PCBs--Compliance Is/And Our Responsibility

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Abstract - Federal regulations do not require the removal of PCBs (polychlorinated biphenyls) from service in totally enclosed industrial and utility transformers earlier than normal. Many of the estimated 140,000 askarel-filled and 35 million oil-filled units in service can and will be around for many years to come.

During the state of frustration that the PCB control issue is in now, the best route to go is to keep informed of the latest state and local regulations, and to make a "reasonable effort" to comply with existing U.S. regulations.

At least seven chemical waste landfills for non-liquid PCBs have been approved by the EPA (Environmental Protection Agency).

On the other hand, until such time as EPA approved PCB liquid incineration becomes feasible--in terms of distance and backlog--don't panic! Hold on to the liquid in EPA approved containers, store in an EPA approved manner, and inspect weekly until incineration becomes practical. Don't contract for shipment to some facility that may have an approved incinerator as you may be subject to spill liability.

I. Introduction

Federal EPA regulations do not require the removal of PCBs from service in totally enclosed industrial and utility transformers earlier than normal. Therefore, many of the estimated 140,000 askarel-filled and five million oil-filled power and 30 million distribution units in service can and will be around for many years to come.[1]

But U.S. EPA regulations do control the use, maintenance, handling, labeling, storage, and disposal of polychlorinated biphenyls (PCBs) within those transformers & large power capacitors. Even though PCB has been the most listed item in U.S. regulations, it has not been totally banned nor is this anticipated in the future.[2]

PCBs, known generically as "askarel", have been used for 50 years for cooling and insulating electrical equipment in situations where high fire resistance was required. Another plus was PCB chemical stability. But this same characteristic of persistance that made PCBs useful for industrial purposes has made them harmful, especially their cumulative effect on the food chain from plankton (the simplest plant or animal) to fish, birds, and so on thru to the human species.[3]

A 1972 attempt at voluntary control was unsuccessful. Therefore, subsequent stages have involved governmental regulations. The first step was the adoption of the Toxic Substances Control Act (Public Law #94-469 known as TSCA) which went into effect January 1, 1977. The intent of TSCA has been to protect in a reasonable and prudent manner the public health and the environment from further contamination from toxic chemical substances and mixtures. PCB is only one of the chemicals to be regulated. Congress also mandated that detailed regulations be published to implement certain sections of TSCA. The first "Disposal and Marking Rule" took effect on April 18, 1978, while the 1979 "PCB Ban Rule" took effect on July 2, 1979. This latest regulation supercedes completely the 1978 version.[4]

II. Unraveling the EPA PCB Regulation

The law is clear -- choosing to keep PCB transformers in service requires proper identification; choosing to dispose of units requires the same identification plus proper storage and disposal procedures. Either option requires accurate recordkeeping.

A. Definitions

Notable among the PCB associated terminology defined in Table I is a PCB item. A PCB item is any PCB associated thing that deliberately or unintentionally contains or has as a part of it any PCB or PCBs at a concentration of 50 parts per million or more (0.005 per cent on a dry weight basis) and is therefore subject to EPA regulations.

Both askarel and PCB are rarely found on a transformer nameplate. Many people are more familiar with one of the insulating fluid tradenames, as Pyranol®, Inerteen®, Aroclor®, and so on. As a matter of record, PCB was invented in 1929 by Swann Chemical, later bought out by Monsanto Chemical. The late Dr. F. M. Clark patented its application for use as an insulating fluid for the General Electric Co. in 1931.[5]

Someone has illustrated the meaning of quantity in parts per million (PPM) using this analogy: One (1) part in a million is comparable to one (1) minute in 1.9 years! The definition of PCB mixture includes transformer oil and other liquid coolants that have been inadvertently contaminated. Major transformer manufacturers have acknowledged that "some oil-filled transformers may contain varying concentrations of PCB." In this regard it is illegal to deliberately dilute PCBs. This precludes topping off a mineral-oil filled transformer that's contaminated with PCBs. At the same time, it stands to reason if the oil level has dropped over the passage of time below the transformer core, the addition of mineral oil as a maintenance step only should not violate the intent of the PCB regulation.

This paper will first cover changes that took place in the 1979 rule and also consider other PCB related legislation -- both existing and forthcoming.

Current PCB regulations apply to all persons who manufacture, process, distribute in commerce, use, or dispose of PCBs. Our focus will be upon those who use and dispose of PCBs.

B. In Service Units

Existing totally enclosed transformers can continue indefinitely in service. Proper labeling, recordkeeping, and voluntary inspection are the only necessary guidelines.

However, free breathers may be phased out by 1985. These

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MONS 000148

Table 1

Environmental Protection Agency PCB Regulation Terminology*

TERM	DEFINITION	EXAMPLES
PCB, PCBs	Any chemical substance containing only a biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance.	PCB liquids and non-liquids.
PCB Transformer	Any transformer that contains 500 ppm PCB or greater.	Askarel filled, retro-filled unit, or mineral-oil filled unit as found from testing.
PCB Contaminated Transformer**	Any transformer that contains 50 ppm or greater of PCB but less than 500 ppm PCB.	Typical oil-filled transformer or PCB retrofilled unit.
PCB Article	Any manufactured item, other than a PCB container that contains PCBs and whose surface(s) has been in direct contact with PCBs.	Large high or low voltage capacitors, transformers, PCB cooled motors.
PCB Container	Any device used to contain PCBs, or PCB articles, and whose surface(s) has been in contact with PCBs.	Bottle, barrel, drum or box.
PCB Article Container	Any device used to contain PCB articles or PCB equipment, and whose surface(s) has not been in contact with PCBs.	Shipping or storage carton for capacitors.
PCB Equipment	Any manufactured item other than a PCB container or PCB article container that contains a PCB article or other PCB equipment.	Industrial television receiver, microwave oven, fluorescent lighting fixture.
PCB Item	Any PCB article, PCB article container, PCB container or PCB equipment, that deliberately or unintentionally contains or has a part of it any PCB or PCBs at a concentration of 50 parts per million (ppm) or more.	Aroclor®, Inerteen®, Pyranol®, contaminated transformer (mineral) oil, or coolants retro-filled to transformers formerly containing PCB.

*Source: Federal Register, Vol. 44, No. 106, Part VI, pp 31514-31558.

**Non PCB Transformer - Any transformer that contains less than 50 ppm PCB - term not formally defined in this regulation.

MUST BE LABELED BY 10-1-79

Table II

Requirements for Labeling PCB-Related Items*
(For PCB items of 50 ppm or more only)

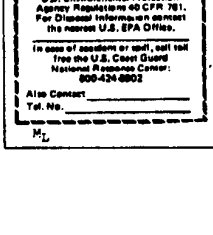
PCB transformer (for units ≥500 ppm only)
Large PCB high-voltage capacitor or capacitors mounted in a protected location such as on a pole, structure, or behind a fence, only one label need be posted on the pole, structure or fence. A telephone number is sufficient owner contact identification.
Other PCB articles-PCB cooled electric motors, PCB hydraulic equipment and systems, PCB heat-transfer equipment and systems not associated with transformer and capacitor cooling.
PCB equipment (containing a PCB transformer or PCB large high-voltage capacitor).
PCB storage areas, PCB containers, and PCB article containers.
PCB transport vehicles (motor vehicle or railcar) carrying more than 45 kg (99.4 lbs) of PCB's.

*See Figure 1 for required label format

LABELING EVEN IF <500ppm AIDS IDENTIFICATION

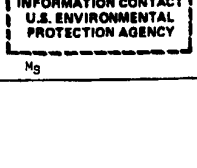
Figure 1

TSCA requires that PCB items be identified as specifically prescribed with the largest PCB mark practical for a PCB item. When a PCB article or PCB equipment is too small to accomodate the smallest permissible size of Mark M_L, Mark M_S may be used. Detailed requirements for size, color and durability are given in the Federal Register, Part VI, P.31556.



M_L

MONS 000149



M_S

units consist of railroad transformers, primarily, with few industrial units involved.

1. Transformer Identification

Under the latest PCB regulation, all items listed in Table II should now display the appropriate PCB label* (Figure 1).

2. Requirements for PCB Recordkeeping

a. Who Must Comply

Since July 2, 1978, an inventory must be kept concerning the status of your PCB items. The requirements apply to each facility owner or operator who has on his premises:

. One or more PCB transformers and/or

. 50 or more PCB large high or low voltage capacitors (See Table III) and/or

. At least 45 kilograms (99.4 lbs) of PCBs.

These records will form the basis for a required annual document prepared by each facility. It should be available on July 1, 1979, and each succeeding July 1 thereafter. For multiplant companies in scattered locations, one record for the entire corporation could be maintained at a central location.

Current law requires that records are to be maintained in the individual companies' own file, subject to request of copies or on-site EPA inspection upon the presentation of appropriate credentials, along with written notice of the facility to be inspected.

b. What Data Required

- Total weight in kilograms of PCBs and PCB items in containers including identification of container contents, such as liquids or capacitors (total weight means excluding the weight of the containers).
- Total number of PCB transformers and total weight in kilograms of any PCB liquids contained in the transformer.
- Total number of PCB large high or low voltage capacitors.
- Location of PCB item.

Use nameplate information to determine PCB weight requirements. Your annual reports must be kept for at least five (5) years after a facility ceases to own or operate PCB related items in the prescribed quantities.

Failure to keep proper records is a violation of the law. Civil penalty of up to $25,000 could be imposed for violation of TSCA; each day the violation continues is considered a separate violation.

c. How Acceptable Records Generated (To test or not to test!)

Testing for PCB concentration in transformer mineral oil is not required in the latest PCB ruling. Therefore, consider two possible options.

1. Do nothing (i.e, do not test). Unless there is a specific reason to believe a given transformer has more than 500 ppm PCB, assume the unit to have 50 to 499 ppm PCB. Available EPA information has indicated that very little mineral oil dielectric fluid will be contaminated with PCB beyond 500 ppm. EPA thus anticipates that most transformer owner/operators will make such an assumption.

2. Schedule over a period of time, as the budget permits, a one time PCB analysis test on each mineral-oil-filled transformer of unknown PCB concentration beginning with the most critical units -- by location (near a waterway) and by disposition (near the end of life expectancy). First, those units tested and found below the 50 ppm PCB standard would thus be exempt from all disposal requirements and any PCB spill associated problems. Secondly, testing would serve as a preventive maintenance tool. Since there is evidence that over 100 ppm PCB in mineral oil reduces the impulse strength of oil, testing would indicate suspect units.[9]

As Table I shows, a distinction has now been made between PCB transformers, those containing 500 or more ppm, and PCB contaminated units, those containing between 50 and 499 ppm, and non-PCB transformers, those with less than 50 ppm PCB.

Those units that contain less than 500 ppm do not require labels. However, special identification of "PCB contaminated units" (50-499 ppm) may be the best way to assure special treatment. Obviously, such action necessitates scheduled one-time PCB analysis, but it facilitates compliance with the law. Thus, these two suggested steps provide:

. Immediate identification for ongoing inspection of units and recordkeeping.

. Minimize future disposal costs.

. Meet probable testing prerequisite prior to any contracted transformer maintenance work.

Consider this typical laboratory data (about 1800 samples of mineral oil):

PCB Concentration	Percentage of Samples Tested
1. > 499 ppm	10%
2. 50 - 499 ppm	24%
3. < 50 ppm	26%
4. 0 ppm (Pure mineral Oil)	40%

Two out of every three units tested will likely contain less than 50 ppm PCB.

As transformer oils are tested for PCB-content, based on the 50 ppm EPA standard for PCB item, units can then be properly labeled, where beneficial.

3. Voluntary Periodic Inspection

Consider all possible precautions that can prevent a spill.

a. Establish a checklist for periodic inspections.

1. Insure that units are structurally sound.

*Labels for PCB items containing 50-499 ppm are not required before October 1, 1979.

MONS 000150

2. Check for gasket leaks (covers, hand-hole or bushings).

3. Check sampling valves and other fittings.

4. Check pumps and cooling radiators for leaks.

b. Establish a consistent schedule for such inspection (monthly minimum).

c. Consider diking and curbing for units near water-ways.

d. Begin to establish a spill prevention plan - a series of operations procedures to be followed in the performance of a PCB activity (operating or testing apparatus).[6]

e. Begin to prepare a control and countermeasure plan to be followed when a release of PCBs occurs at a PCB use or servicing operation.[6]

4. Maintenance

Routine maintenance (oil testing, and so forth) by the owner or outside contractor of all units is permitted. However a contractor performing transformer servicing is required to obtain a special annual EPA authorization.

PCB contaminated transformers (50-499 ppm PCB) may be topped off, refilled or rebuilt with dielectric fluids containing less than 500 ppm PCB. Existing askarel filled units may be topped off with PCB dielectric fluid. However transformer repair, including rewinding of coils is not permitted on units of 500 or more ppm PCB. But, PCB transformers retro-filled to PCB contaminated units may then be rebuilt.

During the next five years, EPA will be examining the use of substitute insulating fluids in older units to determine the feasibility of phasing out all use of PCBs.

C. Out-of-Service Units

All out-of-service PCB items (Table II) must also be properly labeled, whether spare units or those awaiting disposal.

Since April 18, 1978, PCB liquids ($\geq$ 500 ppm) must be disposed of in only an EPA approved incinerator. All non-liquid PCBs can be disposed of in an EPA approved chemical waste landfill.

The various PCB items must be labeled and stored as summarized in Table III for PCB items containing more than 50 ppm PCB, unless otherwise stated.

A transformer declared as a spare can remain in a substation. If the unit is declared for disposal, then it must be moved to an EPA approved storage facility pending appropriate disposal.

1. Permanent Disposal

The only known way to permanently remove PCBs from the environment is high temperature (at least 1200°C) incineration with proper dwell time. EPA regulations no longer permit storage of PCB liquids $\geq$ 500 ppm. However, at present only two approved incinerators are open.*

Several other companies have applied. One was approved, but local ordinance shut the facility down. Because of this delay in obtaining permits and delivery of equipment, it will probably be several years before sufficient incineration capacity will be available.

Until such time as EPA approved PCB liquid incineration becomes feasible, hang loose! Even now, practical logistics -- distance and backlog -- make immediate incineration difficult. Therefore, hold on to the liquid in EPA-DOT approved containers. Store properly and inspect it weekly until disposal is practical.

Fortunately, the EPA recognizes the limitations of technical and economic feasibility to incinerate all PCB items. Therefore the law permits disposal of PCB solids, contaminated liquids (50-499 ppm) at EPA approved chemical waste landfills or high efficiency chemical boilers. At least seven approved chemical waste landfills are now "open". The boiler rating must be at least 50 million BTU per hour and must meet certain stack gas characteristics.

Since disposal in landfills will not result in PCB destruction, other new approaches now in the prototype stage may become available; e.g., the use of microwave radiation.

PCB transformers, notably, can be permanently disposed of in a chemical waste landfill if all these conditions are met:

- The unit must be drained of all free-flowing liquid, and the liquid must be treated in the manner prescribed for PCB liquids in Table III.
- It must then be filled with a suitable solvent (such as kerosene, xylene, toluene) in which PCBs are readily soluble. (Some of these liquids are also hazardous.)
- The solvent must be left in the unit for at least 18 hours, and the unit must then be drained thoroughly.
- The drained solvent -- which is now a PCB item -- must be treated in the manner prescribed for PCB liquids in Table III.

Any PCB contaminated transformer (50-499 ppm PCB) requires only these steps:

- Transformer drained of all free flowing liquid.
- The dielectric fluid may be disposed of in a chemical waste landfill or high efficiency boiler.
- Drained transformer carcass may then be disposed of in a municipal landfill or sold for salvage.

2. Temporary Storage for Disposal

Storage for disposal means temporary storage of PCBs that have been designated for disposal. Table IV lists the provisions for temporary storage of PCB articles, equipment or containers.

When storage is desired prior to disposal, contaminated PCB liquids (50-499 ppm) and non-liquid PCBs must be stored in an EPA approved storage facility.

An EPA approved storage facility has been defined as a roofed, walled and diked enclosure with an impermeable floor, such as Portland cement concrete or steel. No storage facility may be located at a site which is below the 100 year flood water elevation (that is, a flood that has an average frequency of occurrence in the order of once in 100 years). There-

*The first incinerator still may not be EPA approved until September 1, 1979.

Table III

Permanent Disposal or Long Term Storage of PCB's Pending Disposal

(For PCB items of 50 ppm or more, unless otherwise stated)

Disposal means the intentional or accidental discharging or other completion or termination of the useful life of an object or substance.

TERM	DISPOSAL PROVISIONS
PCB liquids ($\geq$ 500 ppm)	Disposal in EPA approved hi-temp. incinerator. No storage permitted.
PCB contaminated mineral oil dielectric fluid (50-499 ppm)	Disposal in EPA approved hi-temp. incinerator; EPA approved chemical waste landfill or an high efficiency boiler.*
PCB contaminated waste liquid (50-499 ppm) such as hydraulic or heat transfer fluids.	Disposal in EPA approved hi-temp. incinerator; EPA approved chemical waste landfill or an EPA approved high efficiency boiler.*
Non-liquid PCBs; contaminated soil, rags, or other debris from uncontrolled spill (trash, trees, lumber).	Disposal in EPA approved hi-temp. incinerator; or EPA approved chemical waste landfill.* However, items may be considered to have been disposed of if they were deposited in a chemical waste landfill before 4/18/78.
Non-liquid PCB waste; dredge spoils, municipal sewage-treatment sludges.	Disposal in EPA approved hi-temp. incinerator. EPA approved chemical waste landfill, or by other EPA approved method.* The digging up of debris and other items disposed of in a landfill prior to 4/18/78 is not required but the intent of the rule is that you can't add to an existing site and let it sit.
PCB transformers ($\geq$ 500 ppm)	Disposal in EPA approved hi-temp. incinerator or EPA approved chemical waste landfill, following procedure given in article text.*
PCB contaminated transformer (50-499 ppm)	Disposal in municipal landfill or sold for salvage following procedure given in article text.
PCB large high or low voltage capacitors (more than 3 pounds or 1 quart of PCB liquid)	Disposal in EPA approved hi-temp. incinerator; disposal permitted until 1/1/80 in EPA approved chemical waste landfill.*
PCB small capacitors (less than 3 pounds or 1 quart of PCB liquid)	Capacitors owned by capacitor manufacturers or PCB article manufacturers (production quality-control rejects, etc.) to be disposed of in hi-temp. incinerator; disposal permitted in EPA approved chemical waste landfill until 1/1/80. All other small capacitors may be disposed of as muncipal solid waste.
PCB hydraulic machine (die-casting)	Disposal as municipal solid waste or sold for salvage following procedures given in article text.
Other PCB articles	Disposal in EPA approved hi-temp incinerator, EPA approved chemical waste landfill; following thorough draining and proper disposal of PCB liquid.*
PCB container ($\geq$ 500 ppm)	Disposal in EPA approved hi-temp. incinerator or EPA approved chemical waste landfill (following temporary storage at an EPA approved facility until properly drained and PCB liquid has been properly disposed of).*
PCB container (50-499 ppm)	Disposal as municipal solid waste, following proper draining and disposal of PCB contaminated liquid.

*Long term storage of this item is permitted in EPA-DOT approved containers and/or located in an EPA-approved facility until 1/1/84.

MONS 000152

Table IV

Temporary Storage of PCB Items Pending Disposal

ITEM	STORAGE PROVISIONS*
Non-leaking PCB article or equipment.	Storage in temporary area up to 30 days instead of standard EPA defined facility. Check weekly for leaks. Long term storage required after 30 days in roofed and diked enclosure with impermeable floor until 1/1/84. Check at least once every 30 days for leaks.**
Non-leaking structurally undamaged large high voltage PCB capacitor, PCB contaminated transformer	Long term storage on skids next to an EPA defined storage facility until 1/1/83. This makes a facility immediately available if a leak should develop. Reason: In case of delay in the construction of proper incineration facilities or for new capacitors to be used at a construction site; check weekly for leaks.
Leaking PCB articles and equipment	Stored in non-leaking EPA-DOT approved containers for up to 30 days (containing sufficient sorbent materials to absorb liquids PCBs)
PCB containers containing non-liquid PCBs (soil, rags) or liquid PCBs (50-499 ppm).***	Storage in temporary area up to 30 days instead of standard EPA defined facility, provided a spill prevention control and counter measure plan prepared.

*Leak, leakage or leaking means any instance in which a PCB article, container or equipment has any PCB on any portion of its exterior surface.

**Date PCB item removed from service noted on the PCB item.

***It is no longer permissible to store drums of liquid PCBs ($\geq$ 500 PPM).

fore, immediately contact your regional office of U.S. Geological Survey for a hydrological map that documents whether or not your present site is adequate or should be relocated.

3. Recordkeeping

In conjunction with disposal requirements, the transformer owner/operator must keep the following data for the annual composite record, documenting the status of PCB items slated for disposal:

- Date removed from service.
- Date placed into storage pending disposal.
- Date placed in transport for disposal.
- Total weight (in kilograms) and identification of PCBs in PCB containers.
- Total number of PCB transformers and total weight (in kilograms) of any PCBs contained in the transformers.
- Total number of large high or low-voltage PCB capacitors.
- Location and name of owner of initial storage or disposal facility (Bill of lading).

It is permissible to determine the weight of PCB by calculation (using valid assumptions of the density of the PCB chemical substance or mixture) if the volume of the container or transformer is known.

Failure to keep these proper records is a civil violation of the PCB law.

D. PCB Spills

Spills and other uncontrolled discharges of liquid PCBs are defined as disposal; therefore, proper procedures must be undertaken.

Ignoring or attempting to conceal a leak, a spill, or other uncontrolled discharge of PCB is engaging in unlawful disposal and subject to criminal prosecution.

1. Preventive Action

Weekly inspection for all items temporarily stored in non-EPA approved facilities or on skids; 30 day minimum inspection for all items stored in an EPA approved facility. Experience has already shown that inspection for leakage should be made more often than every 30 days -- even with new PCB containers. In anticipation of possible rules for hazardous spills, spill prevention is the only sure way to treat a spill situation.

2. Corrective Action

a. In the Event of Minor PCB Leakage

Proper actions to be taken consist of:

- Transfer leaking containers and articles, and their contents, to properly marked, nonleaking containers.
- Use sorbents such as imbiber beads to clean up any spilled or leaked material immediately.
- Dispose of (or store for future disposal) residue as indicated in Table III or IV.

b. In the Event of a Major Spill

A PCB spill is any discharge of sufficient magnitude to give reason to suspect that it has produced, at any point in the surrounding soil, gravel, sludge, fill, rubble, or other land-based substances, a PCB contamination level exceeding 50 ppm. The following measures must be taken in the event of a spill.

- Transfer leaking containers and articles, and their contents to properly marked, nonleaking containers.
- Use sorbents to clean up any spilled or leaked material immediately.

MONS 000153

- Dispose of (or store) residue as indicated in Table III or IV.

- Conduct tests, using EPA-approved sampling techniques and laboratory methods, to determine if PCB concentration in soil, etc., exceeds 50 ppm.

- Decontaminate areas containing more than 50 ppm of PCB in accordance with EPA regulations.

Several companies have already established their own special teams that are sent out to handle PCB spills and clean up. Contracted cleanup services certainly could also be an option.

III. EPA Approved Methods of Testing for PCB Concentration

Implementation of the foregoing guidelines requires first a procedure to readily identify transformers containing PCB mixtures.

Although testing for PCB content in oil by electron capture gas chromatography (GC) is the most prevalent laboratory method,[7] the Beilstein field test can be a preliminary test to detect PCBs at a level of five (5) per cent (50,000 ppm)[8] or greater. Very few units are this grossly contaminated.

Since evidence has shown that more than 100 ppm PCB in mineral oil tends to reduce the impulse strength of oil, testing would indicate suspect units. The technology to remove PCBs from mineral oil is being actively developed to assure the transformers maximum design lightning strike capability.[9]

IV. Other PCB Associated Federal and State Laws

Implementation of the foregoing present and projected regulations in no way precludes compliance under other regulatory rulings. In fact the intent of the various statutes is integrating all facets of the PCB problem yet without doing so at cross-purposes.

The two most important PCB associated documents are (1) The Resource Conservation and Recovery Act (RCRA-P.L. #94-580, 1976), involving hazardous waste management and (2) Section 311 of the Federal Water Pollution Control Act (FWPCA-P.L. #92-500, 1972).

Even though detailed rules of RCRA may not be published until mid-1980 and Section 311 is under a court injunction declaring it void, existing state laws indicate that the prudent way to go would be to prepare even now for inevitable U.S. regulations in one form or another.[10]

Suggested steps that should be taken include:

1. Inventory of PCB items - In service units, spares or units pending disposal (Required under current PCB rule).

2. One-time PCB in oil analysis (best way to assure proper transformer treatment).

3. Tracing of PCB wastes (manifest system).

   Several states already require a manifest system ("cradle-to-grave" paperwork) for off-site disposal. The manifest is defined as the form used for identifying the quantity, composition, origin, routing, and destination of PCB liquids and solids, during transit from the point of generation to the point of storage or disposal.

   Therefore, begin a bound logbook containing this data (compliance under RCRA and/or state law).

4. Assigned clear responsibilities[11]

   a. Make sure that specific technical and legal people are involved in day-to-day decisions on PCB storage and disposal.

   b. Inform other company personnel as to the latest information on how to make a "reasonable effort" to comply with all regulations.

5. Transportation for disposal.[12]

   a. Train shipping personnel.

      1) Proper packaging and labeling:

      Per EPA-Department of Transportation (DOT) specified containers for PCB liquids or non-liquid PCBs. Mineral oil dielectric fluids of unknown concentration may be shipped via United Parcel Service (UPS), but askarel liquid should be shipped with a Class B poison label. Therefore, Askarel cannot be shipped by UPS.

      2) Response control and countermeasure plan when PCB release occurs.

   b. Provide truck drivers with complete bill of lading and current response information in case of an accidental spill. Include phone numbers of site destination point and regional EPA. Start reporting now harmful quantity discharges near waterways to the National Response Center: (800) 424-8802 (under FWPCA, Section 311).

6. Keeping abreast of state legislation - transit of hazardous wastes; both home state and those thru which shipping likely will go.

7. Review of off site disposal agreements. Written contract should spell out in detail what you as PCB generator will do and what disposal contractor will do. When do title, ownership and risks transfer from the PCB generator to disposal contractor?

8. CAUTION: You cannot assume PCBs are being properly disposed of. You should follow thru - make regular checks of waste contractor and routine on-site inspections. Evaluate the facility in terms of competence, staffing, permits, problem history and general suitability for PCB disposal. Has facility received U.S., State and local approval for disposal?[13]

V. Other Options Available to Owners of PCB Transformers

Retrofilling or replacing a PCB transformer are also alternatives, in addition to retaining PCB units.

A. Retrofill Askarel-Filled Unit With Non-PCB Alternative Coolant[14]

The residual mixture should be tested at least annually (preferably more frequently) to determine its exact PCB content, as it will fluctuate as it seeks equilibrum.

Using retrofill procedures only one time will probably

MONS 000154

a result in a contaminated transformer that would to be treated as an askarel unit in all respects. Therefore, retrofill in actuality fails a series of retrofills and/or subsequent filtering with activated carbon.

Even then the unit still might be treated as a PCB item, depending upon concentration; however, the potential economic liability becomes considerably less than the cost of decontamination in the event of a spill involving a concentrated PCB.

Disposal of both existing PCB liquid and flushing liquid requires incineration. So long as disposal thru incineration remains a problem, the best location for PCBs is the transformer itself.

However, when sufficient facilities do become approved, retrofill may be the primary vehicle in preparing for ultimate disposal of PCB transformers and thus phasing out of askarel-filled transformers.

B. Replace the Askarel-Filled Unit

If a transformer is located near a drainage canal, stream, or waterway the only safe option is to replace the unit with one containing a non-PCB coolant, gas dielectric or an air-cooled, dry unit.

Location, use and nameplate capacity required would determine this final choice.

VI. Conclusion

Much criticism has been directed toward the expense of EPA regulation. It is a fact that the long term effect of PCB on the food chain may not be known for years.[15] Yet public support for costly environmental protection remains strong.[16] That's because of the high cost of the alternative -- not regulating.[17]

In any event, while the issue of PCB control continues in a state of frustration, the best route to go is to keep informed of the latest state and local regulations and to make a "reasonable effort" to comply with existing federal regulations (required marking, record-keeping, voluntary inspection, and suggested one-time PCB analysis of transformer mineral oils).

VII. References

1. Microeconomic Impacts of the Proposed PCB Ban Regulations, Versar, Inc. (EPA #560/6-77-35, May 1978, pp 7, 37-38.
2. D. E. Hutchinson, American Electric Power Service Corporation "Regulatory Status of the PCB Substitutes," 1979 Winter Meeting, New York, New York, IEEE Power Engineering Society, February 6, 1979, pp 6-7.
3. Edward L. Raab (Retired, General Electric Co., Pittsfield, Mass.) in conversation held at Transformer Consultants, Div. S. D. Myers, Inc. Akron, Ohio, August 3, 1978, and April 11, 1979.
4. R. H. Parrish & J. J. Kelly "Warning: TSCA May be Hazardous to Your Professional Health," Plant Engineering, May 11, 1979, p. 133. The 1978 law is found in the Federal Register, February 17, 1978, Vol. 43, No. 34, Part V, pp 7150-7164. The 1979 "PCB Ban" Rule published May 31, 1979, is located in the Federal Register, Vol. 44 No. 106, Part VI, pp 31514-31558.
5. E. L. Raab, op. cit., August 3, 1978.
6. Steps d & e may be required under Section 311 of the Water Control Act. Some states already have such.
7. O. Hutzinger, S. Safe, V. Zitko, The Chemistry of PCB's, CRC Press, Cleveland, Ohio 1974, pp 207, 210-212.
8. U.S. Navy NEPSS (Naval Environmental Protection Support Serv.) Information Bulletin, 1 July 1978.
9. E. L. Raab, op. cit., August 3, 1978 and April 11, 1979.
10a. R. S. Glaubinger, "A Guide to the Resource Conservation and Recovery Act, Chemical Engineering Magazine, McGraw-Hill, New York, N.Y., January 29, 1979, pp 79-81.
b. Richard Sobel (Allied Chemical Corporation), "How Industry Can Prepare for RCRA," ibid. pp. 82-85.
c. T. H. Maugh II, "Toxic Waste Disposal a Growing Problem." Science, American Association for the Advancement of Science (AAAS), Volume 204, 25 May 1979, p. 819.
11. W. D. Beebe (Potomac Electric Power Company) "Askarel/Polychlorinsted Biphenyl (PCB) Procedures," Minutes of the 46th Annual International Conference of Doble Clients, 1979, Doble Engineering Co., Watertown, Mass., Section 10B-1.
12. Ken Snow (Flying Tiger Line) "Shipping Hazardous Material," Chemical Engineering Magazine, McGraw Hill, New York, N.Y., November 6, 1978, pp 102-108 (Discussion of Dept. of Transportation DOT regulations.)
13. Allan Hall, "Waste sites may be major liability for CPI" Chemical Week, May 2, 1979, p 18.
14. T. O'Neil & J. J. Kelly, "Silicone Retrofill of Askarel Transformers" Minutes of the 13th Electrical/Electronic Insulation Conference, Chicago, IL Sept. 29, 1977. p. 167.
15a. John Walsh, "EPA and Toxic Substances Law: Dealing with Uncertainty," Science, Volume 202, 10 November 1978, p 598.
b. Bruce N. Ames (Professor of Biochemistry, U. of California, Berkeley), "Identifying Environmental Chemicals Causing Mutations and Cancer," Science, Vol. 204, 11 May 1979, p 587.
16. Luther J. Carter, "Public Support for Environmental Protection Remains Strong," Science, Volume 203, 12 January 1979, p 154.
17. Nicholas A. Ashford (Associated Professor of Technology & Policy, Massachusetts Institute of Technology), "A plea for a new kind of realism," The New York Times, Business Section, December 17, 1978.

MONS 000155