

Technology At Work

EPRI Helps Utilities Track Down Elusive Legacy of PCBs in Transformers

By Brent Barker

Sitting atop poles or mounted on pads, distribution transformers play a critical role in the electric distribution system. They reduce electricity voltage for customer use, relying on internal fluid to help protect the equipment. These sturdy workhorses of the power distribution network can remain in service for well over half a century.

The protective fluid in most distribution transformers for homes and businesses is mineral oil. However, between the 1930s and 1970s, transformers were sometimes manufactured with Askarel (a group of synthetic fire-resistant chemicals used in electrical insulating fluids), which may contain 45–100% polychlorinated biphenyls (PCBs). This Askarel equipment was of particular value where fire was a significant concern, though many utilities did not purchase these units.

PCBs were found to have potential adverse health and environmental risks, and in 1976 Congress passed the Toxic Substances Control Act, which banned the manufacture, use, processing, and commercial distribution of PCBs in any manner other than a “totally enclosed” application—unless authorized by the U.S. Environmental Protection Agency (EPA). Though production of PCBs ceased in the United States nearly 40 years ago, the use of PCBs is still authorized in transformers and other electrical equipment as long as it does not present unreasonable health or environmental risks.

As a result, PCBs are still found at permitted levels in a small and decreasing number of in-service transformers. In addition, some mineral oil-filled distribution transformers contain lower levels of PCBs as the result of servicing with PCB-containing fluids.

Building a Database

Though the use of these transformers is authorized under EPA’s PCB regulations, many utilities have developed voluntary programs to identify and remove PCB-containing transformers from service before the end of their useful life. While these programs can be labor- and resource-intensive, these utilities are pushing forward. Identifying PCB-containing transformers can be challenging because the process of sampling fluids sometimes damages units or involves service outages.

EPRI addressed this challenge by compiling and analyzing historical data related to PCB-containing transformers. Since 2012, EPRI has gathered data on 345,000 transformers—including type of unit, manufacturer name, manufacturing location and date, and PCB concentration. The goal is to use this information to help identify the production facilities and dates associated with the greatest likelihood of PCB contamination.

“If the database is big enough, you can look for patterns—for example, in a given transformer production year at a given manufacturing site—to see if there was a higher incidence of PCB contamination in sampled, out-of-service units,” said EPRI Principal Technical Leader John Acklen. “This can help you assess the likelihood of PCB contamination in a given in-service unit. The data can inform utilities’ efforts as they prioritize and focus their removal efforts on those pieces of equipment most likely to contain PCBs, particularly those located in areas such as schools or public facilities.”

EPRI first published the database in a collection of tables that sorted transformers by manufacturer, production date, plant location, and PCB levels based on sampling of out-of-service units. To facilitate data analysis, EPRI

built and beta-tested software in 2015, and a final version was completed in December 2016. While the database cannot definitively predict PCB content, it can help inform utilities as they define and implement their voluntary phase-out programs.

“It’s already proving useful as a decision-making tool, helping a few utilities zero in on units in service with a higher likelihood of PCB contamination,” said Acklen. “But the database is not comprehensive and should not be considered a panacea. We look forward to expanding the data set as new information becomes available to us.”

Technology Transfer Awards

Individuals at PECO and ComEd received a 2015 EPRI Technology Transfer Award for applying EPRI’s database methodology to identify transformers with the potential for PCB contamination. They used their own databases along with EPRI data on transformer contamination levels to screen in-service transformers.

“We are using the results of the analysis to inspect, dispose of, and replace PCB-containing equipment. We hope to use the database and methodology continuously as part of our voluntary, proactive phase-out effort,” said Lorinda Alms, senior compliance specialist at ComEd and one of the awardees. The other awardees were Keith Kowalski, PECO’s manager of environmental programs and services, and David Mobraaten, PECO’s senior environmental compliance specialist.

Key EPRI Technical Experts

John Acklen, Jim Lingle, Naomi Goodman