The rush to market for PCB substitutes

Producers hope to replace the chemicals suspected of causing many illnesses

Concern over the environmental effects of polychlorinated biphenyls has sparked a marketing blitz by suppliers of would-be substitute chemicals. Some are offering new alternatives; others have dusted off dropouts from previously unsuccessful promotions. But PCB users remain skeptical, and regulatory agencies may ultimately dictate the choice of substitutes through further PCB restrictions.

PCBs, or askarels as they are generally called, are chemically related to DDT and act much the same way in the environment. Neither is biodegradable, and both tend to concentrate in animal tissues. PCBs are suspected of causing a host of human ills, from miscarriages to cancer. Efforts to control their release into the environment began several years ago with effluent limits and more recently have led to restrictions on their use in such noncritical areas as paints and carbonless paper.

In the U. S., askarels have been limited in use since 1971 to the sealed cooling systems of large electrical distribution transformers and industrial capacitors. Japan clamped a virtual ban on askarels in 1972, and hopeful U. S. suppliers of potential substitutes say PCBs' days are numbered here. Even Monsanto Co., the sole domestic maker of askarels, is looking at alternative chemicals.

The pressure on PCB users increased in late December when Russell E. Train, chief of the Environmental Protection Administration, announced that he was directing the EPA's 10 regional offices to use the provisions of the 1972 Clean Water Act "to virtually eliminate PCBs" from the process wastes of capacitor and transformer makers. Train also asked PCB users to step up efforts to develop and use substitutes. Though the EPA has no power to force such changes, "we have public opinion to work with," Train said.

Silicone. "The die is cast and the change is going to be made," declares a confident Richard H. Montgomery, new products market manager for Dow Corning Corp.'s fluids and lubricants business. He predicts that his company's new silicone coolant will capture as much as 10% of the 13-million-lb. market for transformer PCBs in 1976. Silicones are not biodegradable, but they break down slowly in soil, eventually reverting to pure silicon. Says Montgomery: "The material is good, it's safe, and it works."



RTE explosion tests on mineral oil show why PCB users hesitate to switch.

Silicone is also more expensive. Montgomery estimates that the new coolant will price out in the transformer at $5 to $6.50 per gal. more than askarel, adding 10% to 20% to a transformer's total cost. But he says that the extra cost of coolant would be almost entirely offset by cheaper handling procedures for the material and by

Silicones have a chance, breaking down in soil and reverting to pure silicon

elimination of the expensive coatings needed inside transformers to protect them from the solvent action of PCBs.

The electrical equipment industry is not sold yet. "We've looked at more than 100 replacements, and none of them combines the electrical properties and nonflammability of PCBs," says Lucas P. Hart, general manager of General Electric Co.'s Capacitor Products Dept. Among the alternatives Hart evaluated: the silicone fluid that GE's own silicone products business has offered with little success to transformer makers for 20 years.

Askarels came into use 45 years ago as a more expensive but noncombustible alternative to mineral oil, which was then widely used in liquid-cooled transformers and capacitors. Askarels are routinely specified today whenever such equipment is to be installed near people or wherever the explosion of an overloaded unit could pose a fire hazard. Since even moderately sized transformers contain 150 to 600 gal. of coolant, flame resistance has been the major performance measure confronting potential replacement fluids. Underwriters Laboratories' flammability index, which puts water at zero and ether at 100, rates askarels at 2 to 8. Silicones rank between 4 and 5, while mineral oil, though not listed, would fall between 10 and 20, according to Dow Corning researchers.

For capacitors, which normally account for two-thirds of PCB sales, fire is a lesser consideration because an individual device may contain only 4 gal. or less of the fluid. But here PCBs' electrical properties outshine those of alternative chemicals. A substitute, say many equipment builders, would mean bigger and more costly capacitors—without the fire protection offered by an askarel.

Heat capacity. Another selling point for PCB is its heat-handling capacity. Equipment makers note that one obvious way out of environmental problems with askarel-filled transformers is to substitute gas-cooled units. But these typically are bulkier and cannot tolerate the overloads that liquid-filled transformers can. Likewise, liquid-filled capacitors are more compact than their dry counterparts.

Dow Corning says that its silicone transformer coolant can be substituted directly for PCBs with little or no design change. Some equipment manufacturers regard the claim with open skepticism. And Harry R. Sheppard, manager of materials and manufacturing for Westinghouse Corp.'s transformer divisions, adds, "I do not believe that it has been established that equivalent safety or performance is obtainable with silicones."

Dow Corning's three silicone com-

MONS 032202

Furmanite is the proven process for sealing high pressure leaks.

While your plant stays on line.

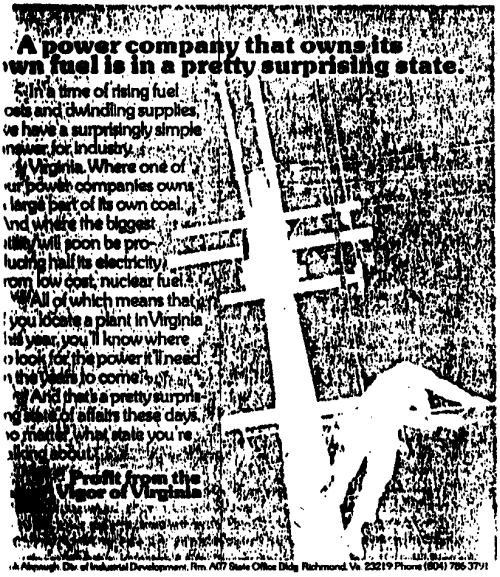
Furmanite is the one leak sealing process that can solve your most difficult leak problems, while keeping your plant or subsystem on-line. That makes us the place you should call before your leaks drain off valuable energy. And profits. Before leaks become a problem, call Furmanite collect at 1-461-8686. Or write us. We will arrange for a representative to explain the entire proven Furmanite process and our Contract Leak Sealing Program. Without obligation and at your convenience.

Furmanite. The proven process for on-line leak sealing. And a new partner in energy and profit conservation.

FURMANITE

The Proven Process

DEPT. B-1, SUITE 120
#15 KOGER EXECUTIVE CENTER
NORFOLK, VIRGINIA 23502



petitors in the U. S. agree that silicone coolants are one solution to askarel pollution, but all take a more conservative view of the market ahead. SWS Silicones Corp., of Adrian, Mich., a joint venture of Stauffer Chemical Co., and West Germany's Wacker Chemie, found little interest among equipment makers for its silicone coolant a few years ago. But today, says a spokesman, "the incentive is there."

Union Carbide Corp. thinks so, too. "Frankly," confides John F. Tancredi, silicone fluids project coordinator, "we looked at this business years ago and decided it wasn't for us. Others seemed to have the market sewed up." Now, Tancredi says, a PCB substitute is inevitable, and "we're sitting on the sidelines wondering when to jump in."

GE's Chemical & Metallurgical Div. warns against promoting alternatives

Dow has an organic replacement for askarels in high-voltage capacitors

for the wrong reasons. "We're not going to exploit an environmental situation," declares Thomas H. Fitzgerald, general manager of the silicone products business. "The decision to replace PCB will be made on technical grounds, not press hysteria."

Meanwhile, RTE Corp., of Waukesha, Wis., is testing a nonsilicone transformer fluid it calls RTEMP. The material is a food-grade mineral oil, refined from a paraffin base, which RTE says performs about as well as silicones but at less cost. RTE, itself a manufacturer of small and medium capacity transformers, developed the fluid three years ago for use in a small, underground transformer it designed. Now the company is selling above-ground units filled with either RTEMP or Dow Corning's silicone coolant, for testing by utilities. One RTE source estimates that its fluid could be ready for full marketing in 1977, and that the company itself could handle volume production. "We're a transformer manufacturer, not a chemical supplier," adds another spokesman, "but we'd love to have it ready."

RTE's transformer failure tests, made a year ago, are among the very few conducted anywhere on alternatives to PCBs. The company exploded 4-gal. tanks of various coolants by igniting them with a high-voltage spark. Results showed that normal mineral oil explodes with a giant fireball and large black cloud, then continues to burn. Both Dow Corning's silicone and RTE's fluid mimicked the smaller explosion of askarel, and all three extinguished themselves immediately.

Though industrial capacitors require less coolant than transformers, manufacturers say that PCB's flame resis-

tance makes it a tough material to unseat. GE introduced its own capacitor coolant substitute, called Econol, in 1972. The substance matches PCB electrically but, says GE's Hart, "it's flammable, and we regard that as a major risk the user must be made aware of."

Organic chemical. Dow Chemical Co. recently announced an organic chem-

Monsanto, the only U. S. PCB maker, is working on a substitute coolant

ical replacement for askarels in high-voltage capacitors and is now testing the liquid, with the jaw-breaking name of butylated monochloro-diphenyl oxide, in smaller devices. A company researcher describes the coolant as less flammable than mineral oil but more flammable than PCBs. Improving its resistance to flame, the researcher says, would also reduce its ability to degrade in the environment.

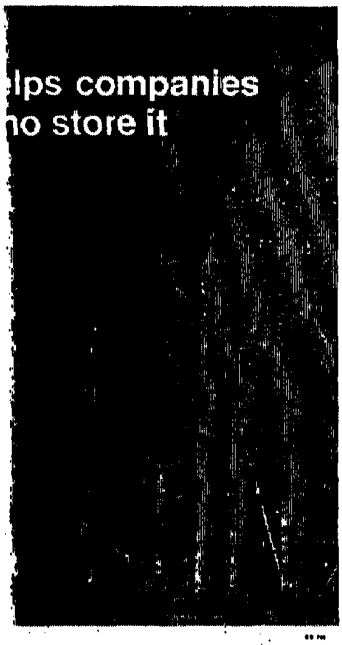
Another coolant—this one aimed at smaller capacitors used in electronic devices and fluorescent lights—was introduced two years ago by Exxon Chemical Co. and is being used in a small number of commercially available capacitors. The chemical, called diisononyl phthalate, is normally used as a plasticizer for polyvinyl chloride, but, at 50¢ per lb., it costs about half as much as PCBs on a volume basis. "We've gone as far as we can go right now," says a company researcher of Exxon's marketing effort. "The pressures for change will have to come from the equipment manufacturers."

Meanwhile, Monsanto, the only U. S. producer of PCBs, is working on a substitute coolant that it hopes will work in capacitors of any size. The material is a synthetic hydrocarbon with an additive to boost its electrical insulating qualities. Like Dow Chemical's entry, it is more flammable than askarel, but it is also more compatible with the environment, Monsanto says

Monsanto's PCB sales of 40 million lb. per year account for only about 0.5% of company revenues, and Monsanto pulls no punches in acknowledging the environmental problems of askarels. "If we had an alternative product available, we'd withdraw PCB immediately," says a spokesman. "But until there is, it would be irresponsible to do so." He suggests that Monsanto would halt PCB sales for capacitors as soon as a substitute is approved by the electrical equipment industry and when "society says it can live with the increased fire hazard."

Such a halt, if it occurs, might affect not only capacitors. Because of the lower PCB volume, the price of askarel transformer coolants would undoubtedly rise, making now-costly substitutes more attractive. ■

MATERIALS



chain—discovery, production, transtorage is a key link. And CBI has been ·3ds of petroleum companies—world-·ing single responsibility for design, d testing of efficient vapor-conserv-s the CBI way. Chicago Bridge & Iron llinois 60521. Throughout the world.

"All this ju

"Right—and t world. In fact

"Because at products. Th gering. We your plant."

"No, not reali and design measure up

"We try not t of quality."



Qual

MONS 032204