3. CAPACITOR GUIDELINES

3.1 General. The environmental effects of askarels are under in-depth study by governmental and other agencies. Askarels have been considered relatively harmless to humans based on about 40 years of safe industrial usage. There has been no known instance of human injury when they were used under the normally accepted precautions and conditions of handling in both manufacturing and user applications.

Traces of askarels are being found in the environment and in fish and bird life. The long-term genetic and ecological effects are not yet completely understood. For these reasons, care should be taken to contain askarels and minimize their entry into the environment.

There are two general classes of askarels used by the electrical industry. The higher chlorinated grades are the more persistent in nature. Because of their high degree of nonflammability, they are used in transformers where personnel safety is of paramount importance.

Capacitor-grade askarel has a lower degree of chlorination (composed primarily of the 3-chlorine isomers of biphenyl) and a higher degree of biodegradability. Generally, it has not been found in animal life. It is used in capacitors, where the extreme degree of nonflammability required in transformers is of less importance.

Although capacitor- and transformer-grade askarels both contain members of the PCB family, they do differ in composition, degree of biodegradability, persistence in nature, electrical stability, chemical stability, and degree of nonflammability (both are recognized as nonflammable). It is for these reasons that Section 3 of this standard is intended to apply to capacitor-grade askarel.

3.2 Capacitor Grade Askarel. In September 1971 a new grade of capacitor impregnant, Aroclor 1016, was made available to the industry. This new grade contains a typical concentration of 0.4% by weight of the higher boiling homologues of the chlorinated biphenyls. (See ASTM D3303-74 [1].)[3] Aroclor 1016 replaces Aroclor 1242, which previously was the major capacitor impregnant and contained around 7% of the higher-boiling homologues (the more persistent in nature). ~~This~~ 0.4% level of the higher-boiling homologues should be the maximum concentration acceptable in any capacitor impregnant. Aroclor 1242 and 1254, previously used as impregnants, do not meet this requirement and should no longer be used in capacitors designed and manufactured for alternating-current applications.

Aroclor 1016 has the same Underwriters' Laboratories, Inc. nonflammability rating as Aroclor 1242. Its typical properties are given in Table I.

Commonly used solvents include benzene, kerosene, acetone, trichloroethane, trichloroethylene, and perchloroethylene. Typical vapor pressure data for Aroclor 1016 are:

0°C=	0.001 mmHg
25°C=	0.006 mmHg
150°C=	4.3 mmHg
200°C=	29.0 mmHg

At 25°C and 760 mmHg pressure, saturated air contains approximately 0.09 mg/l.

Note: 1 mg/l = 90.0 ppm (v/v)
1 ppm (v/v) = 0.011 mg/l

3.3 Employee Safety and Plant Housekeeping. The procedures and limits given in 3.3 are intended to be minimum requirements to be met by manufacturers and users of capacitors containing askarel. Handling, control, and disposal procedures are given, together with exposure limits and indicated antidotes and clean-up procedures.

3.3.1. General Safety Precautions. Although it is generally accepted that exposure to capacitor-grade askarel is not hazardous provided that simple precautions are taken, exposure should still be avoided.

3.3.1.1. Vapors. The odor of askarel is noticeable well below the maximum air concentrations considered safe. Up to 1.0 milligram per cubic metre of air has been determined to be the maximum safe level of exposure during an 8-hour workday. (See

[3] Numbers in brackets refer to corresponding numbers in 5.1, References to the Text.

reference 19). The procedure for performing the necessary analyses is contained in Section B3 of Appendix B. This procedure or its equivalent should be used.

Breathing vapor or fumes from heated askarel should be avoided. Provisions should be made for adequate ventilation and regulation of manufacturing operations to avoid open exposure to askarel (especially at temperatures of 55°C or higher). The gases produced when askarel is decomposed by very high temperatures (such as that of an electric arc) in the presence of air or organic insulating materials contain a very high percentage of hydrogen chloride, and small percentages of carborn dioxide, carbon monoxide, and oxygen. Minute concentrations of this combination of gases are very unpleasant and irritating, thus giving ample warning of their presence. If exposure to high concentrations of askarel is necessary under emergency conditions, an approved gas mask or self-contained breathing apparatus should be worn. Such exposure should be under the surveillance of other personnel capable of effecting rescue in case of an accident. If the odor of askarel is detected by the person wearing protective equipment, he should immediately go into fresh air. All gas masks, respirators, and replacement parts should have U.S. Bureau of Mines approval and be maintained on a regular schedule in accordance with the manufacturer's recommendation.

3.3.1.2. Liquid. In contrast to the situation in which mineral insulating oils are handled, there is virtually no fire hazard in handling askarel. A limited solvant action (similar to that for paint thinner) on the fats and oils of the skin with prolonged contact may lead to drying and chapping of the skin. As with insulating oil, some people are allergic to askarel, and continued exposure may result in skin irritation. Both the liquid and vapor are moderately irritating to eye tissue.

Operating procedures should be such as to minimize or eliminate contact with askarels. Use of eye protection is recommended. The use of porous gloves that can absorb and retain askarel is to be avoided. Barrier creams[4] or resistant gloves[5]

[4]For example, PLY No. 9 Gel (Milburn Company, Detroit, Mich), or Kerodex No. 71 (Ayerst Laboratories, New York, N.Y.), or the equivalent.

[5]For example, Edmont - Solvit 5-352 (Mersick of Bridgeport, Bridgeport, Conn), or the equivalent.

should be used if contact is unavoidable. Use of enclosed transfer and handling equipment, processing equipment, and mechanical washers reduces direct contact.

Medicinal washes or mild detergents followed by the application of cold cream will reduce the irritation resulting from the contact of an open cut or abrasion with askarel.

Safety glasses with side shields or a face shield should be worn when handling askarels. If liquid askarel contacts the eyes, the eyes should be irrigated immediately with large quantities of running water for 15 minutes and then examined by a physician (A drop of caster oil has been found to reduce irritation).

Persons developing a skin irritation or respiratory tract irritation while working with askarels should be placed under the supervision of a physician. Ingestion or swallowing of askarels is not generally regarded as a problem of the industry. Should accidental ingestion occur, a physician should be consulted.

Hands should be cleaned of askarel before eating, drinking, smoking, or using toilet facilities by means of waterless hand cleaners[6] and wipe towels which should then be properly disposed.

3.3.2 Bulk Fluid Shipment, Receiving and Transfer. Shipment of askarel from point of manufacturing to point of receiving should be done in closed containers such as rail tank cars, truck tanks, marine or barge tanks, or sealed drums. In case of an askarel spill during bulk fluid shipment, reference should be made to paragraph 3.7 which provides procedures for control and listed authorities to be notified. Containers should be labeled as to contents and carry a label cautioning against loss of fluid to the open environment. Containers used to transport askarel should not be used for storage or to transport other material without being completely cleaned of all traces of askarel. (Cleaning procedures must take cognizance of precautions against excessive exposure and of the need for proper disposal of contaminated cleansing solvents and materials as set forth in 3.5) Transfer from shipping containers to processing systems should be through closed piping or tubing with appropriate valves, pumps, etc. Provision should be made for trapping and disposing of fluid lost by leakage or spills from the

[6]For example, Pow'r Kleen Handcleaner, (Woodbine Chemical and Research, Inc., Medina, Ohio or Man's Hands, Oak Industries, Inc., Hoosick Falls, N.Y.)

transfer system and from the storage containers.

Drums to be retired from use should be cleaned before crushing, delivery to scrap dealers, or other disposal. Contaminated cleaning fluids and materials should be disposed of as indicated in 3.5.

3.3.4 Manufacturing Housekeeping. Manufacturing equipment and operating procedures should safeguard against loss of askarels to the environment through proper containment and disposal procedures.

3.3.4.1 Processing Area Control. Enclosed systems of sealed piping properly gasketed joints, valves, containers, and processing chambers should be used for any portion of the operation where askarel temperatures may exceed 55°C. Enclosure should preferably extend to all other portions of the system insofar as practicable.

Containment provisions should be established around all askarel processing areas to ensure against inadvertent loss to sewer systems by spillage, leakage or other uncontrolled conditions or events.

3.3.4.2 Types and Control of Liquid Askarel Wastes. Askarel-containing liquid wastes may occur in manufacturung from sources such as the following: 1) Liquid askarel contaminated during processing which is unsuitable for reclaiming as a dielectric fluid, 2) liquid askarel from solvent operations or water and detergent type washers, 3) vacuum pump oils contaminated with askarel, 4) steam jet vacuum system condensates contaminated with askarels, and 5) askarel containing materials from laboratory samples.

Waste fluids containing askarel should be collected (by means of traps, drip pans, trays, etc) and disposal should be in accordance with 3.5.

Spills of askarels should be removed promptly by means of absorptive material, such as sawdust, or trapped and removed by pumping or other suitable means. Disposal should be per 3.5.

3.3.4.3 Types and Control of Other Askarel Containing Wastes. Saturation of materials with askarels may occur in manufacturing from the following sources: 1) Saturated earth or other absorbent media from filtering operations or from cleaning up spills, 2) saturated filters from vapor control devices and other filters, 3) saturated wastes such as paper, rags, etc. 4) saturated spent gasket materials and 5) capacitors failing tests or

otherwise designated for disposal.

All of the above items should be collected for proper disposal. Wiper rags, protective clothing[7] and other extraneous materials which are likely to be soiled should preferably be made of disposable materials. Other materials should be collected within the containment area for properly controlled laundering.

3.4 Control of Plant Effluents

3.4.1 Water Effluents. The industry goal is to eliminate askarel in plant water effluent streams. However, it is recognized that existing drain systems in capacitor manufacturing plants are probably contaminated as a result of past practices, and askarel traces may continue to decrease with the proper containment of askarel wastes and no further discharges into drain systems. Other sections of this standard provide that no askarel wastes of any kind be disposed of in any water effluent streams and that accidental spills be prevented from getting into such streams.

3.4.1.2 Concentration Limits. A 1975 proposal by the Environmental Protection Agency (EPA) is to keep the PCB levels in rivers and lakes below 0.001 parts per billion (or 1 part per trillion). This is currently under review by the EPA and standards are expected to be promulgated in 1976. Plant effluent streams should be managed and controlled in a manner anticipating these government standards.

3.4.1.3 Monitoring Streams. On a regular basis consistent with plant situations, all effluent streams should be analyzed. The procedure for performing the necessary analyses is contained in Section B3 of Appendix B. This procedure or its equivalent should be used.

3.4.1.4 Methods for Minimizing Effluent Stream Contamination. The ideal approach is to isolate totally all effluent streams that could be contaminated with askarels during manufacturing processes and prevent them from being discharged from the plant. Carbon adsorption, limestone beds, and solvent extraction are techniques that can be applied to reduce the askarel content of effluent streams. These techniques may be most useful in cleaning up water used in plant processing and to permit recycling.

[7] For example, Edmont-Wilson, 1294 Walnut St, Coshocton, Ohio 43812, or Slosman Corp., P.O. Box 3014, Asheville, N.C. 28802.

3.4.2 Air Effluents. The industry goal is to eliminate askarel vapors in plant air effluents. Plant operations involving askarels at elevated temperatures in excess of 55°C should be performed, wherever possible, within closed systems. Filtration of plant air effluents, to minimize PCBs entry into the environment, should be accomplished where evolvement of air borne PCBs occur from open operations.

3.4.2.1 Monitoring Streams. All plant air effluents should be sampled and analyzed on a routine basis consistent with plant situations. The procedure for performing the analyses is given in Section B3 of Appendix B.

3.5 Scrap-Disposal Procedures. The manufacture and use of capacitors involve processes which produce askarel-saturated solids and liquids containing or composed entirely of askarel, which should be disposed of as wastes. Specific sources of these materials are described throughout this standard. They may be placed into three categories:

1) Capacitor units impregnated with askarel, production and field rejects

2) Manufacturing process liquid wastes containing askarel

3) Solid waste purposely or accidently saturated with askarel

Disposal should be done in a manner which is consistent with proper concern for the environment and minimizes any release of askarels to the environment.

3.5.1 Disposal of Capacitor Units. Scrap capacitor units can be generated during manufacturing processes or during field service. Production rejects are those capacitors that are rejected after the impregnation process in the course of production by the capacitor manufacturer. They may be rejected for mechanical or electrical reasons.

Field rejects are those units that are rejected or, for other reasons, are to be scrapped after shipment from the plant where they were manufactured.

Capacitor units should be disposed of intact or, if leaking, in sealed drums. The small amount of liquid to be drained, the integrity of intact units and the necessity for complex control over drainage procedures make intact disposal preferable.

3.5.1.1 Production Rejects. Rejected capacitors in capacitor manufacturing plants represent a concentration of askarel. It is therefore important that disposition be made in a manner consistent with proper concern for the environment. Preference should be

given to disposal of capacitors in sites approved for toxic and hazardous waste disposal. Another alternative would be disposal in supervised dry landfill sites that meet all applicable state requirements.

Care should be exercised to insure that no loss of liquid will occur during transportation to the disposal site.

Incineration of scrap capacitors in facilities designed to accept such solids would provide a preferential alternative to dry landfill sites when such services become available.

3.5.1.2 Field Rejects. Wherever practical, all askarel containing capacitors should be removed prior to disposal of equipment. This precaution will enhance environmental control procedures and insure that by removing these capacitors they do not ultimately disperse their askarel contents into a landfill site which does not meet all applicable state requirements.

After removal from equipment, capacitors should be disposed in accordance with the procedures for production rejects (3.5.1.1). Where removal of askarel-containing capacitors from equipment is not practical, that equipment should be disposed of only in supervised, dry landfill sites meeting all applicable state requirements.

3.5.2 Disposal of Liquid Wastes. All waste askarel or liquid wastes containing askarel should be disposed of in accordance with one of the procedures given in 3.5.2.1 or 3.5.2.2. However, preference should be given to incineration, 3.5.2.1.

3.5.2.1 Incineration. Proper incineration must involve a suitable balance between dwell time and temperature in the incinerator plus oxygen availability, and finally, suitable scrubbers to remove the HCL that will be formed; for example, 2-second dwell time at 2000°F and 3% excess oxygen in stack gas, or 1.5 second dwell time at 2700°F and 2% excess oxygen in stack gas.

These facilities should meet the applicable state requirements and should control effluents within the limits set forth in this standard.

3.5.2.2 Toxic and Hazardous Waste Disposal. Where incineration is not feasible, sites which have been classified by state agencies as suitable for disposal of toxic and hazardous liquids should be used (See Appendix A).

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3.5.3 Disposal of Solid Wastes (See 3.5.1 for scrap capacitors) All solid wastes which have been saturated with askarel should be disposed of by the following procedure:

1) The saturated wastes should be placed into leakproof containers and transported to a supervised dry landfill site meeting state requirements. Alternatively, they can be disposed of by incineration in state-approved facilities.

2) Solid absorbents used for spills can be disposed of uncontained in the supervised dry landfill site; transport to the site should be in closed containers. Alternatively, they can be disposed of by incineration in accordance with 3.5.2.1 (See Appendix A for a listing of facilities.)

3.5.4 Packaging and Shipment

3.5.4.1 Transportation to the disposal facility should be in containers that will prevent leakage and accidental loss of askarel to the environment.

3.5.4.2 Containers should be labeled as to contents and precautions relative to loss to the environment.

3.5.4.3 Containers used for this purpose cannot be used for any such materials or retired from service until they are completely cleaned. Any solvents used in cleaning these containers will be contaminated with askarel and should be disposed of according to the same procedures described in 3.5.2.

3.6 Labeling. Capacitor units vary greatly in size and in end use or application. Small capacitor units are frequently applied as a component of another piece of equipment, such as a fluorescent lighting ballast, a roadway or area lighting luminaire, a motor, etc. In such applications a label on the capacitor unit referencing approved disposal procedure would not normally be visible when the piece of equipment is disposed of.

For the foregoing reasons the methods of providing disposal instructions for small capacitors and large capacitors are treated separately in 3.6.1 and 3.6.2, respectively.

3.6.1 Small Units. Small capacitors are defined as those that contain askarel in quantities up to about 2 pounds each and in which the free liquid does not exceed 0.4 pounds. They are hermetically sealed in metallic cases. It is recommended that shipping containers from capacitor manufacturers should be labeled as to contents and that transporters be given instructions, in accordance with paragraph 6.2 as to procedures in

the event of a spill. The label should contain, as a minimum, the following information: Caution: Contains PCBs (askarel) which are environmental contaminants. In case of leaks, restrain discharge and consult manufacturer. In transportation emergencies, call 618 271-5835 collect.

Small unit capacitors are applied as a component of a large piece of equipment. Manufacturers utilizing askarel-filled capacitors should affix a label referencing this standard or describing disposal procedures consistent with it.

3.6.2 Large Units. Large capacitor units are defined as those which contain more than 2 pounds of askarel. The capacitor manufacturer should affix a label in a conspicuous place, referencing this standard or describing disposal procedures consistent with it. As a minimum, the label should contain information listed in 3.6.1.

5. Disposal of Laboratory Samples Containing PCBs. The disposal of laboratory samples and materials used for testing and experimental purposes which contain amounts of PCBs (askarels) must be carefully controlled. Their disposition should be made in a manner consistent with proper concern for the environment.

5.1 Liquid Samples. Liquid laboratory wastes containing PCBs (askarels) should be properly incinerated or disposed in sites suitable for toxic and hazardous liquids. Preference should be given to incineration.

5.2 Solid Samples. Laboratory solid wastes containing PCBs (askarels) should be disposed in state approved toxic and hazardous waste disposal sites (See Appendix A) or, if this is not feasible, in supervised dry landfill sites that meet all applicable state requirements.

6. Spill Plans, Capacitors.

6.1 Capacitor Manufacturers Bulk Shipment Askarel Spill Plan. This plan is intended to establish effective notification and action procedures, to guide the manufacturer of polychlorinated biphenyls (Monsanto) and capacitor manufacturers in the event of a spill while the material is in transit. A manufacturer using its own equipment and personnel to transport PCBs should instruct its employees concerning proper procedures to be followed in the event of a spill. Such instruction should be documented in each

manufacturer's spill control plan.

6.1.1 Spill Notification Procedure

1. Each tank car used to transport PCBs from Monsanto to the manufacturer should be marked boldly on its sides and ends, in 4" to 6" high letters, with the instruction, "In Case of Spill Immediately Call 618/271-5835, collect".
2. Each capacitor manufacturer should provide to Monsanto the number of a telephone which is manned 24 hours per day 7 days per week, which Monsanto should call to inform the manufacturer of a spill. Where it is not possible to maintain such a number, the capacitor manufacturer should call those persons, in succession if necessary, to provide notification of a spill.
3. When Monsanto receives notification of a spill, its employee shall obtain the following information:
   a) The name of the caller.
   b) The official title and function of the caller
   c) All available information concerning the spill, including:
      1. Exact location (in sufficient detail to find the site on maps and on the ground).
      2. Time of occurrence (as close as possible)
      3. Name of transportation company involved and its emergency call number.
      4. Amount of material spilled, its current location, and action taken.
      5. Cause of spill, if known
      6. Condition of the transportation equipment.
      7. Disposition of casualties, if any (what hospital, clinic or physician).
      8. Witnesses (name and address).
      9. Information as to how to contact the caller or other responsible party at or near the scene.
      10. Identity of others who have been notified, including local, state

and federal pollution control agencies. Specifically name and phone number of persons contacted.

4. After obtaining the information outlined in #3, Monsanto, acting as agent for the capacitor manufacturer, should provide the following information to the person reporting the spill:
   a. Material is fire resistant.
   b. It is recommended that boots and gloves of Neoprene or PVC be worn when handling the material, to avoid possible skin irritation.
   c. Possible control procedures enumerated in Section 6.1.2. below.
5. Monsanto should then immediately notify the capacitor manufacturer that a spill of its material has occurred and should provide the manufacturer with the information it has obtained concerning the spill.
6. The capacitor manufacturer, upon notification of a spill, should immediately notify appropriate state and federal pollution control agencies and should dispatch a responsible individual to the spill site immediately.
   a. To notify the federal EPA, call 1-800-424-8802
   b. To notify state pollution agency if number is not known, call regional EPA office to obtain state number. (See attached map and phone list.)

6.1.2 Spill Control, Clean-up, and Precautionary Procedures. The specific circumstances of a spill should dictate effective control and clean-up procedures. The following actions should be considered.

1. Possible control procedures:
   a. Limit the number of material that escapes from the container by righting the container (tank car or drum), closing valves, plugging holes with wooden pegs or by any other available means.
   b. Limit spread of material by using absorbent materials such as dry sand, sawdust, oil absorbers or rags and/or by erecting an earthen dam, using any equipment available.
   c. Prevent material from flowing into sanitary or storm sewers, ponds, lakes

or rivers by whatever means available. Do not wash material away or into sanitary or storm sewers, ponds, lakes or rivers.

d. If other freight is contaminated, quarantine it until appropriate mode of disposition is determined. Such freight must be decontaminated or disposed of in a responsible manner.

2. Possible clean-up and precautionary procedures:

a. Pump free askarel or liquid within contained area into drums or tank truck.

b. Dig up contaminated earth and transport to an area approved for the disposal of askarels.

c. Decontaminate any equipment used in the clean-up operation and dispose of absorbent materials in a manner which prevents askarels from entering the environment.

Note: Transportation equipment should be thoroughly cleaned before being used for other purposes. The cleaning of the equipment should not result in contamination of sewers, streams, or other areas not approved for disposal of askarels.

d. If there are shallow wells in the surrounding area, sample the water from the wells and analyze for askarels. Be sure the water from a contaminated well is not taken internally.

Environmental Protection Agency
Regional Offices

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Environmental Protection Agency
Region I, Room 2303
John F. Kennedy Federal Building
Boston, Massachusetts 02203
Tel: (617) 228-7265

Environmental Protection Agency
Regional II, Room 909
26 Federal Plaza
New York, New York 10007
Tel: (201) 548-8730

Environmental Protection Agency
Region III
Curtis Building, 6th & Walnut Streets
Philadelphia, Pa. 19106
Tel: (215) 597-9898

Environmental Protection Agency
Region IV
1421 Peachtree Street, N.E.
Atlanta, Georgia 30909
Tel: (404) 528-5062

Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604
Tel: (312) 896-7591

Environmental Protection Agency
Region VI, Suite 1000
1600 Patterson Street
Dallas, Texas 75201
Tel: (214) 749-3840

Environmental Protection Agency
Region VII
1735 Baltimore Avenue
Kansas City, Missouri 64108
Tel: (816) 374-3778

Environmental Protection Agency
Region VIII, Suite 900
1860 Lincoln Street
Denver, Colorado 80208
Tel: (303) 837-3880

Environmental Protection Agency
Region IX
100 California Street
San Francisco, California 94111
Tel: (415) 556-6254

6.2 Capacitor Manufacturers Product Shipment Askarel Spill Plan. Shipping containers for small capacitors (containing less than 2 pounds of askarel) and large capacitors should be labeled in accordance with 3.6.

Spill notification, clean-up, and precautionary procedures should be in accordance with 6.1.2.

7. References

7.1 References to Text

(1) Standard Method of Test for Rapid Gas Chromatographic Estimation of Higher Boiling Homologues of Chlorinated Biphenyls for Capacitor Askarels, ASTM D3303-74.

(2) American National Standard Method of Test for Specific Gravity of Askarels, C59.68-1965 (R1973) (ASTM D 1810-63 (1973))

(3) American National Standard Method of Test for Neutralization Number by Color-Indicator Titration, Z11.131-1964 (R1974) (ASTM D 976-64 (1973), IP 139/65)

(4) American National Standard Method of Test for Neutralization Number by Potentiometric Titration, Z11.59-1958 (R1971) (ASTM D664-58 (1968), IP 177/64)

(5) Standard Method of Test for Density of Rubber Chemicals, ASTM D 1817-66 (1972)

(6) American National Standard Method of Test for Inorganic Chlorides in Askarels, C59.55-1963 (R1973) (ASTM D 1821-63(1973))

(7) American National Standard Method of Test for Pour Point of Petroleum Oils, Z11.5-1966 (R1972) (ASTM D 97-66 (1971), IP 15/67)

(8) American National Standard Method of Test for Power Factor and Dielectric Constant of Electrical Insulating Liquids, C59.22-1967 (R1973)(ASTM D 924-65 (1973))

(9) American National Standard Method of Test for Specific Resistance (Resistivity) of Electrical Insulating Liquids, C59.51-1965 (R1973) (ASTM D 1169-64 (1973))

(10) American National Standard Method of Test for Hydrolyzable Chlorine Compounds in Chlorinated Aromatic Hydrocarbons (Askarels), C59,106-1970 (ASTM D 1820-65 (1970))

(11) American National Standard Method of Test for Thermal Stability of Chlorinated Aromatic Hydrocarbons (Askarels), C59.111-1970 (ASTM D 1936-64 (1971))

(12) American National Standard Method of Test for Distillation of Road Tars, A37.9-1974 (ASTM D20-72)

(13) American National Standard Methods of Testing Electrical Insulating Oils, C59.2-1974 (ASTM D 117-71 (1973))

(14) American National Standard Method of Test for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes, C59.19-1968 (R1973) (ASTM D 877-67 (1971))

(15) American National Standard Method of Test for Flash and Fire Points by Cleveland Open Cup, Z11.6-1973 (ASTM D 92-74, IP 36/67)

(16) American National Standard Method of Test for Saybolt Viscosity, Z11.2-1956 (R1971) (ASTM D 88-56 (1973))

(17) American National Standard Method of Test for Coefficient of Thermal Expansion of Electrical Insulating Liquids of Petroleum Origin, and Askarels, C59.57-1963 (1973) (ASTM D 1903-63 (1973))

(18) MUNCH, R.H. Measuring the dissipation factor, dielectric constant, and resistivity of liquids. Insulation/Circuits, vol 16, Mar 1970, pp 46-49.

(19) Chlorodiphenyls. Hygienic Guide Series. Westmont, N.J.:American Industrial Hygiene Association, Jan-Feb 1965.

(20) Standard Specification for Chlorinated Aromatic Hydrocarbons (Askarels) for Transformers, ASTM D 2283-73a

7.2 General References

Polychlorinated Biphenyls and the Environment, Interdepartmental Task Force on PCBs, Washington, D.C., May 1972. (National Technical Information Service, U.S. Dept. of Commerce, Springfield, Va. 22151.) (COM-72-10419)

DRINKER, C. K. Further observations on the possible systemic toxicity of certain of the chlorinated hydrocarbons. Journal of Industrial Hygiene and Toxicology, vol 21, 1939, pp 155-159.

DRINKER, C.K.; WARREN, M.F..; and BENNET, G.A. The problem of possible systemic effects from certain chlorinated hydrocarbons. Journal of Industrial Hygiene and Toxicology, vol 19, 1937, pp 283-311.

ELKINS, H.B. The Chemistry of Industrial Toxicology. New York: John Wiley & Sons, Inc., 1959.

GREENBURG, L.;MAYERS,M.R.; and SMITH,A.R. The systemic effects resulting from exposure to certain chlorinated hydrocarbons. Journal of Industrial Hygiene and Toxicology, vol 21, 1939, pp 29-38.

Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment. Cincinnati: American Conference of Governmental Industrial Hygienists, 1973.

TREON, J.F.;CLEVELAND,F.P.;CAPPEL,J.; and ATCHLEY,R.W. The toxicity of the vapors of Aroclor 1242 and Aroclor 1254. American Industrial Hygiene Association Quarterly, vol 17, 1956, pp 204-213.

8. Revision of American National Standards Referred to in This Document

When the American National Standards referred to in this document are supseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply.

APPENDIXES (These Appendixes are not a part of American National Standard Guidelines for Handling and Disposal of Capacitor- and Transformer-Grade Askarels Containing Polychlorinated Biphenyls, C107.1-1974, but are included for information purposes only.)

Appendix A

DISPOSAL SERVICES

In addition to the supervised dry landfill sites that may be used for the disposal of askarel-containing scrap, the following additional known facilities and services have been established. For other facilities, call your regional Environmental Protection Agency office.

Chem-Trol Pollution Services, Inc.
P.O. Box 200
1550 Balmer Road
Model City, N.Y. 14107
Phone: 716 754-8231

This organization has facilities and services capable of handling:
(1) Liquids. Askarels alone or mixed with solvents or oils. Disposal by high-temperature incineration.
(2) Solids (software). Askarel-soaked compounds, rags, cartons, absorbing earths, etc. Disposal by incineration or scientific landfill.
(3) Solids (hardware). Capacitors, transformer tanks, cores, askarel-soaked metals. Disposal by scientific landfill. Has solvent extraction capability.

Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: 314 694-3352

This organization has facilities and services capable of handling askarel liquids alone or mixed with other oils or solvents by high-temperature incineration. Liquid is pumped through a gun with atomizing steam into incinerator. Temperatures are maintained at 2000°F with auxiliary natural gas. Exit gases are quenched to 180°F by contact with

water. Gas is than passed through a high-energy venturi scrubber for removal of particulates. Before exhausting to air (110°F), gases are passed through a packed column scrubber to remove HCl. Askarel liquids containing more than 1% water, or any phosphate esters cannot be accepted.

Nuclear Engineering Company
Eastern Division
P.O. Box 146
Morehead, Ky 40351
Phone: 606 784-6611

Nuclear Engineering Company
Disposal Division
Sheffield, Ill. 61361
Phone: 815 454-2624

This organization provides containerization, transportation, and disposal services of all liquids and solids (including hardware). Disposal is in controlled chemical and scientific landfill area. Licensed by Atomic Energy Commission for radioactive waste disposal. The organization also has two West Coast locations, in the states of California and Washington.

Rollins Environmental Services, Inc.
P.O. Box 2349
Wilmington, Del. 19899
Phone: 320 658-8541

This organization has facilities and services capable of handling:

(1) Liquids. Askarel alone or mixed with solvents or oils. Disposal is by high-temperature incineration.

(2) Solids (software). Askarel-soaked compounds, rags, cartons, absorbing earths, etc. Disposal is by incineration at combustion temperatures up to 2500°F. Incineration gases are scrubbed, and entrained solids are removed before exhausting to air.

Rollins Environmental Services maintains disposal facilities in the following areas:

Philadelphia/Camden:
Rollins Environmental Services, Inc.
Route 322
Logan Township
Bridgeport, N.J. 08014

Baton Rouge:
Rollins Environmental Services, Inc.
Scenic Highway & West Cheatham Lane
Scotlandville
East Baton Rouge Parish, La 70807

Houston:
Rollins Environmental Services, Inc.
Tidal Road & Highway 134
Deer Park, Texas 77536

General Electric Company
100 Woodlawn Avenue
Pittsfield, Mass. 01220
Phone: 413 494-3729

This organization has facilities and services capable of handling askarel liquids and complete transformers only.

Appendix B

ANALYTICAL PROCEDURES AND LABORATORY SERVICE ORGANIZATIONS

B1. General

Analysis for PCB in environmental samples is a tedious process due to the very low levels (ppb or ppt) which are of interest and due to the high sensitivity of the electron capture chromatographic procedure. It cannot be overemphasized that extreme care must be taken to ensure first that the sample is representative and second that sufficient numbers of blanks, and sample replicates are tested to define detectability limits and precision of the particular equipment and procedure being used. Cleanliness of sampling devices and containars and their extraction is also important. Analytical procedures for the determination of PCBs in air, water and sediments are given in section B3.

B2. Laboratories

For a listing of laboratories offering services for PCB analysis refer to Directory of Testing Laboratories publication STP333A available from the American Society for Testing and Materials (ASTM) 1916 Race Street, Philadelphia, Pa. 19103. If an outside laboratory is used, a verification of capability is recommended.

B3. Analytical Procedures

(See ASTM D3304-74, "Analysis of Environmental Materials for Polychlorinated Biphenyls," reference.)