use in their microprocessor products. The UNIX system is known for its "portability" which permits it to be used in the full range of computers from personal computers to mainframes. The agreement was interpreted in the trade press as a move by AT&T to have the system become standard in the industry.

Companies that adopt the UNIX system use their products pay licensing fees to AT&T. Perhaps more significant, Bell Labs and Western Electric have developed a broad range of software products based on the UNIX system that the company will be free to sell after divestiture.

AT&T has already made an aggressive move to capitalize on lightwave technology developed at Bell Labs and Western. The company, for example, is optimistic about its bid in the competition for the contract to lay the first Atlantic cable using fiber optics technology. Bell Labs also is regarded as having put the company in a strong position to exploit new developments in laser transmission of voice, data, and visual information via lightwave technology and is rumored to be nearing the commercial application of the technology to computers and memories.

AT&T is also regarded as capable of emerging full armed into the savagely competitive semiconductor industry. Western Electric is already among the dozen largest manufacturers of integrated circuits, although its products have been made only for internal consumption.

ITT's Cormack appears to express a view widely held in the industry with his appraisal that Western will be "a major force in semiconductors in a couple of areas. Their design capability is very good and they've invested a lot of money in tools, particularly for semiconductor applications in semicustom products. Such products are based on standard chips whose design can be varied to suit customer specifications.

Western will plunge into the vortex of semiconductor competition by vying for a share of the market for the 256K random access memory chip, the prospective big seller among integrated circuits. This will put Western against the toughest Japanese and American competition. Western is already shipping 256K chips for its own products, but observers say that it will have to succeed in increasing production and lowering costs in its unmanned factories in order to establish itself as a front runner.

Western is the developer of advanced microprocessors used in its switching equipment and is fast in the vanguard of many advances in computer science and design. Much speculation has centered on the question of what strategy AT&T will be following in venturing into the computer business. Company sources are noncommittal about the rumor that Western will produce a personal computer and make a bold challenge to IBM on its own ground.

For Bell Labs and its AT&T parent, divestiture obviously brings risks and opportunities. Bell Labs officers just wryly that most they managed the chores of reorganization they should be able to survive more competition. The restructuring, in fact, is not yet complete. Appeals about some details are still pending. Furthermore, Bell Labs and AT&T will have to live with vestiges of regulation. To satisfy the antitrust lawyers' aversion of cross subsidies, for example, Bell Labs is required to deal at arm's length in various ways with AT&T's marketing subsidiary, AT&T Information Services (ATTIS), so that competitors are not put at unfair advantage. And other difficulties could arise. The move to cost-based pricing has upset the system of subsidies designed to promote universal telephone service by keeping local telephone service inexpensive. The cost of local service will rise with divestiture and a backlash is already building in Congress. An attempt by Congress to revise the overall settlement is seen as highly possible. And despite divestiture, the shock of political intervention could still be transmitted along the network to Bell Labs.—JOHN WALSH

EPA, Utilities Grapple with PCB Problems

PCB's in transformers may be a thing of the past sooner than expected

The Environmental Protection Agency (EPA) and a few utility companies seem ready to accede to demands that steps be taken quickly to replace electrical equipment containing polychlorinated biphenyls or PCB's. This appears to be a reversal, at least on the part of EPA, of a long-standing view that PCB's in electrical equipment pose no significant health hazard. The utility companies, however, have responded as a result of recent PCB accidents and the lawsuits that followed.

In 1976, when Congress banned the manufacturing of PCB's, it presumably thought that problems with this pervasive and toxic chemical were for the most part solved. But a loophole in the law allowed the continued use of PCB's in electrical transformers and capacitors as insulators. A year ago, the utility industry successfully argued before EPA that transformers filled with PCB's should only be replaced as the equipment wore out. At this rate, transformers would be replaced in 20 years. The cost to proceed any faster would be prohibitive, the industry contended.

Now EPA is moving to close the loophole. Because accidents involving the release of PCB's are occurring much more frequently than previously believed, EPA is considering a newly proposed that would ban PCB transformers in public buildings. But in the past 6 months, two utility companies say they have decided to speed up the replacement program not because they believe there are serious health hazards linked with PCB's but because they say they are weary of trying to counter the public perception that PCB's are extremely toxic. Public concerns were heightened after transformer accidents in Binghamton, New York, and San Francisco resulted in the contamination of commercial buildings, causing millions of dollars to clean up.

Other companies are campaigning to calm public fears about PCB's. General Electric and Monsanto, for example, have been active in disseminating information claiming that the health effects of PCB's have been overblown. Although there is good evidence that PCB's are toxic at high dose levels, the companies maintain that the data on low-dose effects are far less clear cut.

Last May, the Pacific Gas and Electric Company decided to replace its large transformers shortly after one of them

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exploded and contaminated a high-rise office building in San Francisco. The episode, and the subsequent lawsuits, prompted the company to allocate $60 million over the next 5 years to replace about 1000 PCB transformers. "We got tired of battling public perceptions," said company spokesman Tony Ladwell. Recently, the Florida Power and Light Company, which services half of Florida, took the same step and will spend $15 million over the next 5 years. Although it has not had a major PCB accident with its transformers, "we're getting ahead of the game before a problem occurs," said company spokeswoman Stacey Shaw, citing the accident in San Francisco and a similar one in Binghamton that occurred in 1982. "The public's concerns about PCB's have been severely exaggerated," she said.

The cause for concern can be largely attributed to the fact that PCB's are pervasive in the environment. According to EPA, there are 750 million pounds of PCB's either in storage or in use in the United States. In a national health study, EPA found that almost everyone has a detectable amount of PCB's in adipose tissue, although the number affected has dropped since Congress banned the production of PCB's in 1976. About 1 percent of the U.S. population in 1981 had more than 3 parts per million in their fatty tissue, a drop from 8 percent in 1977. The meaning of these low levels is not clear.

But many studies show that heavy PCB exposure is toxic, according to data presented at a recent meeting on PCB's held at the National Institute for Environmental Health Sciences at Research Triangle Park, North Carolina. PCB's are in a class of compounds related to dibenzodioxins and dibenzofurans. According to Ernest McConnell, chief of the chemical pathology branch at the National Institute of Environmental Health Sciences, PCB's rank third behind dioxins and furans when the most toxic member of each group is considered.

Although General Electric has stated that "the question of whether PCB's cause cancer in animals is unresolved," there is little, if any, doubt in the academic scientific community that PCB's are animal carcinogens at high dose levels. According to separate studies by Diane Norback, a pathologist at the University of Wisconsin Medical School, and Renate Kimbrough, a medical officer at the Centers for Disease Control, PCB's cause liver tumors in rats when the animals are fed a heavy dose of 100 parts per million over a period of 2 years.

In animal studies, large doses of PCB's are also known to cause a drop in body weight, enlarge the liver, damage kidneys, and change skin pigmentation. They cause reproductive disorders in mink and monkeys. According to one study, minks fed a diet of fish contaminated with PCB's showed a severe decrease in their reproductive rate. Monkeys exposed to PCB's became infertile. If, however, the monkeys were taken off the diet with PCB's, their fertility returned. It is not clear whether PCB's are mutagenic.

Several accidents with PCB's have provided some clinical data, but Kimbrough of CDC said at the seminar meeting that "it is difficult to sort out the toxicity" because some of the accidents occurring in other countries may involve different mixtures of PCB isomers. Another problem is how to test for the presence of PCB's and how to best determine adverse health effects. The consensus seemed to be that fatty tissue provides the most sensitive sample for PCB's. Some scientists advocated serum samples, however, as a speedier and less invasive test. The drawback is that serum does not bind PCB's as much as adipose tissue.

Several studies do reveal some toxicity of PCB's. In 1968, about 1200 Japanese became ill after eating rice oil contaminated with PCB's that had leaked from a heat exchanger. With PCB concentrations exceeding 100 ppm, many developed chloracne, a disfiguring acnelike disorder. According to a literature search by Robert Miller, chief of the epidemiology branch of the National Cancer Institute, most pregnant Japanese women who had eaten the rice oil gave birth to children with various abnormalities. Some of the babies showed dark pigmentation, which disappeared several months later. At least two children developed overgrown gums. The babies were also underweight. Kimbrough suggested that more extensive study of reproductive effects in humans is needed.

A number of Taiwanese were also poisoned in 1979 by rice oil that had been contaminated with PCB's. Shu-ying Tang, a physician and biochemist at National Taiwan University, reported that researchers in her group have correlated neurological damage with PCB exposure among the Taiwanese who consumed the oil. Other scientists also noted molecular changes in liver cells from patients who have been exposed to PCB's. It is unclear, they say, what these changes mean because the patients have not as yet shown any clinical symptoms of disease.

Arnold Schecter, professor of preventive medicine at the State University of New York at Binghamton who has been studying the firefighters and others involved in the accident there, suggests that PCB's in transformers may even be more hazardous than currently believed because furans are formed when PCB's are subjected to the intense heat of a fire. Soot taken from the contaminated state building contained from 270 to 1200 parts per million of dibenzofurans.

According to Marvin Halper, chief of the exposure evaluations division at EPA, fires involving transformers and capacitors containing PCB's are much more common than once thought. "It's no longer a one in a million chance. It's much more prevalent." By contacting fire departments, for example, EPA has discovered that "there have been a couple hundred fires involving transformers. Now the whole picture has changed."

Halper estimates that there are 30,000 to 70,000 transformers with PCB's. Whether other utility companies will follow the lead of those in California and Florida is unclear, but Halper speculates that the majority "will have to be forced to replace the old equipment."

—Elizabeth Hsu



Workers clean up after a PCB transformer fire in San Francisco last May. The accident prompted Pacific Gas and Electric to spend $60 million to replace all the remaining large transformers with PCB's.

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