Monsanto

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TSCA Public Information Office (TS-793)
Office of Toxic Substances
U.S. ENVIRONMENTAL PROTECTION AGENCY
Room E-108
401 "M" Street, Southwest
Washington, D.C. 20460

Dear Sir:

Re: Docket No. OPTS-62035
Comments In Response To Advance Notice
Of Proposed Rulemaking On Use Of PCBs
In Electrical Transformers (49 FR 11070)

Monsanto Company, a broad-based manufacturer of chemicals, welcomes the opportunity to comment on this proposed rule.

General Comments

The EPA should proceed cautiously in proposing as yet another rule on the use of PCBs in transformers. It should not allow unfounded crisis mentality to provoke decisions without a complete assessment of available analytical and health information coupled with a determination of the economic impact.

This PCB transformer rulemaking is truly a case where benefits vs. risks should be very carefully evaluated. The fire resistant properties of PCBs clearly offers certain safety benefits for electrical equipment use that have stood the test of time - over 50 years. However, scientists are just now able to actually quantify the comparative fire risks of transformer units containing alternative dielectric fluids. In addition, the effects of various other potential health and environmental properties of possible PCB replacement dielectric fluids has not been adequately investigated and defined. The Agency should act carefully in revisions to its PCB transformer rule otherwise a more serious problem may arise.

Industrial usage of PCB electrical equipment has been shown to be safe and effective. Data submitted in this rulemaking by the Chemical Manufacturers Association (CMA) details chemical industry PCB transformer usage, including Monsanto Company. Lessons learned from industry should apply to other commercial building and utility industry usage of PCB transformers.

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As a CMA member, Monsanto contributed data and technical expertise to the comments submitted in this rulemaking by CMA for the industry. Therefore, Monsanto Company supports and adopts other comments submitted on this subject by the Chemical Manufacturers Association.

In addition, EPA should carefully evaluate the costs to industry and the national economy of a total elimination program. This should include costs of new equipment, removal and installation costs, redesign and construction costs, and storage and disposal costs for used PCBs and related items. Any risk assessment decision should take into account whether a massive PCB elimination/control program for electrical transformers at a significant cost will have a major impact in reducing potential risks from toxic combustion products in building fires. The Agency should provide substantial evidence that a new PCB transformer rule is necessary and is justified on a cost/benefit as well as health and safety/benefit basis.

Specific comments relating to questions posed in the ANPR are addressed below.

Quantitative Comparative Fire Risk Assessment
Of PCB-Askarel Vs. Mineral Oil

Little if any information is currently available which quantitatively assesses and compares the fire risks of polychlorinated biphenyls (PCBs) with other common dielectric fluids, although such fluids have been used on a wide basis for over 50 years.

Monsanto Company has had in progress for over a year a study assessing and comparing fire risks of PCBs and of mineral oil, the most commonly used commercial dielectric fluid in transformers. The quantitative risk assessment, though not complete at this time, does provide a valuable insight into the comparative risks and benefits of PCBs as flame resistant dielectric fluids. The study shows that the average frequency of a fire starting and spreading beyond the transformer room is 300 times greater for a mineral oil-filled transformer than for an askarel-filled (PCB plus trichlorobenzene) transformer. In addition, the analyses indicates that there is a significant decrease in the risk of fatalities when a mineral oil transformer is replaced by an askarel (PCB plus trichlorobenzene) transformer. A copy of the Technical Summary of this Comparative Transformer Fire Risk Study is attached as Appendix I. A copy of the full study report will be made available to the Agency when completed and published in several months.

Such fire risk information is essential in EPA's considerations of the "significant risk" assessment of PCB use in electrical equipment. Before making a rash decision which may place human safety and property damage in even greater jeopardy, the Agency should consider and evaluate fire risk of the various alternatives proposed for PCB fluids, including pure PCB fluids and "askarel blends" which may contain PCBs and trichlorobenzenes. By the use of quantitative risk assessment techniques, which have been developed for the nuclear industry, consultants, such as the renowned group which performed the transformer fluid study for Monsanto, are now able to apply these techniques to other potential risk situations, specifically the transformer fluid issue.

Estimates Of Fire Frequency

Accurate estimates of fire frequency of PCB transformers are not available since such records are not routinely reported and recorded; and if fires are reported and recorded, the appropriate category and detail may not be accurately represented. This represents a major difficulty in performing a quantitative assessment of fire risks as discussed previously.

In addition, if such information is currently available, care must be taken to assess its validity, hence one of the reasons for the costs and delays of fire risk assessment studies.

For example, EPA cites (49 FR 11077) data from the Director General of the Finnish Institute of Occupational Health (FIOH) in support of the validity of EPA's estimates of PCB transformer fire frequency. Yet in our study of the quantitative fire risk assessment of transformers, communications with the Director General of FIOH[1] indicate that the EPA estimate based upon the Finnish data is probably incorrect. The Director General stated that the Finnish data provided to U.S. EPA was based not upon transformers but upon their report[2] of capacitor fires and leakages. (These data were reported by the Director General at an international conference on PCBs at Research Triangle Park, North Carolina, September 12-14, 1983. Press reports of the presentation erroneously referred to the Finnish (28) incidents that implied that they were transformer incidents. Thus extrapolations reporting there may be 1,120 such incidents in the U.S. each year were in error.[3])

Toxic Combustion Products Of Transformer Fires

In addition to considering the fire risk/benefits of PCB vs. other dielectric fluids, the Agency should thoroughly investigate the formation of toxic combustion products from all fuel sources. In two of the fire incidents discussed by EPA in the ANPR, re Binghamton, New York and San Francisco, California, the information discusses at length tetrachlorodibenzofuran (TCDF) and dioxin (TCDD) and imply that the major source of these problem toxic combustion products in the building fires is the PCB.

Little if any significant information is available on other combustible materials which were consumed in either fire, including trash or foreign materials stored in the electrical vaults, wiring and cables, along with associated electrical components that burned or pyrolyzed, paint and construction materials of the vaults and buildings per se and any other possible materials which served as fuels for the building vault fires.

[1]Personal Communication from Dr. J. Rantanen to Dr. M. Kazariana, January 1, 1984.

[2]J. Rantanen et al, "Recent PCB Accidents in Finland", CCERP Conference on Potential Health Effects of PCBs and Related Persistent Halogenated Hydrocarbons, Research Triangle Park, North Carolina, September 12-14, 1983.

[3]Chemical Regulation Reporter, September 23, 1983, Pg. 845.

Reports from both of these fire incidents have been fragmented and are incomplete. However, for example, early reports in the media and from on-the-scene observers indicated that in both cases foreign material other than dielectric fluid combusted.

Binghamton - Large quantity (cases?) of rubber "V" belts used to drive motors were stored in transformer vault. (One report indicated the case(s) were on top of the transformer.) Wiring and cables burned.

San Francisco - The fire in the vault "smouldered" for several hours, perhaps as long as eight, due to burning wiring and cables before the fire was put out.

Combustion of materials such as rubber goods, wiring and cables could account for large quantities of soot in both of these incidents.

Before the Agency proceeds with any revision to the PCB transformer rule, it should conduct studies to determine all sources of the various combustion products of the fires to insure that a new PCB transformer rule is appropriate and necessary. For example, in the ANPR the Agency expresses concern over presence of TCDD in the residues of the transformer fires, yet TCDD is generated from trichlorobenzene, a major component of many askarel transformers, and the Agency remains silent on the manner in which it intends to proceed to eliminate or control both the trichlorobenzene fluid source and the combustion/pyrolysis products thereof, including TCDD and possibly TCDF.

Respectfully submitted,

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/dg

Attachment

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APPENDIX I

Technical Summary

of

COMPARATIVE TRANSFORMER FIRE RISK STUDY

by

Pickard, Lowe, and Garrick, Inc.
Newport Beach, California

Technical Summary

Prepared
by

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May 11, 1984

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Summary

A risk assessment comparing the use of mineral oil and Askarel dielectric fluids in two typical office building transformer applications has been completed (1). The study was done by the consulting firm of Pickard, Lowe and Garrick, Inc. of Newport Beach, California. The study shows that the average frequency of a fire starting and spreading beyond the office building transformer room is 300 times greater for a mineral oil-filled transformer than for an Askarel-filled transformer. The analyses of both office building transformer applications indicate that there is a significant decrease in the risk of fatalities when a mineral oil transformer is replaced by an Askarel transformer. A typical Askarel consisting of 50% Aroclor® 1254 (PCBs) and 50% 1,2,4 trichlorobenzene was used in the study. The use of trichlorobenzene as a blending fluid reduces the fire resistance of the resulting Askarel mixture when compared to essentially 100% PCB fluid.

Scope

The study was done to evaluate the impact on fire risk of the decision to replace mineral oil by PCBs as the cooling and insulating fluid for electrical equipment. Risk is taken to mean the likelihood of a hazard resulting in the actual delivery of loss, injury or some form of damage (2). By contrast, a hazard is defined as the source of danger (2). In this study, fire risk was defined to include the frequencies of fatalities, injuries and fires spreading beyond the room of origin.

In the study, mineral oil transformers are compared to Askarel transformers. The term Askarel generally refers to a generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons used as dielectric fluids. For the purpose of the study, the term Askarel refers to a mixture containing 50% PCBs (Aroclor® 1254) and 50% 1,2,4 trichlorobenzene.

Two separate cases are considered in the evaluation of fire risk for the two types of transformer fluid. The first

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(Case 1) involves the installation of the transformer in a one-hour fire-rated room in a general use basement area of an office building. The other (Case 2) involves a transformer room with a three-hour fire rating in a nonpublic use basement of an office building. These two cases describe typical transformer installations used for Askarel and mineral oil transformers respectively in building applications, and meet current National Electrical Code standards (3). The fire frequency, injury and fatality data used in this study were obtained by analysis of several fire incident data bases which are detailed in the final report (1).

Results

The results of this study show a significant decrease in fire risk when a mineral oil transformer is replaced by an Askarel transformer. The likelihood of fire spreading beyond the room of origin is 300 times greater for a mineral oil transformer than for an Askarel transformer in Case 1 and 1000 times greater in Case 2. Table 1 presents the mean fire frequencies for each case.

Table 1
Transformer Fire Frequencies
(events per transformer year)

	Transformer Fire	Fire Spreads Beyond Transformer Room
Case 1		
Askarel	2.0 x 10-4	4.6 x 10-7
minerel oil	2.5 x 10-4	1.5 x 10-4
Case 2		
Askarel	2.0 x 10-4	7.3 x 10-8
mineral oil	2.5 x 10-4	7.3 x 10-5

To provide a better understanding of the numbers presented in Table 1, consider the case 1 Askarel transformer fire frequency. The frequency of an Askarel transformer fire is 2.0 x 10-4. This means one fire every 5000 years or every 5000 transformer years. If the current number of Askarel transformers is 140,000, this equates to 28 Askarel transformer fires per year.

An important factor of the Askarel transformer fire is the presence of trichlorobenzene. If an Askarel transformer did not contain trichlorobenzene, the frequency of fire would be significantly smaller. This is because the trichlorobenzene has a flash point of 99 C and PCB (Aroclor® 1254) does not have a flash point (Cleveland open cup flash point test (4)).

Using the fire frequencies from Table 1, the fatality frequencies were calculated and are listed in Table 2. These calculations assume that about 1 in 1000 (1.2 x 10-3) of all fires confined to a transformer room would involve one or more fatalities. For fires spreading beyond the transformer room, about 1 in 100 (8.8 x 10-3) were assumed to result in one or more fatalities. The frequency of a fire being confined to the transformer room was computed by subtracting the frequency of a fire spreading beyond the transformer room from the total frequency of transformer fires. Several statistical points of comparison are presented in Table 2 to show the uncertainty in the calculations. For all points of comparison, Askarel-filled transformers have a lower frequency of fatalities than mineral oil-filled transformers.

Table 2
Transformer Fire Fatality Frequencies
(fatality events per transformer year)

Statistical Point of Comperison	Case 1		Case 2	
	Askarel	mineral oil	Askarel	mineral oil
Mean	2.4 x 10-7	1.4 x 10-6	2.4 x 10-7	8.5 x 10-7
Percentile				
5th	8.6 x 10-10	1.7 x 10-7	2.0 x 10-9	1.3 x 10-7
95th	5.9 x 10-7	4.3 x 10-6	5.9 x 10-7	2.7 x 10-6

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In both of the cases, room fires are the dominant contributors to the risk of Askarel transformers. Fires that spread beyond the room are the dominant contributors to the risk from mineral oil transformers. This suggests that the risk from mineral oil transformers could be much greater than from Askarel transformers, since a fire that spreads beyond the transformer room is of more concern than a fire that is contained within the room. Historical data (5) suggest that there is a greater likelihood of multiple fatalities when a fire spreads from its room of origin.

References

1. M. Kazarians, B.J. Garrick, T.L. Chu, and V.M. Bier. "Comparative Transformer Fire Risk Study," Technical Report Number PLG-0356, Pickard, Lowe and Garrick, Inc., Newport Beach, California, 1984.

2. S. Kaplan and B.J. Garrick, "On The Quantitative Definition of Risk," Risk Analysis, Vol 1, No 1, March 1981, pp 11-27.

3. "National Electrical Code - 1984," National Fire Protection Association.

4. "Flash and Fire Points by Cleveland Open Cup, Test," American Society for Testing and Materials, ASTM Standard D 92.

5. "California Fire Incident Reporting System," Annual Report, California State Fire Marshall, 1982.