.

_____ (Buyer)	MONSANTO COMPANY
BY: _____	BY: _____
TITLE: _____	
DATE: _____	

DSW 444197

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

December 15, 1971

Dear Sir:

We are writing to advise you that, effective this date, Monsanto will no longer sell the Therminol® FR series of heat transfer fluids. This important decision by Monsanto's management has been carefully considered.

The Therminol® FR series of fluids contain polychlorinated biphenyls (PCBs). As we have previously advised you, studies indicate PCBs may be accumulating in the environment. In some instances, PCBs have been found in food or in the food chain. An article by Carl G. Gustafson of the Federal Water Quality Administration appearing in "Environmental Science & Technology" and dealing with this subject is attached for your information.

Because of Monsanto's concern over this problem, we have discontinued sales of PCBs where the usage was in so-called "open systems." We have discontinued sales of Therminol® FR materials where the usage would be in food processing applications. In addition, we have encouraged Therminol® FR fluid customers to switch to other materials.

As a result of these efforts, many of our heat transfer fluid customers have switched from Therminol® FR series fluids to other materials or systems.

Our action in discontinuing sales for use in heat transfer systems has been taken because of the problems which may arise should there occur accidental leakage of PCBs from such systems. We believe this action is in the best interest of all our customers who have continued using these materials in heat transfer applications.

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In order to help you accomplish a change-over from Therminol® FR to another heat transfer fluid with the least difficulty, Monsanto will offer you the following special services:

1) We have assembled a team of experienced engineers who will be available to visit your plant on request to consult with you on available alternatives. Of course, the decision is and will be yours as to how you elect to proceed. If you consider such a service would be of assistance to you, please telephone (314) 694-2514, or write directly to Dr. Cumming Paton, Monsanto Company, P. O. Box 14617, St. Louis, Missouri 63178.

2) We will pay freight costs incurred in returning the Therminol® FR to us and will properly dispose of the material (by high temperature incineration) at our cost. We will contact you concerning instructions about drainage, drumming and shipping of material to our facility in St. Louis.

3) We will accept return of any unopened drums of Therminol® FR series products which may be in your possession and credit you for this material at full purchase price if returned to us prior to March 1, 1972.

We sincerely regret any hardship that this decision may cause you, but feel you will agree Monsanto has made the correct decision.

Yours sincerely,

Howard Bergen

Howard Bergen, Director
Specialty Products Group
Monsanto Industrial Chemicals Company

Attachments

DSW 444199

feature

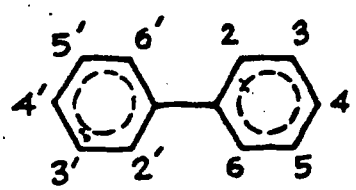
PCB's—prevalent and persistent

Intensified research is needed to minimize their dangers

Carl G. Gustafson, *Federal Water Quality Administration, Athens, Ga.*

During the past three years, a special class of compounds, called polychlorinated biphenyls (PCB's), has claimed the attention of ecologists and pesticide analysts in this country. These compounds were not discovered in the environment until 1966 in Sweden and 1967 in the U.S., despite the fact that they have been available commercially for 40 years. Interest in PCB's has arisen because they are frequently found in fish, bird, water, sediment, and other environmental samples when such samples are examined for chlorinated pesticide residues. That a wide variety of samples containing PCB's has been collected from England, Scandinavia, The Netherlands, Antarctica, Central America, and many different parts of the U.S. makes them truly ubiquitous pollutants.

Polychlorobiphenyls are made by substituting chlorine atoms for one or more of the hydrogen atoms at the numbered positions of the biphenyl structure.



In the process of replacing hydrogen atoms with chlorine atoms, a large number of substitution combinations arise. For example, three monochlorobiphenyl isomers are possible, 12 dichlorobiphenyl isomers, 21 trichlorobiphenyl isomers, and so on. Theoretically, 210 compounds can be prepared by this substitution process; a typical example would be 2,4,6,2′4′-pentachlorobiphenyl.

Whenever aromatic hydrocarbons such as biphenyls are chlorinated, the product is a mixture of compounds, including isomers. It is quite difficult to synthesize single, specific chlorobiphenyl compounds in the laboratory unless involved procedures are employed. Consequently few of the individual compounds have been prepared in the pure form for study.

In the commercial process for PCB manufacture, biphenyl is chlorinated with anhydrous chlorine in tall cylindrical towers with either iron filings or ferric chloride as the catalyst. The by-product is hydrogen chloride; the product is a mixture of several PCB's. The degree of chlorination is determined by measuring the specific gravity of the mixture or, when the product is more viscous, the ball-and-ring softening-point test is used. The whole process takes from 12 to 36 hours.

In the U.S., the sole manufacturer of PCB's is the Monsanto Co., which markets them under the trade name Aroclor. PCB's are also manufactured in Europe and Japan, under trade names such as Phenochlor and Clophen. The various Aroclors are differentiated by a four-digit number, with the last two digits indicating the percentage of chlorine in the mixture.

Properties

The three most important physical properties of the PCB's are low vapor pressures (they have high boiling points), low water solubility, and high dielectric constants. They are miscible with most organic solvents and compatible with many types of polymers. Although some individual polychlorobiphenyl compounds are crystalline, the Aroclor mixtures are either liquids or resins.

The chemical properties that make PCB's desirable industrial materials are their excellent thermal stability, their strong resistance to both acidic and basic hydrolysis, and their general inertness. They are quite resistant to oxidation. Monsanto reports, in a technical bulletin on PCB's, that they can be heated to 140° C. under 260 p.s.i. of oxygen pressure "without showing any evidence of oxidation as judged by development of acidity or formation of sludge."

The physiological properties of the PCB's make them potentially significant contaminants of the environment. For any pollutant, two factors are involved: acute toxicity, which is immediately evident because of a high death rate or other maiming effect; and chronic toxicity, which is the result of a slow accumulation of the poison in the body and is a sublethal effect. Whenever acute toxicity is high, a pollutant will be readily recognized and appropriate remedial actions will be introduced. If, on the other hand, acute toxicity is low,

The Monsanto Co. stated recently in a letter to Congressman William F. Ryan of New York that as of August 30, it would no longer sell PCB's to customers for use in general plasticizer operations where disposal of the end-products cannot be controlled. After some lag period—the time it takes to eventually dispose of the products made from PCB's and currently in processor's inventories—the quantity of PCB's getting into the environment may be substantially reduced. If Monsanto's former customers look for PCB substitutes, rather than purchasing PCB's from manufacturers in Japan and Europe, the projected decrease could become a reality.

Carl G. Gustafson

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the physiological effects will go unnoticed until the chronic effects make themselves evident. When this happens, the problem may have advanced beyond immediate or easy correction.

Acute toxicity

All studies of PCB's in animals indicate that acute toxicity is not a significant factor. Their acute toxicities are on the order of those of other chlorinated aromatic compounds. Monsanto has sponsored two investigations of the acute toxicities of Aroclor mixtures. In the first, at the Kettering Laboratory at the University of Cincinnati, Dr. J. F. Treon and his coworkers investigated the toxicity of Aroclor vapors for guinea pigs, mice, rabbits, and rats. All animals survived a 24-day exposure to 0.83 p.p.m. of Aroclor 1242 for 7 hours per day on 17 of those days. Even after more prolonged tests, there were no severe effects from Aroclor 1242. In the second investigation, still in process, three groups of beagles are fed Aroclor 1242, 1254, and 1260, respectively, at a rate of 100 p.p.m. in their diets. After three months no significant abnormalities have been noted.

Similar studies on fish have been performed in several laboratories. Dr. Richard Schoettger of the Sport Fisheries and Wildlife Fish-Pesticide Research Laboratory in Columbia, Mo., reports that 96 hour-TL_{50} toxicities of the Aroclors to trout range from 1.17 to 60 p.p.m. Compared to DDT, whose 96 hour-TL_{50} toxicity is 0.002 to 0.009 p.p.m. for trout, the PCB's have a relatively low acute toxicity. With the more sensitive bluegill, the 96 hour-TL_{50} for Aroclor 1248 is 0.278 p.p.m., while that of DDT is 0.008 p.p.m. Aroclor toxicities appear to be inversely proportional to the chlorine content of the mixture.

Shellfish, oysters, and shrimp are more sensitive to PCB's. Dr. Tom Duke, at the Bureau of Commercial Fisheries Pesticide Field Station, reports 100% mortality of juvenile pink shrimp exposed to 0.10 p.p.m. of Aroclor 1254 in water for 48 hours. This concentration of Aroclor 1254 will cause a 100% decrease in shell growth of oysters after 96 hours. To achieve the same effects with DDT in these experiments, only 0.0006 p.p.m. and 0.01 p.p.m., respectively, were required.

There is very little evidence that PCB's are toxic to insects. Studies to date show that they are less toxic than dieldrin or DDT. As with fish, their toxicity appears to be inversely proportional to the chlorine content of the mixture.

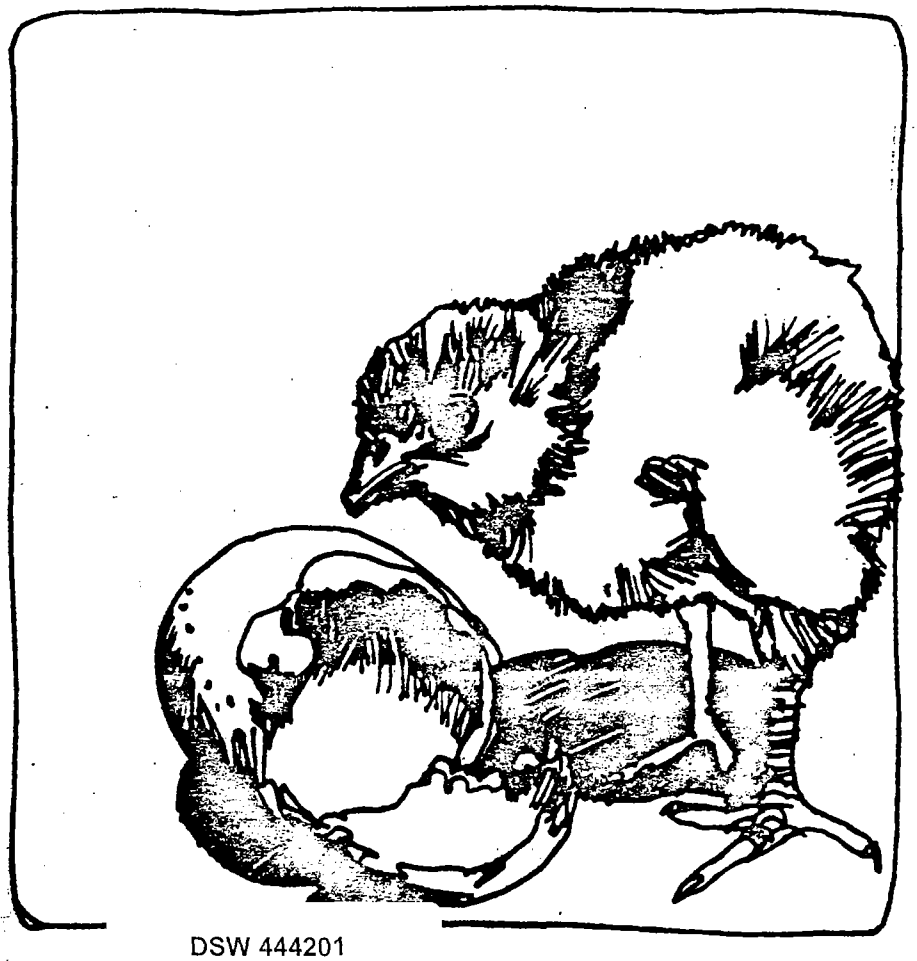
Based on the above data, it is understandable why the polychlorobiphenyls, commercially available for 40 years, have only recently attracted attention as toxic environmental contaminants.

Chronic toxicity

The chronic toxicities of PCB's present a more disturbing situation; several chronic effects have been observed. It was discovered, quite by accident, that PCB's have a toxic effect on chickens. Professor E. L. McCune and his coworkers at the University of Missouri found their chickens dying after they were placed in a feeding house, parts of which had been freshly painted with an epoxy paint. Careful investigation revealed that the toxic factor was Aroclor 1242, a binder in the paint. When Aroclor 1242 was fed to the chicks it produced the same characteristic effects as chick edema factor. McCune reported: "Gross pathology included hydropericardium, hydroperitonium, enlarged heart, liver, and kidneys, and hemorrhage of internal organs. Microscopically the kidneys showed marked tubular dilation and numerous casts."

Another chronic effect of PCBs is related in wildfowl. The accumulation of high concentrations of chlorinated hydrocarbons in birds resulted in disruption of normal breeding behavior and in the formation of thin-shelled eggs. A dramatic example of this effect has been observed in the case of the brown pelican. On the Anacapa Islands off the California coast, no young were hatched last year from 300 pairs of nesting birds. The shells of most eggs laid were so thin that a dent occurred when the egg was picked up.

There are two possible causes for the laying of thin-shelled eggs by wildfowl. One is a low calcium reserve in the bird; the other is the inability of the bird to deliver the needed calcium to its oviduct, where the eggshell is forming. The calcium level in the avian biosystem and the calcium reserve in the secondary bone structure or medullary bone, found only in female birds when they are breeding, are controlled by the hormone estrogen. A high estrogen level is associated with the formation of this calcium reserve. Chlorinated hydrocarbons, such as DDT,



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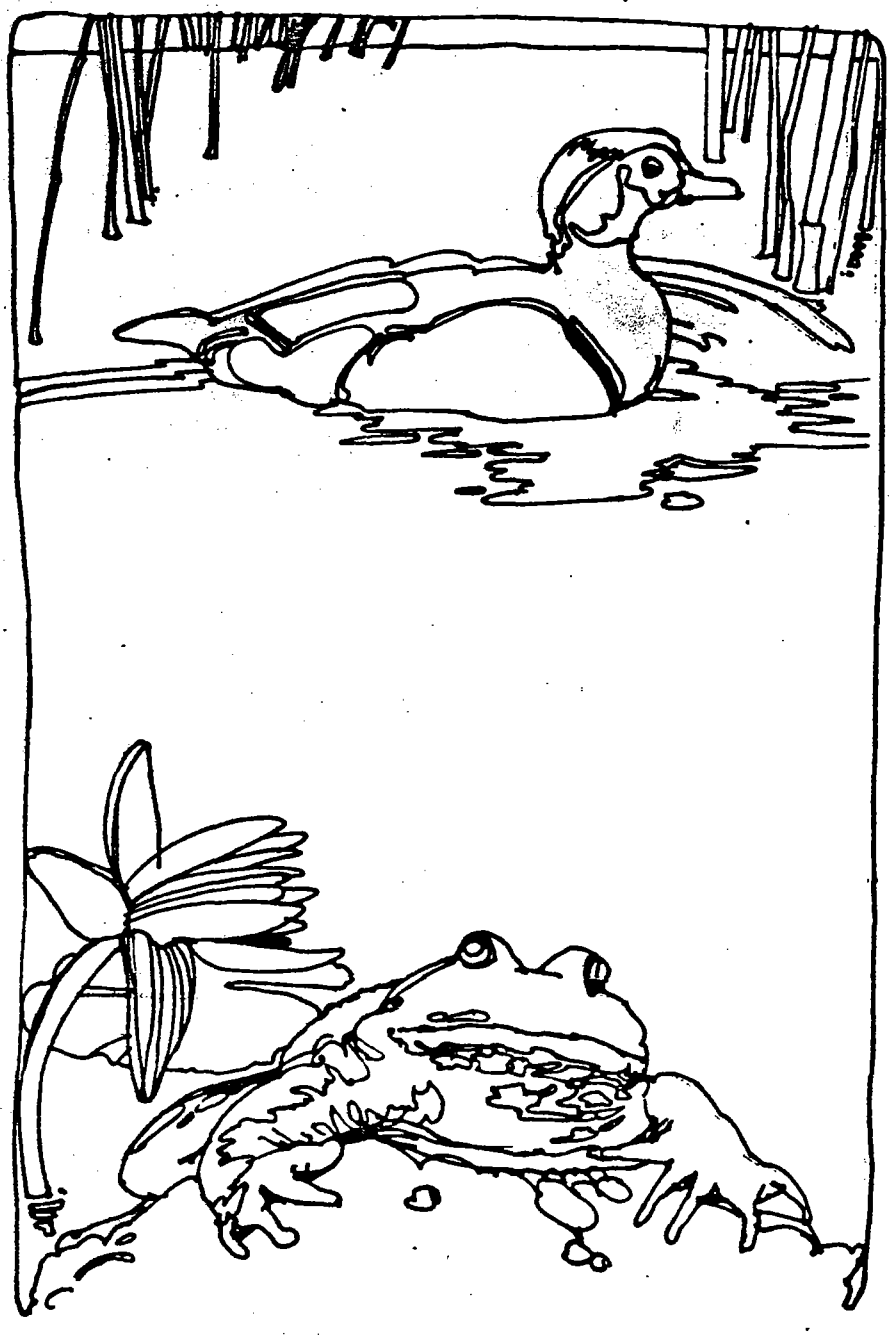
chlordane, dieldrin, and PCB's, activate enzymes in the liver which transform estrogen into a more water-soluble compound that is readily eliminated from the bird's body. This means that when estrogen levels are low, calcium reserves will also be low, and therefore very little calcium will be available for strong eggshell production. Dieldrin and PCB's are more effective than DDT in this type of enzyme-induction activity. Aroclor 1262 has an estradiol degrading potential four to five times that of *p,p'*-DDE or technical grade DDT.

The ability of the female bird to deliver calcium to her oviduct during the last 20 hours, when the eggshell is being formed, is related to the functioning of the enzyme carbonic anhydrase. When birds that have exhibited the ability to lay normal eggs are injected with a metabolite of DDT (DDE) just prior to the formation of the eggshell, they will lay thin-shelled eggs. This indicates that DDT also inhibits the activity of carbonic anhydrase, the enzyme that controls the flow of calcium from the blood stream of the bird into its oviduct.

Since dieldrin seems to have no effect on carbonic anhydrase, we may assume that neither do the PCB's. However, these compounds delay breeding time significantly. Many ornithologists feel that late breeding has a stronger influence on the reduction of bird populations than does the laying of thin-shelled eggs. If this is true, PCB's are a more potent threat than DDT to our declining bird populations, especially for predatory birds that accumulate fairly high levels of PCB's because they eat smaller animals that already have concentrated PCB's in their own tissues.

Other investigators have produced evidence to show that PCB's are similar to DDT in their activity. Dr. Joseph Street at Utah State University has shown that when PCB's accumulate in the liver, they induce microsomal enzyme activity by bringing about more rapid metabolism of drugs, insecticides, and other foreign compounds. He fed rats a diet containing 50 p.p.m. of Aroclor 1254 or Aroclor 1260. After 10 days on this diet, the test animals were administered hexobarbitol at a dose of 100 p.p.m. to induce sleep. In comparison with a control group, the sleeping time for these rats was reduced by 65 to 80%. Street also found that Aroclor, when fed at the same level, will reduce dieldrin storage in adipose tissue by 90 to 95%; increase aniline oxidation by 200 to 300%; and increase EPN detoxication by 430 to 470%. In addition, the PCB's cause activation of organothiophosphate compounds, which adversely affect the system. This latter effect counterbalances the detoxification of dieldrin.



Normally, when a substrate activates an enzyme, it is converted to a water-soluble form that will be eliminated from the system; however, this is not the case with PCB's. Because they remain in the system for prolonged periods of time, their enzyme induction activity is always present. In this way the normal concentration of important body chemicals may be lowered to the point of bringing about malfunctions in the system. For example, Street believes that the PCB's bring about steroid degradation, which can lead to altered endocrine relationships.

The chronic toxicity to man is as follows:

> Like the chlorinated naphthalenes, the chlorinated diphenyls have two distinct actions on the body, namely, a skin effect and a toxic action on the liver. The lesion produced in the liver is an acute yellow atrophy. This hepato-toxic action of the chlorinated diphenyls appears to be increased if there is exposure to carbon tetrachloride at the same time. The higher the chlorine content of the diphenyl compound, the more toxic it is liable to be. Oxides of chlorinated diphenyls are more

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toxic than the unoxidized materials.

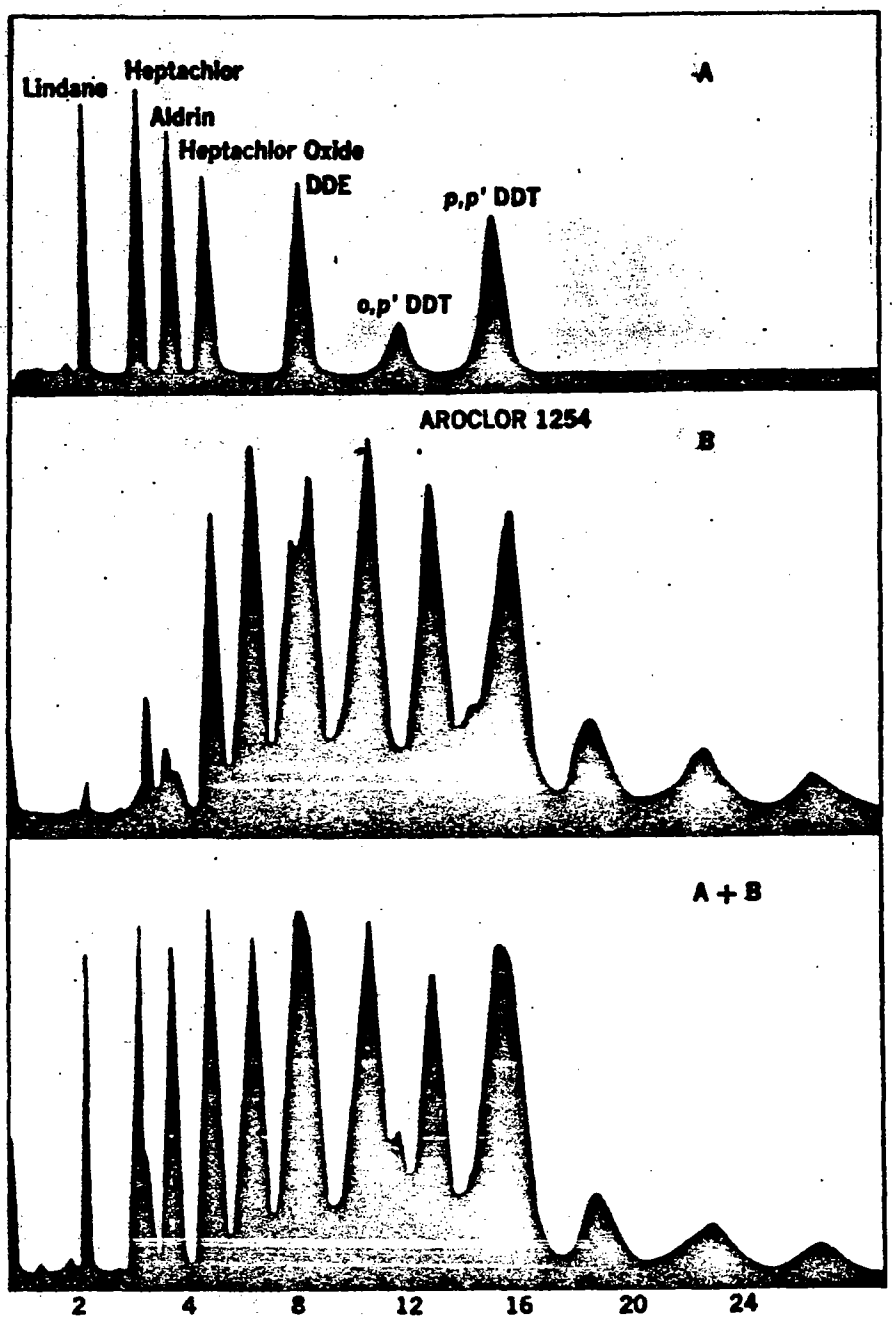
The skin lesion is known as chloracne, and consists of small pimples and dark pigmentation of the exposed areas, initially. Later, comedones and pustules develop. In persons who have suffered systemic intoxication, the usual signs and symptoms are nausea, vomiting, loss of weight, jaundice, edema, and abdominal pain. Where the liver damage has been severe, the patient may pass into coma and die.

Sax, N. Irving, "Dangerous Properties of Industrial Materials," 3rd ed., Van Nostrand-Reinhold, New York, 1968.

The ubiquity of PCB's is related to the wide spectrum of applications that have been found for them. The largest single use of PCB's is related to their electrical properties—as coolant-insulation fluids in transformers. For this purpose the Aroclors are also sold under such trade names as Chlorextol (Allis-Chalmers Mfg. Co.), Dykanol (Federal Pacific Electric Co.), Inerteen (Westinghouse Electric Co.), Noflamol (Wagner Electric Co.), Pyranol (General Electric Co.), and Therminol (Monsanto Co.).

Other uses of PCB's include formulation into ballasts for fluorescent fixtures; impregnation of cotton and asbestos for braided insulation of electrical wiring; a plasticizer in wire and cable coatings; capacitors and askarel-type transformers; and plasticizers of vinyl chloride polymer films. Because of their thermal stability and fire resistance, the PCB's also find application in high-pressure hydraulic fluids, specialized lubricants and gasket sealers, heat transfer agents, and machine tool cutting oils. Miscellaneous uses include: formulation into some epoxy paints; protective coatings for wood, metal, and concrete; adhesives; and in carbonless reproducing paper. One of the primary manufacturers of carbonless reproducing paper also sells Aroclors in an encapsulated form.

Generally the kinds of applications described above mean that the PCB's will be in many types of products that eventually find their way to the domestic market. When used in manufacture of ballasts for fluorescent fixtures they will be found in kitchens, bathrooms, stores, and offices throughout the country. Wherever office forms are used that do not use carbon paper, one may find PCB's formulated into the microcapsules of dye that comprise the reproducing layer of the business form. PCB's have also been found on the transparent receipts used in credit card charge forms. As plasticizers they can be expected to appear in many consumer plastics.



Gas chromatogram A is of a standard pesticide mixture, B is typical of Aroclor 1254, and A + B is the chromatogram of a 50 : 50 mixture of both. The concentration of Aroclor 1254 is approximately 10 times those of the pesticides in A, hence it is understandable why PCB's were not readily recognized in pesticide chromatograms. Gas chromatograph (Packard 7620) conditions: gas flow 80 ml./min. nitrogen; temperatures—oven, 210° C., inlet, 230° C., detector, 218° C.; Ni^{63} electron capture detector; 5' × ⅛" glass column packed with 8% SE-30 on Chromosorb Q 80–90 mesh.

Since the chronic toxicities are so significant, it becomes important to know just how extensively the PCB's are distributed in the ecosystem, and just how they find their way into the environment. Rainwater in England, brown seals off the coast of Scotland, white-tailed eagles in Sweden, cod in the Baltic Sea, mussels in The Netherlands, adelie penguin eggs in the Antarctica, brown pelican eggs in Panama, Arctic terns, shrimp in Florida, river water in Japan, waters in the Great Lakes, human hair, and human adipose tissue—samples of all these have been found to contain PCB's,

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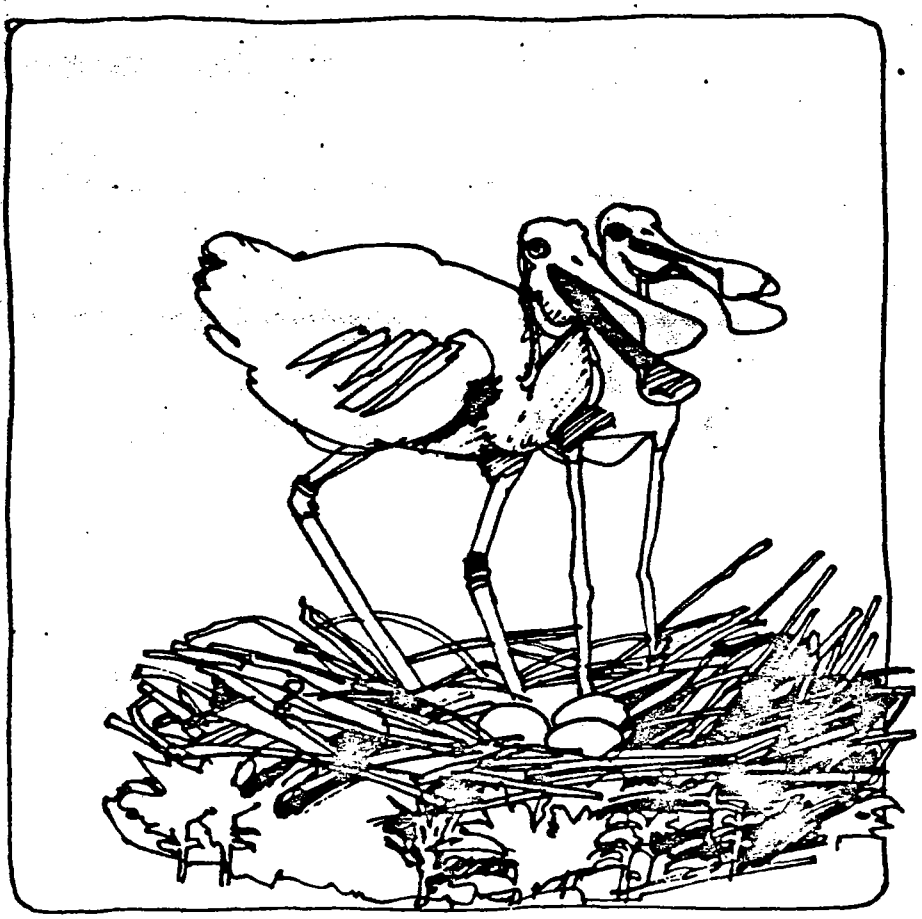
thus making them a class of widely dispersed pollutants.

Readily absorbed

The properties of PCB's that make them industrially useful are the same properties that cause them to persist in the environment. These include thermal stability, resistance to oxidation and hydrolysis, solubility in a wide range of organic solvents, water insolubility, high dielectric constant, and compatibility with many types of macromolecules. Their resistance to oxidation and hydrolysis also makes PCB's more stable and persistent than DDT. Consequently, they could eventually accumulate to a higher concentration than DDT, especially if the use of DDT is sharply curtailed in the U.S.

The solubility of PCB's in nonpolar solvents explains why they are readily absorbed into fatty tissue and into the liver. Their resistance to oxidation or other types of chemical degradation explains their persistence in the environment and accumulation in animal tissue. The latter effect is enhanced both by their insolubility in water and solubility in organic solvents. Their chemical inertness and resistance to metabolism account for their low acute toxicity. But as they slowly build up in a living system their concentration approaches toxicity levels, at which point chronic effects make themselves evident.

It has been established that fish-eating birds will accumulate large concentrations of PCB's, as in the case of the white-tailed eagle, which has been found to have as much as 14,000 p.p.m. of PCB's. Peregrine falcons, taken off the coast of California, were found to have as much as 2000 p.p.m. in their lipid tissue. When shrimp were exposed to 10 p.p.b. of Aroclor 1254 for 48 hours, they accumulated 1300 p.p.b. of PCB's, which represents a 130-fold concentration in a very short time. Oysters, exposed to an identical concentration of Aroclor 1254 for 96 hours and then placed in PCB-free water for four days, still had a concentration of 33,000 p.p.b. of PCB's, which constitutes a 3300-fold concentration. This means that even though the concentrations of PCB's are in the parts-per-billion range in the environment, their high lipid solubility causes them to collect in fatty tissues of lower animals and marine life. Therefore, species at the top of a food chain will also accumulate PCB's in their bodies, particularly in their lipid tissue and liver, in much the same way as they accumulate DDT and other chlorinated pesticides.



Because of the low solubility of PCB's in water, when a solution or dispersion of them is discharged into a river or lake, they will accumulate on the sediment in relatively high concentrations. Subsequently, they will redissolve very slowly in the water as conditions change. Therefore, it will usually take a long time to flush out a contaminated area.

Accidental occurrence

The reason that PCB's have not been found in the ecosystem as extensively as DDT, and are not present in environmental samples at as high a concentration as DDT, is that PCB's find their way into the environment accidentally. DDT is deliberately spread because this is the only way its insecticidal properties can be utilized. PCB's are not intended to get into the environment, but they do because their unique chemical properties prevent them from being destroyed by our usual waste disposal methods. Thus, they inadvertently escape and become widely dispersed.

In Sweden, where the use of DDT has been banned, and where the main power source is hydroelectric, investigators find that the concentration of PCB's in the environment is as high as that of DDT.

There are several ways by which PCB's get into the ecosystem. One of these is by incineration. Products containing PCB's, such as carbonless reproducing paper in business forms, plastics (especially polymer film and sheeting that contain PCB's as plasticizers), spent ballasts from fluorescent light fixtures, and objects coated with PCB-formulated coatings, all find their way to the city dump or incinerator for burning. The PCB's do not burn but are vaporized. They are then carried into the atmosphere, where they collect on particulate matter and are subsequently returned to the surface of the earth, into the rivers, lakes, and oceans. In this way they become widely distributed throughout the global environment. Another source is probably land run-off from industrial wastes and dumps. A third source is the point of manufacture and the plants where PCB's are processed into other products. They can escape through the plant ventilation and exhaust systems into the atmosphere and through its waste treatment system into sewers or directly into waterways.

DSW 444204

STLCOPCB4057806

It is interesting to note that the incidence of PCB's in environmental samples is highest in industrialized and urbanized areas. Birds whose primary habitat is the San Francisco Bay area have a larger concentration of PCB's per unit of body weight than those located in Baja, Calif., which is completely rural. Aquatic life in the Archipelago of Stockholm, the most industrialized area of Sweden, were found to have a higher concentration of PCB's than fish samples taken from the western coast of Sweden, a less developed area. Sediment samples taken from southern portions of Lake Michigan have a higher concentration of PCB's than those from other parts of the lake.

Monsanto states that until a recent change in marketing policy (see inset, page 814), sales of Aroclors were increasing at the rate of 8% per year. While this increase does not seem significant, it may be important if the increased consumption was in consumer products and thus would find their way into our normal solid waste disposal systems. Such an occurrence would mean a definite increase of PCB residues in the environment, and therefore a marked increase in their chronic toxicity effects.

Detection

PCB's were not discovered in environmental samples until very recently for several reasons. First, as indicated above, they have not been deliberately distributed about the ecosystem. Secondly, because of their relatively low acute toxicities, their presence was not immediately evident. Finally, they are difficult to detect analytically.

The PCB's were first detected as interfering peaks in the gas chromatographic analysis (GC) of environmental samples being analyzed for chlorinated pesticide residues. When PCB's are present in a sample they give a pattern of several GC peaks, whose retention times are similar to those of dieldrin, DDT, DDE, aldrin, and heptachlor oxide. Because the peaks were not large or sharp, investigators tended to ignore them until S. Jensen, in Sweden, and R. Risebrough, at the University of California at Berkeley, identified them as corresponding to common constituents of environmental samples being analyzed for persistent pesticides.

The problem of the interferences of PCB's with the analysis of other chlorinated pesticides has been largely overcome by prior treatment of the sample. Several investigators have used column chromatography to separate PCB's from chlorinated pesticides. At a recent meeting, sponsored by the FWQA's National Water Quality Laboratory, Duluth, Minn., a general procedure was recommended for separation of PCB's from pesticides. In this procedure for biosamples, the sample is extracted with hexane as in regular pesticide analysis. It is then partitioned with acetonitrile to remove fats, the cleaned-up extract is passed through a Fluorisil column and then through a silicic acid column. Finally, the sample is analyzed by gas chromatography, with a chloride-specific detector. In this way the pesticides are retained on the silicic acid column for later elution and identification.

Research needs

To assess fully the significance of PCB's as environmental pollutants, additional research is needed. No one really knows the extent of the chronic effects of these chlorinated hydrocarbons. Some problems that need to be considered are:

- Although PCB's are known to accumulate in human organs we do not know at what concentration they will begin to exhibit toxic effects. Will these chronic effects be similar to those shown in animals—microsomal enzyme activity, calcium metabolism inhibition, and so on? What are other possible chronic effects?
- Which of the many PCB compounds in the commercially available mixtures are responsible for their toxicity? Can commercial PCB mixtures be modified to eliminate the toxic components? Pure samples are required to answer these questions. At the present time work is continuing at the FWQA's Southeast Water Laboratory to separate each of the Aroclor mixtures into its many components, and to identify each component.
- We need to know all the uses for the PCB's. What is the annual production of PCB's? Our knowledge of these facts is limited and needs to be expanded. These facts should be known if we are to accurately determine how they get into the environment, and take steps to prevent further environmental contamination by them.
- In view of the complexity of the isolation and accurate quantitative analysis of PCB's in chlorinated residues, a straightforward, unambiguous measurement of them needs to be developed.
- What is the fate of PCB's in natural waters? More needs to be known of their partition coefficients between bottom sediments and water. This is vital if we are to estimate how long it will take for a river bed to clean itself of contamination. It will also be useful when assessing the effects of PCB's on marine life that feed on the bottoms of lakes, rivers, and estuaries. We should also learn more about PCB solubility in water of various ionic strengths.
- Are present waste treatment systems adequate to handle PCB's? Do special measures need to be taken when PCB's are part of the waste effluent being treated?

By trying to get some of these answers now, we may find that we are in a position to control the escape of PCB's into the environment before additional damage is done. So frequently, action is taken only after it is evident that massive damage has resulted from a particular pollutant. In the case of the PCB's we may have an opportunity to resolve the situation before that happens.

Additional Reading

Hubbard, H. L., "Chlorinated Biphenyl and Related Compounds," Encyclopedia of Chemical Technology, 2nd ed., 5, Interscience Publ., New York, N.Y., 1964, pp. 289–298.

Reynolds, L. M., *Bull. Environ. Contam. Toxicol.* 4, 128 (1969).

Risebrough, R. N., et. *al.*, *Nature* 220 (1968).



Carl G. Gustafson, *chairman of the Department of Chemistry of King's College, Briarcliff Manor, N.Y., received a Ph.D. in organic chemistry from the University of Delaware in 1957. During the 1969–70 academic year, he was on leave at the FWQA Southeast Water Laboratory in Athens, Ga., where he studied trace organic analysis in waste effluents. As a member of the National Water Contaminants Characterization Research Program, he worked with PCB's and pulp and paper mill effluents.*

DSW 444205

STLCOPCB4057807

Monsanto

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

Aug '71

Gentlemen:

We are contacting your firm as a manufacturer of equipment which may contain one or more of the Therminol®FR series heat transfer fluids. Therminol®FR series includes Therminol® FR Lo-Temp, Therminol®FR-0 and Therminol®FR-1. As you are probably aware, the Therminol®FR series contains polychlorinated biphenyls (PCB) of various types.

As you are undoubtedly aware, the PCB concentration in our environment has increasingly come under the scrutiny of various governmental agencies and scientific laboratories. In some studies, certain PCBs have been found to be persistent, an environmental contaminant and, possibly, injurious to certain forms of bird, aquatic and animal life. Accordingly, it is very important that PCBs be kept out of the food chain.

Effective immediately, we are instituting a policy of restricting sales of the Therminol®FR series to existing heat transfer systems which are presently utilizing the Therminol®FR series and do not involve food or food related products. We would appreciate your discontinuing the use of the Therminol®FR series in any new equipment sales and discontinuing any recommendation of the Therminol®FR series in your literature. In accordance with this policy, the Therminol®FR series will no longer be available to your firm.

We would like to point out, however, that certain Monsanto products which are sold under the Therminol® trademark, namely, Therminol®55, 66, 77 and 88 do not contain PCBs and will continue to be available for new heat transfer systems as well as for replacements of existing systems. While these are not classified as fire-resistant, proper design, operation and maintenance and the use of appropriate protective devices should minimize any added fire risks. We would appreciate your continued use

DSW 444206

and recommendation of Therminol®55, 66, 77 and 88 in both new and existing systems.

Should you have any questions, please contact your local Monsanto representative or me.

Sincerely,

J. J. Roder

J. J. Roder
Product Supervisor
Heat Transfer Fluids

cs

DSW 444207

Pydraul / Santovac

1. Dec 31, '71 - H S Bergen

   To Santovac 1 and 2 customers

2. Sept 27, '71 - R. Hatton

   To Santovac 1 & 2 customers - alert

3. April 15, '71 - C.C. Bradford

   To all Pydraul customers

4. Feb 1, '71 - C C Bradford

   Follow-up to Feb '70 letter. To Pydraul 312, 135, 230, 540A and A200 customers.

DSW 444208

STLCOPCB4057810

Monsanto

MONSANTO INDUSTRIAL CHEMICALS CO.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

December 31, 1971

Dear Sir:

We are writing to advise you that, effective this date, Monsanto will no longer sell Santovac 1 and Santovac 2 vacuum pump fluids.

These two Santovac fluids contain polychlorinated biphenyls (PCBs). As we have previously advised you, studies indicate PCBs may be accumulating in the environment. In some instances, PCBs have been found in food or in the food chain. An article by Carl G. Gustofson of the Federal Water Quality Administration appearing in "Environmental Science and Technology" and dealing with this subject is attached for your information.

Because of Monsanto's concern over this problem, we have discontinued sales of PCBs where the usage was in so-called "open systems". We have discontinued sales of Santovac 1 and Santovac 2 where the usage would be in food processing applications.

Our action in discontinuing sales for all uses in vacuum systems has been taken because of the problems which may arise should there occur accidental leakage of PCBs from such systems. We believe this action is in the best interest of all our customers who have continued using these materials in vacuum applications.

DSW 444209

STLCOPCB4057811

Please contact your pump supplier for his recommended replacement product.

To prevent entry of PCBs into the environment during your changeover from Santovac 1 or Santovac 2, return the used fluid to us for proper disposal (by high temperature incineration). Please send to Monsanto Co., W. G. Krummrich Plant, Sauget, Ill. 62201, Attention: Supervisor Dept. 246. To help you accomplish this with the least difficulty, we will pay the freight and disposal costs involved through April 1, 1972.

We will also accept return of any unopened cans or drums of Santovac 1 or Santovac 2 which may be in your possession and credit you at full purchase price if returned to us prior to March 1, 1972.

We sincerely regret any hardship that this decision may cause you, but feel you will agree Monsanto has made the correct decision.

Yours sincerely,

Howard S. Bergen

Howard Bergen, Director
Functional Products Group
Monsanto Industrial Chemicals Company

/pep
Attachment

DSW 444210

bcc: C. L. Bradford

September 27, 1971

Mr. C. E. Mitchell
Purchasing Agent
Adamas Carbide Corp.
31000 Industrial Road
Livonia, Michigan 48150

Dear Mr. Mitchell:

This letter will confirm our telephone discussion on your use of Santovac 2 vacuum pump fluid.

As indicated on their labels, Santovac 1 and Santovac 2 contain polychlorinated biphenyls (PCBs) of various types. As you are aware, PCBs have increasingly come under the scrutiny of various governmental agencies and scientific laboratories. In some studies, certain PCBs have been found to be persistent, an environmental contaminant and possibly injurious to certain forms of bird, aquatic and animal life. Accordingly, it is important that PCBs be kept out of the food chain.

We want to remind your firm of the extreme care that must be taken by users of Santovac 1 and Santovac 2 fluids to prevent any entry into the environment through spills, leakage, use, disposal, vaporization or otherwise. Some specific applications where these fluids should definitely not be used are in vacuum systems involving food or food-related products, animal feeds, pharmaceutical products, packaging materials involving any of such items and buildings where any of these items are manufactured or stored.

If your vacuum system involves any of the mentioned applications, or if your system is such that entry into the environment cannot be prevented, you should replace Santovac 1 and 2 with non-PCB fluids immediately. Please contact your pump supplier for his recommended replacement product.

DSW 444211

STLCOPCB4057813

Used Santovac 1 and 2 should be returned to Monsanto Company, W. G. Krummrich Plant, Sauget, Illinois 62201, Attention: Supervisor Dept. 246 for proper disposal. This service is performed at cost, which is $0.03 per pound.

Very truly yours,

R. E. Hatton
Technical Manager
Hydraulics & Lubricants

/pep

DSW 444212

Monsanto

ORGANIC CHEMICALS DIVISION

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

April 15, 1971

Dear Sir:

Over the past year or so we have written you several letters concerning polychlorinated biphenyls and have urged that care be taken to prevent the escape of hydraulic fluids containing PCBs into the environment. Certain Pydraul hydraulic fluids did contain PCBs, taking advantage of the excellent characteristics of that material for certain industrial applications. However, in view of the questions which have been raised concerning possible environmental effects, Monsanto launched a program to develop alternative products without using PCBs.

This is to inform you that our efforts to develop alternative hydraulic fluids for applications which cannot be completely confined have been successful. There are now no PCBs in any of our Pydraul fluids.

We appreciate your understanding over this past year. The reformulated products you are now using will give you equal or better performance than you previously had - and with no PCBs.

Very truly yours,

C. Larry Bradford

C. Larry Bradford
Product Manager
Hydraulics & Lubricants

P. S. - Would you please circulate this letter to all departments in your operation that are concerned with hydraulic fluids and/or maintaining a clean environment.

DSW 444213

Monsanto

ORGANIC CHEMICALS DIVISION

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

February 1, 1971

Dear Sir:

In February, 1970, we advised you of the newspaper and magazine articles indicating that polychlorinated biphenyls (PCBs) have been discovered at some points in some marine, aquatic and wildlife environments. It was claimed that the PCBs found strongly resembled chlorinated biphenyls containing 54% and 60% chlorine by weight. The quantities detected are said to be in the parts per million and parts per billion categories.

Pydraul 312, Pydraul 135, Pydraul 230, Pydraul 540-A and Pydraul A-200 have been formulated with polychlorinated biphenyl. New formulations have been developed and tested to provide equal or superior performance. The new formulations will be designated Pydraul 312 A, Pydraul 135 A, Pydraul 230-A Pydraul 540 B and Pydraul A-200-B. They are completely compatible with the old formulations and do not contain polychlorinated biphenyls.

During the next 60 days, as inventory is depleted in warehouses around the country, the new formulations will be shipped to fill your orders.

If we can be of farther assistance or answer any questions you might have please contact your local representative or me in St. Louis.

Very truly yours,

C L Bradford

C. L. Bradford
Product Manager

lb

DSW 444214

Phocion S. Park

J.C. - Los Angeles Grand Jury

JUL 14 1972

June 23, 1972

David H. Anderson, Esq.
Asst. U. S. Attorney
United States Attorney's Office
312 North Spring Street, Room 1200
Los Angeles, California 90012

Dear Mr. Anderson:

This letter is written pursuant to our telephone conversation, Thursday morning, June 22. You informed me that it would not be necessary for a representative of Wynn Oil Company to testify on June 22 before the Grand Jury of U. S. District Court for the Central District of California.

I confirm my telephone representation to you that our records show we did not purchase, use or dispose of any Monsanto polychlorinated biphenyls in the period of Jan. 1, 1971 to present. We do purchase and use other chemicals from Monsanto and, due to a coding error in Monsanto's records, they mistakenly had informed you that we purchased 24,000 lbs. of ARoclor 1254 (a PCB) between Jan. 1, 1971 and present.

We have received confirmation of this coding error from Monsanto, through letter (copy attached) and per telephone conversation with their legal counsel, Mr. Phocion Park III, Esq.

I trust that this is all the information you require; however, if any additional detail is necessary please get in touch with me.

Sincerely,

WYNN OIL COMPANY

Orville T. Manley
Director, Research
and Development

OTM:lt

cc: Mr. John Borie
Mr. Ken Lovett

Phocion S. Park III, Esq.

DSW 444215

STLCOPCB4057817

TECHNICAL
JUN 21 1972
OPERATIONS

Monsanto

Monsanto Company
P.O. Box 120
Santa Clara, California 95052
Phone: (408) 243-0414

June 20, 1972

Mr. Orville Manley
Wynn Oil Company
1151 West Fifth Street
Azusa, CA 91702

Dear Mr. Manley:

This letter is to confirm my phone conversation with your secretary this morning regarding a 24,000 lb. shipment of Aroclor made to your location in March, 1971.

Our plant has verified that the material shipped to your location against your Purchase Order 8332 was Aroclor 5460. It seems our IBM run and invoice erroneously reflected Aroclor 1254 due to an incorrect product code entry at the time of the original order.

I'm terribly sorry, Mr. Manley, for the inconvenience this error has caused. If we can be of further help, please feel free to call.

Sincerely,

Sandi Brimmer

Sandi Brimmer
Specialty Products

SB/
cc: Mr. C. Boutin

DSW 444216