Mr. J. R. Savage - General Office

June 8, 1970

Mr. W.B. Papageorge
Mr. H.S. Bergen

PCB Losses To Atmosphere

Messrs.

B.W. Corlew	WGK Plant
H.L. Williams	Anniston Plant
F. Macdonald	Newport

The attached memo from Bill Papageorge points out an area for study which has not been previously emphasized. While the nature of the process and the product seem to preclude substantial losses to the atmosphere, we should not be complacent.

One of the first questions from semi-knowledgeable legislators and control agency personnel is always "how much goes up your stacks?" It would be little good to tell them how sure we are, if we have no data.

Sampling seems indicated at the exhaust of the scrubbed air from blowing, and from ventilating hoods at drumming statins, still bottoms draw-off, etc. Calculated values for storage tank vents assuming saturation at the storage or transfer temperature will probably suffice. If the calculated values exceed a pound or two per day, sampling is in order.

When the first set of data is complete, please propose such reduction targets as seem needed, and a frequency for future control sampling. I suggest a target date for this first phase (initial samples, target and sample frequency setting) of September 15, 1970.

J. R. Savage

md
attachments: 2

DEFENDANT'S EXHIBIT 31
9-1-04 SM

WATER_PCB-SD0000051863

Monsanto

FROM (NAME & LOCATION): W. B. PAPAGEORGE - ST. LOUIS

DATE: JUNE 1, 1970

SUBJECT: PCB LOSSES TO ATMOSPHERE

REFERENCE:

TO : J. R. SAVAGE

cc: H. S. BERGEN
G. BRATSCH - KRUMMRICH
P. B. HODGES
G. L. JESSEE - ANNISTON
R. E. KELLER
P. MACDONALD - NEWPORT
J. E. SPRINGGATE

In evaluating our performance in the control of PCB's to the environment from our manufacturing facilities, we should not neglect to consider losses to the atmosphere through jet exhausts, vents, stacks, etc.

Bob Keller's group has developed procedures for the sampling and subsequent analysis of gas (air, vapor) samples.

I recognize that accurate determination of the losses to the atmosphere is difficult, but I believe a critical study of each facility considering flow rates, frequencies and concentrations could result in a pounds per day loss figure which could serve as a useful guide.

Will you have each plant develop a program for auditing the present situation, monitoring on a planned basis and taking corrective action to achieve targeted losses to the atmosphere?

W B Papageorge

W. B. PAPAGEORGE

ms

DSW 175778

WATER_PCB-SD0000051864

Aroclor Vent loss to atmosphere

Sample calculation:

Assume a 20,000 gal tank being filled with 1242 @ 100°C. If tank is insulated, will quickly be filled with 1242 vapor saturated in air or N_2 @ 100°C.

Say vapor pressure @ 100°C is 0.3 torr.

$$\frac{20{,}000}{7.48} = 2680 \text{ ft}^3$$

$$\frac{2680 \text{ ft}^3}{359 \text{ SCF/mole}} \times \frac{273°K}{373°K} \times \frac{0.3 \text{ torr}}{760 \text{ torr}} \times 257 \frac{\text{lb}}{\text{mole}}$$

$$= .555 \text{ lb}$$

Suppose temp is 150°C, v.p 2.0 torr

$$\frac{2680}{359} \times \frac{273}{423} \times \frac{2}{760} \times 257$$

$$= 3.26 \text{ lb}$$

Worst case - no vents tied together, ∴ each lb Aroclor made displaces its own volume 5 times (filling S.T., filling car or drum, filling intermediate tankage.)

Department producing 4 M lb/mo = 133,000 lb/day
= 13000 gal/day

If all were 1242 and transfers were at 150°C.

$$3.26 \times 5 \times \frac{13}{23} = \underline{10.9 \text{ lb/day}}$$

Assume we must hold transfer and storage temperature as [illegible]

DSW 175779

MCL 143
959

PROGRESS REPORT

TECHNICAL SERVICES DEPARTMENT
SQ. 10651

JOB NO:-	27/7139/2392
REPORT:-	No. 2
DATE:-	15.10.70

Distribution:-

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A.F. Regan / D.W.H. Casey	*	D. Danna	"
R. Thomas	*	W.A. Kuhn	"
R. Williams	*		
B.J. Williams			

* To receive details section

TITLE: Environmental Contamination by PCB (Atmospheric)

PROBLEM: To report on sampling of plant atmospheres for PCB contamination.

PERSONNEL: R. Thomas (A.C. Nethercott)

SUMMARY:

An absorption train apparatus was set up. The plant atmospheres were sampled and the PCB content was ascertained. The results obtained are quoted below. All but a few of the locations have been sampled to date and more samples will be taken so that more meaningful results are obtained.

Results varied from practically nil to 0.94 mg/m^3 PCB in air.

FUTURE WORK

To complete the sampling programme and finalise any recommendations.

R. Thomas

R. THOMAS

DSW 175780

WATER_PCB-SD0000051866

Results

Area	PCB mg/m^3 air	Comments
Drumming	0.38	Indoors. Two roller doors open
Chlorination (Ground floor)	0.59	Enclosed space, large roller door open
	0.13	" " " " " "
Santolube 900	0.23	Indoors. Normal process conditions
4NDPA	0.94	Outdoors. Variable W - E wind (still)
(Expansion Tank)	Prac. Nil	Outdoors. W - E wind (Wet and Windy)
Aroclor control room	0.28	Indoors
Chlorination (First floor)	0.12	Fourth side open. Chlorinators were shut down.
	0.19	Chlorinators operating
	0.12	" "
Airblowing room	0.39	Indoors. Normal process conditions.

DSW 175781

WATER_PCB-SD0000051867

Recommendations

1. That these determinations be repeated on a regular basis to be decided so that trends can be studied and controls set.

2. That the apparatus be assembled in a permanent portable form for use when required.

3. That any future modifications or recommendations be incorporated in the apparatus.

4. That all storage vessels containing finished product Aroclor be held at as low a temperature as is possible for subsequent handling.

5. That all storage vessels containing finished product Aroclor be fitted with nitrogen fed conservation vents.

6. That emission of Aroclor from venting systems on storage vessels be cut to the very minimum by the use of some suitably designed vent gas cooling/condensing system.

7. That the ventilating systems in the plant office, changing room and control rooms be upgraded so that these atmospheres are continuously purged with fresh clean air.

WATER_PCB-SD0000051868

DETAILS

The apparatus consists of two absorbers in series, the first one being charged with 75 mls of toluene. The second one is empty and acts as a catch vessel for any entrained toluene. An indicating flowmeter (rotameter) is next in line with a water filled manometer feed into the line. An indicating dry gas meter is next in line and this is followed by a laboratory vacuum pump which is fitted with an air-bleed valve. Where the vacuum pump cannot be used, as the electric motor is not flameproof, a laboratory size water pump is used. This latter is not as convenient to use and needs more attention.

The dry air meter used can only be used to a vacuum of 10 ins water gauge so pressure drop through the system must be minimal. This is why only two absorbers are used.

The absorbers are thoroughly cleaned before each run using the procedure recommended by R. Keller. Air flow through the apparatus is at ½ - 1 litre per minute and about 60 litres of air is drawn through the apparatus for each run.

At the end of the run the toluene is transferred to a sample jar after measurement of final volume. This sample is taken to the Analytical laboratory where it is reduced in volume to about 3 mls. from 60 - 70 mls. The concentrated sample is fed into the chromatograph and the PCB content is determined.

The temperature of the air being sampled is measured, the manometer is read and a mean reading is established, the barometric pressure is obtained and the air meter is read to find the volume of air used.

The absorbers are removed and sealed for removal from the area, but the rest of the apparatus is purged with air to remove any entrained toluene.

The volume of air sampled is corrected to 25°C and 760 mms of mercury pressure.

A PCB result is obtained from the laboratory and this result is converted to give milligrams of PCB per cubic metre of air. The range for maximum allowable concentration (M.A.C.) is 0.5 mg/m^3 - 1.0 mg/m^3 for lower to higher aroclors.

Results obtained to date range from practically nil to 0.94 mg/m^3 which is satisfactory.

WATER_PCB-SD0000051869

COMMENTS

These determinations are not absolute and there are limitations in interpretation of the results. At best the results can only compare measured concentration from sample point to sample point.

Every effort was made to standardise the sampling procedure but for certain locations a different method was used to suck air through the apparatus.

Sampling atmospheres is an inaccurate procedure as things like wind direction, weather conditions and local unexpected contamination can have bearing on the results obtained. Conditions at two different sampling times will nearly always be different.

Two absorbers in series were used, the first was charged with Toluene and the second was used as a catch vessel for any entrained toluene. Despite this catch vessel, loss of toluene was experienced through the apparatus. This loss was allowed for on each result calculation.

As air had to be sucked through the apparatus the absorption took place at less than atmospheric pressure and this of course necessitated measured volume correction to atmospheric (standard) pressure. Each volume was corrected to 760 mms. Hg pressure and 25°C.

The variables determining the degree and extent of constituent distribution are stability of the atmosphere, wind speed and direction, precipitation, topography, emission and formation rates and physical and chemical characteristics of the constituents.

WATER_PCB-SD0000051870

Equipment used and operating data

Electron Capture Gas Chromatographic Procedure

Instrument:	Hewlett - Packard 402 Gas Chromatograph
Detector:	High temperature N_i^{63} Electron capture cell
	6 mm x 6' Glass column, 4% O.V. 225 on 80/100 mesh Chromosorb W, H.P.
Column Temperature:	170°C
Detector Temperature:	260°C
Injection Port Temperature:	200°C
Pulse:	150
Flow rates:	40 mls/min Argon/Methane
	80 mls/min Helium
Range:	10
Alternation:	4
Chartspeed:	0.25"/min.

RT/EM
15.10.70

DSW 175785

W. B. PAPAGEORGE - ST. LOUIS

JUNE 1, 1970

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ms

DSW 175786

WATER_PCB-SD0000051872