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JOB PCB Bulletin

(COVER) Handling, Waste Control & Disposal of

PolyChlorinated Biphenyls

...Produced and distributed as a service to industry by Monsanto (Logo)

INTRODUCTION

For many years, products containing polychlorinated biphenyl compounds have been used to perform hundreds of valuable jobs in industry. Monsanto's Aroclor®, for example, has been -- and is -- the "essential ingredient" in dozens of applications ranging from electrical transmission and distribution to industrial heat transfer.

Recently, however, polychlorinated biphenyl (PCB) residues have been found, in small amounts, in the environment, and some studies indicate that such residues may be harmful to certain forms of animal life. Like all responsible corporations today, Monsanto is extremely concerned with the environment, and as a result, has taken some positive steps to minimize any serious threat of environmental contamination by PCBs.

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For example, wherever at all feasible, Monsanto has reformulated products containing PCBs to eliminate the potential hazard to the environment. The Pydraul® fire-resistant hydraulic fluids are cases in point. These valuable and highly-regarded products, formerly based on PCB chemistry, today no longer contain PCBs in any amount, yet continue to do their job protecting the metalworking and diecasting industries against hydraulic fluid fire.

In other cases, it has proved impossible to remove PCBs from certain products without totally compromising their effectiveness and function. Where this is the case, Monsanto is actively helping companies to use PCB-containing products safely and without threat to the environment. This bulletin is just one of the tools Monsanto is bringing to bear against the problem of PCBs and potential environmental contamination. Properly applied, the guidelines spelled out in the pages that follow will help the user of PCB-containing products eliminate one potential source of environmental contamination.



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IN GENERAL...

...every care should be taken by users of PCB-containing products to prevent entry into the environment through spills, leaks, disposal, vaporization or everyday use and handling. In a word, common sense combined with good maintenance procedure will go a long way toward eliminating any threat to the environment from PCBs.

Tight maintenance of old facilities and installations and proper design and maintenance of new plants and systems are important first-line defenses against PCB loss. If at all possible, the following nine guidelines should be observed in PCB handling facilities:

1) Restrict PCB's to a small area.

2) Weld as many connections as possible.

3) Use flanges with graphite impregnated asbestos gaskets for accessibility.

4) Use canned pumps or pumps without seals.

5) For high temperature service where seals are needed, use a carbon stellite-faced internal mechanical seal with a flush for seal lubrication.

6) Maintain minimum pressures and temperatures.

7) Make frequent inspections of equipment.

8) Route relief or vent lines into other vessels.

9) Keep equipment in high state of maintenance.

Measuring Losses

A check of how much Aroclor is used versus how much is known to be in finished product gives a good estimate of losses. Liquid and vapor losses can be quantified by sampling suspected streams and analyzing for PCB's.



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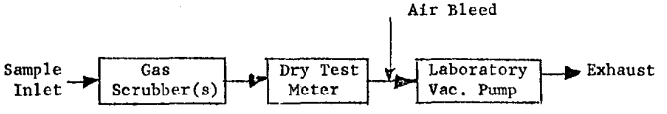
Sampling point is extremely important. Samples should be taken from streams where the total amount of flow is known. It is also necessary that the sample taken be representative of the total flow. For example, a sewer stream can have two phase (2 layers) flow and one phase not be included in a sample.

Stream concentrations usually vary with time so it is necessary to either collect samples frequently and combine them or use a continuous sampling device.

Air or vapor sampling is especially difficult and requires apparatus as shown in this flow diagram:




The air to be sampled for airborne PCBs is drawn through a gas scrubber(s) and a dry test meter using a laboratory vacuum pump. The sampling flow rate is controlled by bleeding in air via a needle valve located between the pump and the meter. At the end of the sampling period, the metered gas volumes are corrected for temperature and pressure to cubic meters at $25^{0}$ C. and 760 mm Hg.

It is important to note that neither the capacity nor the efficiency of the gas scrubber(s) for removal of airborne PCBs have been experimentally evaluated. For this reason it is best to minimize the sampling flow rate and maximize the sampling time period to obtain measurable amounts of PCBs. When high flow rates must be employed or a larger capacity may be needed, it is recommended that several gas scrubbers be used in tandem.

By analyzing the sample (Monsanto can perform the analysis) and knowing the total flow, total loss can be determined for the stream sampled.



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Sample concentration in parts per billion x flow in pounds/day = loss in pounds per day x $10^9$ for liquids. For gas streams: concentration in pounds per cubic foot of gas x total gas flow in cubic feet per day = loss in pounds per day.

Theoretical Vapor Loss Calculation

Table I gives approximate daily losses of Aroclor 1242 at various temperatures from a gas flow of 100 scfm assuming the gas is saturated with Aroclor 1242 but no mist is present. The actual pressure is also assumed to be atmospheric.

Table I

Daily Losses in Pounds per Day for 100 scfm

Continuous Flow Saturated with Aroclor 1242

| Temperature $^oC$ | Vapor Pressure mm Hg | Loss Pounds per Day |
|---|---|---|
| 20 | 0.00028 | 0.04 |
| 40 | 0.0025 | 0.3 |
| 60 | 0.015 | 2.0 |
| 80 | 0.072 | 10 |
| 100 | 0.24 | 30 |
| 120 | 0.85 | 100 |
| 140 | 2.6 | 350 |
| 160 | 6.5 | 900 |

To approximate a loss, convert the flow to standard conditions ($32^oF$, 1 atm.), multiply the actual flow in hundred scf. times the appropriate loss from Table I.



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CONTROL OF LOSSES

Liquid Loss

1) Every effort must be made to prevent the mixing of PCB with water, thereby measurably reducing the opportunity for PCB's to enter a water system such as sewers, creeks, rivers or lakes. Hosing down of the area where PCB is present should be minimized. Organic solvents (benzene, chlorobenzene, chloroethylene, oil, etc.) in the water stream will make PCB removal difficult.

2) All liquid handling systems must be designed and maintained to assure that leaks and spills are a rarity. If they do occur, corrective measures should be taken immediately and the PCB's should be properly contained or disposed.

3) All areas in which spills and leaks occur should be paved, curbed and properly drained. In some instances such as under pumps or sampling points, drip pans or catch basins may be appropriate. These, however, must be drained properly into waste collecting systems.

4) Experience in the Aroclor production facilities have shown that interceptor basins in a sewer line will remove most of the PCB from a water stream. A typical sewer basin is shown in the sketch below. Points to remember in constructing and maintaining a basin of this type are:

   a) Design the basin to contain the largest spill which can be anticipated.

   b) Floating PCB should be removed by a skimming device either stationary or mechanical.

   c) When the level of heavy PCB material reaches about half way it should be removed for disposal.



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d) Positive displacement pumps work to remove the heavy material from the bottom.

e) Do not stir up the liquid in the pump when cleaning.

5) Other types of equipment which can be used to remove emulsions or disposed of by incinerating at a temperature above 800°C. The products of combustion will contain hydrogen chloride gas which should be scrubbed with water and neutralized. If proper incineration facilities are not available locally, Monsanto will provide disposal. Cost for disposal not including shipping has been set tentatively at 3¢ per pound. Material returned should be properly labeled and addressed to:

Attn: Supervisor, Dept. 246
W. G. Krummrich Plant
Monsanto Company
Sauget, Illinois 62201

Vapor Losses

If vapor losses are determined to be excessive either by sampling or by visual inspection, one or more of the following suggestions may be of help in reducing the loss.

Of utmost importance are the temperatures of both the Aroclor in use and the vapor stream. Keep both temperatures as low as possible. Also keep total gas flow in the stream to a minimum so that any correction equipment can be of smaller size.

The vapor handling facilities should be designed and maintained to assure no vapors escape to the atmosphere. The use of liquid vent seals, condensers and entrainment separators are recommended. Interconnection of vent lines to contain vapor within the system eliminates these losses. Carbon adsorbers are



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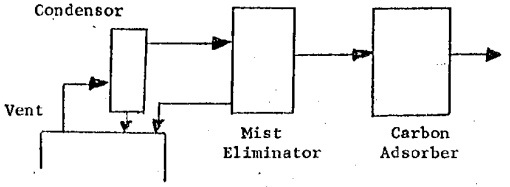
available commercially to reduce organic loss from vent lines. The sketch below is a flow sheet of a vent with correction equipment attached.




Solids

1) Solids contaiminated with PCB must be segregated from other plant solid wastes.

2) Disposal may be made in a properly operated landfill which is not located near any water system.

3) Ordinary burning of these materials must be avoided. Steel or copper wastes may be reclaimed in high temperature furnaces.

4) Steel drums which contained PCB should not be reused for any other material.

5) Drums should be reclaimed by Monsanto approved Aroclor drum reclaimer.



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