PYRANOL UPDATE

BACKGROUND

Prior to 1930, the most commonly used transformer insulating liquid was mineral oil. The early 1930's saw the commercial development of insulating liquids that were a mixture of synthetic chlorinated aromatic hydrocarbons, principally various polychlorinated biphenyls. By controlling the composition of these mixtures, a manufacturer could obtain desired combinations of thermal, chemical and dielectric properties that resulted in insulating liquids which had much greater resistance to oxidation and fire than mineral oils. During the past 40 years these liquids have been widely used in certain types of transformers and capacitors and are recognized as a distinct class of insulating liquids, designated by the international term "askarel".

Monsanto Chemical Company is the sole domestic supplier of polychlorinated biphenyls. Under the trade name "Aroclor" they sell the basic ingredient of askarel. There are several types of Aroclor compounds and each transformer manufacturer selects the type best suited to his requirements. Pyranol is the GE trade name of its askarel compounds. The formulation for the Pyranol used in transformers and capacitors does differ because of the desired characteristics of the insulating fluid for each of these equipments. As might be expected, the formulation of Pyranol has changed over the years; and, at the present time, transformer Pyranol consists of a mixture of chlorinated diphenyl (Monsanto Chemical designation is Aroclor 1254) and tri-tetrachlorobenzene. Also included in the formulation is a small amount of a diepoxide which acts as a scavenger for free hydrogen chloride molecules which are present when arcing occurs in Pyranol. The purpose of the tri-tetrachlorobenzene is to lower the viscosity of the chlorinated diphenyl so as to improve its heat transfer capabilities, its ability to impregnate paper insulating materials, and its ability to flow at low temperatures.

The material that Monsanto manufactures under their trade-mark "Aroclor" consists of a mixture of polychlorinated biphenyls. Polychlorinated biphenyls (commonly referred to as PCB) is a generic term covering a family of partially or wholly chlorinated isomers of biphenyl. It is important to realize that polychlorinated biphenyls have been used in a wide variety of industrial applications other than transformers and capacitors. PCB compounds have been used in "open ended" application, e.g., paints, printing inks, paper coatings, plastics, etc. They have been used in "nominally closed" applications, e.g., hydraulic and heat transfer fluids. Transformer and capacitor applications are considered a "closed system". Since the early 1930's, about 60% of all the PCB's manufactured have been used in closed electrical systems.

ENVIRONMENTAL CONCERNS

Although in use for over 40 years, only recently was evidence discovered to indicate that PCB's were quite widely dispersed throughout the environment. The main source of PCB in the environment is generally attributed to the open and nominally closed applications. On the basis of the most pessimistic assumptions, less than 10% of the total amount of PCB in the environment could be attributable to closed electrical systems. Although PCB's have been associated with adverse biological deficiencies in some birds and animals, a definite cause-effect relationship has never been established.

In early 1971, widespread headlines were generated when large quantities of turkeys in Minnesota, chickens in North Carolina, and large quantities of eggs at various locations were destroyed after they were found to be contaminated with a high concentration of polychlorinated biphenyls. The source of the contamination was traced to a leaking heat exchanger cooling system in a fish meal processor's plant which apparently went unnoticed for several months. The fluid in the heat exchanger contained polychlorinated biphenyls. Unfortunately, this fish meal was used as an ingredient in a commercial poultry feed product.

As a result of this occurrence there was a growing industrial, public and governmental scrutiny of polychlorinated biphenyls. Much, if not all, of the recent adverse publicity on PCB's in the popular press has concerned such non-electrical applications as heat transfer agents, plasticizers, and carbonless transfer paper. In response to these environmental concerns, the Monsanto Company announced that it would discontinue sale of PCB's for all uses except closed system electrical applications which involves about 50% of Monsanto's Aroclor production. Monsanto's decision is a tacit recognition that over the past four decades askarel-insulated transformers and capacitors have played a vital role in the safe, reliable, and efficient delivery of electrical power. This role is reflected in various codes, standards and regulations that now effectively require or encourage continued use of askarel-insulated electrical equipment in many applications. Among all uses to which PCB's has been put, these closed system electrical applications combine the greatest benefits to the user, and public at large, with the smallest risk of environmental contamination.

Monsanto has been made a party to several suits resulting from environmental contamination, none of which have stemmed from electrical applications. In order to protect itself from further suits, Monsanto has further restricted the sales of polychlorinated biphenyls to those transformer and capacitor manufacturers who have entered into a special indemnification agreement with Monsanto. As of last month, the following manufacturers have signed an agreement with Monsanto:

General Electric	Federal Pacific (Signed primarily for capacitors)
Westinghouse	Buell Engineering (Rectifier transformers only)
Kuhlman	ITE
Standard	McGraw-Edison (Capacitors only)
Niagara	Research Cottrell
	Hevi-Duty

CURRENT STATUS

Monsanto will no longer sell Pyranol to any other customer except the General Electric Company. The Medium Transformer Products Department is the purchasing point for all transformer Pyranol used by the General Electric Company. MTPD will continue to sell Pyranol transformers under the same conditions that we have in the past. We have modified our policies concerning the sale of Pyranol as a supply part item; Information Letter MT-166 explains our new policies.

The General Electric Company will continue to support all industry activities to establish the safe nature of PCB's in sealed electrical equipment. At the present time there is ANSI Committee, C-107, to establish standards concerning the use and disposal of askarel used in electrical equipment. We will support and follow the recommendations of that Standards Committee in all areas of concern. In response to a recent recommendation, we intend to affix labels to Pyranol transformers which will read as follows:

CAUTION

"The insulating fluid in this transformer contains polychlorinated biphenyls, which some studies have shown may be an environmental contaminant. Care should be taken to prevent any entry into the environment. In the case of malfunction or leaks, consult the Instruction Manual or the manufacturer."

It should be pointed out, however, that we feel quite strongly that our present designs of Pyranol-insulated transformers when installed, maintained and operated in accordance with recognized industry codes and standards, will offer only a very minimal risk of contamination to the environment.

PYRANOL DISPOSAL

If for any reason a user should find that Pyranol in a transformer is no longer suitable and wishes to dispose of the Pyranol, then it is necessary that the user contain the used Pyranol in an appropriate enclosure and return it to Monsanto for disposition. Monsanto has a high temperature incinerator which wi burn the Pyranol and recycle the products of combustion into less harmful

chemicals. Not only should Pyranol itself be returned, but any material such as rags, filter paper, etc., that has been contaminated by Pyranol should also be carefully containerized for ultimate disposal by an acceptable disposal service. The ANSI Committee referred to previously will undoubtedly formalize procedures and set forth guidelines in regard to the containment and disposition of askarel and askarel-contaminated material.

LEGISLATIVE CONTROLS

There has been a bill introduced by Congressman Ryan of New York which seeks to ban the use of polychlorinated biphenyls. This bill has not come out of committee nor is it expected to do so. GE has been working with various industry organizations who have acquainted all interested parties with the continuing need for askarels in transformers and capacitors. The consensus of opinion is that, if any kind of a restrictive bill is passed, it will merely reaffirm Monsanto's previously stated position in regard to restricting the sale of polychlorinated biphenyls.

As a matter of information, the May issue of Environmental Science and Technology carried the following statement in its section entitled "Environmental Currents" on page 5:

> "FINAL WORD: USE OF PCB's SHOULD NOT BE BANNED ENTIRELY
>
> "An interdepartmental federal task force finds that if currently available substitutes for polychlorinated biphenyls were used in transformers and capacitors there would be a greatly increased likelihood of fire and explosion, resulting in deaths, injury, and damage to property. Such use (as insulating materials) can be controlled so that it does not significantly contribute to environmental contamination. The task force included representatives from the Office of Science and Technology, CEQ, EPA, and the Departments of Agriculture, Commerce, Interior, and Health, Education, and Welfare. PCB's are widely manufactured in Japan, Italy, France, West Germany, and Russia and possibly in Brazil, Argentina, India, and East Germany. The report is available from NTIS, Springfield, Va. 22151 (For more on PCB's, see ES&T, October 1970, p 814).

SUBSTITUTES FOR ASKAREL

Askarel compounds are about ten times as costly as mineral oil. Therefore, there has been considerable incentive over the years to try to develop a suitable replacement material but without success. We are continuing to evaluate various other chemicals to determine their usefulness as a non-flammable insulating liquid. The material selected as a replacement would, of course, undergo an environmental evaluation before being acceptable. At the present time we know of no chemical compound that can, with reasonable cost, replace askarel.

COMPETITIVE ACTIONS

We have seen a few instances where some smaller manufacturers are using scare tactics to encourage the use of dry-type transformers, particularly those manufacturers whose total business has been dry-type transformers. I am sure you have heard many exaggerated claims made as to restrictions on Pyranol transformers.

Sorgel has stated that dry-type transformers and oil-insulated transformers will meet all existing needs and applications, and that they can see no reason for the continued use of askarels. In fact, they stated that the disadvantages of PCB compounds were known to them for a considerable period of time; and they have, therefore, refused to manufacture transformers of that type for six or seven years. To our knowledge, they've never manufactured any liquid transformers of any type in any period of time. Also, it is unfortunate that they didn't see fit to share their supposed knowledge of askarel deficiencies with the rest of the country.

Zinsco has stated that they wish to be indemnified by any purchaser of askarel-immersed transformers that are sold by or on behalf of this particula manufacturer. I think this might be a scare tactic on their behalf since they do not, to our knowledge, manufacture any askarel transformers. As far as we have been able to determine, they buy these types of transformers from other transformer manufacturers for resale as part of their products.

Federal Pacific makes both liquid and dry-type transformers but has chosen not to furnish anymore askarel transformers. They may feel they have more strength in the market place with their dry-type transformers than their liquid, and this is probably correct.

It is likely that other transformer manufacturers may also withdraw from furnishing askarel transformers. We would expect this would be more a result of their internal economics associated with a relatively small production of askarel units.

There are many good reasons for using dry-type transformers in any given installation. However, a decision made solely on the fact that askarel contains polychlorinated biphenyls is not viable. It has been interesting to us to note that environmental concerns in other areas have actually given rise to an increase in the use of Pyranol-insulated transformers. A case in point is the precipitator transformer which furnishes power for electrostatic precipitation systems used in smokestacks.

Service Performance Quality Reliability

May 22, 1972

Information Letter - MT-168

MTD SPOT

To Holders of SPOT

Information Letter Tab of Section I

SUBJECT: PYRANOL UPDATE

TO: FIELD SALES MANAGERS
FIELD SALES ENGINEERS

Many of you have expressed concern about the future availability of askarel transformers since the principal ingredient, polychlorinated biphenyls, has been found to be widely dispersed throughout the environment. Unfortunately, a good deal of misinformation has been circulated on this subject. To give you the latest correct information concerning General Electric Company's position on Pyranol transformers, we are attaching a report entitled "Pyranol Update" which should help you answer your customers' questions about Pyranol transformers.

We will revise the attached report as required. We would appreciate receiving any information that you obtain from your customers regarding our competitors' positions on askarel transformers. We would also like to know if there are any proposed local or state government restrictions in your area on the use of askarel or polychlorinated biphenyls. To date, most such restrictions have been to limit the use of PCB compounds in the processing of such products as paper, food products, inks, etc.

You can assure your customers that General Electric will continue to offer Pyranol transformers. Further, your customers can continue to apply Pyranol transformers, as they've done in the past, with minimal risks of environmental contamination.

R. W. Frahm

R. W. FRAHM
MANAGER-MARKETING

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Attach.

PLAINTIFF'S EXHIBIT 1270

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GENERAL ELECTRIC COMPANY
MEDIUM TRANSFORMER DEPARTMENT, ROME, GEORGIA

SIZ 1768