Info. presented at town (L.WV.) 5-11-76 by R. Anderson.

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In 1932, the introduction of chlorinated aeromatic hydrocarbon impregnating compounds (Askarels or PCBs) allowed the electrical industry to use this material because of its high dielectric capabilities, and its important heat-resistant properties that made it nonflammable.

For over 40 years, electrical manufacturers have used large quantities of polychlorinated biphenyl compounds (PCBs) for production of electrical capacitors and transformers. Prior to 1972/73, PCBs were also widely used in brake and shock absorber fluids, heat transfer, printing materials, carbon paper, etc. The unique combination of good electrical and safety properties when used in electrical equipment are key reasons why PCBs have not been replaced over this 40 year time span.

Capacitors were first used in power systems in the 1930's. During World War II, the electric utilities began to buy capacitors in large amounts. The reason is that capacitors involved less critical material and provided the simplest way to increase the efficient use of available electrical energy.

Since then, there have been increased applications of capacitors worldwide. Moreover, the recent energy shortage has again focused attention on improving the efficient use of electricity.

Most of the transformers used in the United States use mineral oil as an insulating and cooling medium. However, mineral oils have one serious drawback, they are flammable. Where transformer failures may cause fires and explosions threatening life and property, the use of mineral oil is restricted. Fire underwriters will not allow the use of

flammable liquids for transformers located indoors, in congested areas, large buildings such as the World Trade Building, Sears Tower, hospitals, schools, or homes. In these instances, the transformer is filled with a nonflammable PCB.

Today, capacitors are widely dispersed throughout our total environment. Capacitors are located on power lines, in factories, in buildings and in our own homes. The insulation system of every alternating-current capacitor employ PCBs to prevent the saturated paper, film and aluminum conductor from becoming a hazard if the capacitor fails.

A proposal to eliminate PCBs from the environment will have a direct bearing on the use of all alternating-current capacitors in the U.S. and on the use of transformers in high-risk areas. Polychlorinated biphenyls have found acceptance in our electrical systems since they provide safety to the public and to workers in industry. In addition, this electrical equipment permits our country to manage its energy sources efficiently. If PCBs are eliminated without suitable alternates, energy use in this country would climb by approximately 10 percent. This energy increase will cost the consumer of electricity $100 million a week.

Presently, no one has developed a fluid that has all the desirable properties of PCBs for making a power capacitor. With 40 years of experience in capacitors, Westinghouse has evaluated alternate fluids.

In looking at the various possible fluids to design and produce a good capacitor, we were extremely sensitive in selecting a fluid that had no environmental problems. A prime characteristic of the fluid is

that it must make a reliable long-lasting capacitor, and the failure rate must be low. Any fluid selected must be capable of being handled with minimum danger to employes. Another most important consideration is that the capacitor must be safe in performing its function. The fluid must be readily available and it must have reasonable cost.

A number of fluids have been found which exhibit all of the requirements previously outlined except for safety. There is no known fluid today that will make a good capacitor, containing the fire-resistant properties of PCBs. A number of alternate fluids have been proposed by Monsanto, Dow Chemical, Shizuki in Japan, the General Electric Company, the Sun Oil Company, and others. Some of these will make better capacitors than others. Some are more readily available than others. Some are more economical than others. But, the one key drawback is that not one of them are as fire resistant as PCB. Our care for safety is the primary reason that we have not switched to a fluid other than PCBs by now.

PHTHALATE ESTERS MIXTURE
ISOPROPYL BIPHENYL

In 1974, we settled upon an alternate fluid which we designated as F982. This fluid had competitive flammability characteristics, but did not have the excellent flammability characteristics of a PCB. We decided, however, that if PCBs were eliminated and we had to go to an alternate fluid, that we would use this fluid in spite of its poorer flammability characteristics. We reached a point in the development schedule and built units for customer field testing. After another review of the handling of this fluid in a large quantity, we decided that because of safety we did not want to expose our workers to the fluid. We then renewed our search for a fluid. Today we have settled on another fluid.

safer to handle, but with inferior flammability characteristics than PCBs. We have designated this fluid S17 and are presently constructing capacitors for field tests. We have spent over one-half million dollars in arriving at this point.

Now, what does this mean to you and to the public in general? In your own home, if you have a window air conditioner or a central air conditioner, it probably contains a small capacitor made out of PCBs. Your washing machine also probably contains a capacitor made with PCBs. Your furnace may have a capacitor containing PCBs. If you have some fluorescent lights, they probably contain a capacitor with PCBs. Your television set will probably contain a capacitor made with PCBs. Yet, I would say that no one in this room has ever known of a fire caused when one of those capacitors failed. If the capacitor industry switched to the only alternate fluids known today, when one of those capacitors fail, they could very well start a fire. Today, the entire capacitor industry would like to discontinue the use of PCBs because of environmental concerns. However, the potential fire hazard in homes, schools, hospitals, and businesses could well be more serious than the problem we are trying to correct.

The State~~s of Michigan and~~ Indiana have taken action to eliminate PCBs from items, products or materials used in these states. Westinghouse concurred with the Indiana proposal since it provides for statutory control over the use of PCBs in non-electrical uses. It recognizes that substitutes must be available to minimize the risk of fire and explosion and the disruption of electrical service that might result if PCBs were banned before alternatives were found. Also, Monsanto has publicly stated that they will cease the manufacture of PCBs when there are adequate substitutes.

The electrical industry and Monsanto have taken the lead in reducing the amount of PCBs that may enter into the environment. These decisions have been based upon the criteria that have eventually become statutory requirements and have not resulted in subjecting the general public to increased risks of fire. In addition, these actions have not deprived the general public of energy during this period of energy conservation.

What has been done at the Bloomington Westinghouse plant?

The approach taken has been to abate the amount of Aroclor that would come into contact with water.

We built a concrete dike around the storage tanks.

W submitted engineering plans for construction of the shelters for the unloading and storage areas for approval by the State and the railroad.

We sealed all the floor drains in the oven area.

Drip trays were installed and floor dry or sawdust put under the trays to soak up any fluid that might get through these trays.

Since 1971, our liquid wastes have been shipped to companies that have approved thermal oxidation procedures. We have shipped solid wastes to scientific landfills.

Our customers have been advised by instructions to the field and with nameplates on the capacitors that the users of these capacitors needed to take the same precautions in disposing of failed and/or obsolete units.

Professional people from our plant share this knowledge and experience with other manufacturers and users.

Over the years, we have invested research and development time and money to improve capacitor designs and manufacturing technologies. The object was and is to use less and less Aroclor to produce capacitor units and still maintain an equivalent performance. Significantly, over a six year period, we reduced the amount of Aroclor per capacitor rating by 66 percent.

Westinghouse is investigating a novel system to remove the thin film from the capacitors' outer surface after they are filled. This method will replace the present capacitor water washing system. Three proposed contractors have been contacted and will be ~~revisiting the Bloomington facility this week to present~~ presenting their quotations and proposals for the scientific and engineering method for this new system. Westinghouse will evaluate these proposals and expects to award a contract by June 11, 1976. At the time of the award of the contract, we will furnish the State with the name of the contractor and the final construction schedule for their approval.

We have established and are testing a procedure to prevent the introduction of PCB into the water seal pumps.

We believe that these actions in combination with other actions already taken will further reduce the amounts of polychlorinated biphenyls in our wastewater discharges and clearly show that we are continuing to work as expeditiously as possible to reduce these levels. THE LAST EST. WAS THAT Westinghouse is ~~currently~~ losing 15 pounds a day in waste water. THE STEPS TAKEN TO DATE SHOULD HAVE REDUCED THAT SIGNIFICANTLY We hope technology and development will allow us to cut this to ounces in the future.