MYCELX
TECHNOLOGIES CORPORATION

PCB GONE

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New technology cuts costs and provides utilities with an effective solution for PCB removal

By Hal Alper and Phil D'Angelo

Although outlawed over 20 years ago because of their harmful effects on people and wildlife, polychlorinated biphenyls (PCBs) still haunt us today. More than 1.5 billion pounds of PCBs--once used in hundreds of industrial and commercial applications as coolants, lubricants, plasticizers and insulators--were manufactured in the United States between 1926 and 1977.

While the Environmental Protection Agency's (EPA)Toxic Substances Control Act banned the manufacture of PCBs in 1979, the substances still can be found in old transformers, rubberized paint, liquid-cooled electric motors, fluorescent light ballasts, switches, vacuum pumps and microwave ovens. These machines, many of which are still in use, have the potential to release PCBs into the environment.

For utilities, the problem occurs primarily in manholes where stormwater is exposed to old transformers and capacitors that may still have oil containing PCBs.

The pollutants are stable organic compounds and can remain in the environment indefinitely, bioaccumulating in the fatty tissue of most living organisms. Even one gram of PCBs can make up to one billion liters of water unsuitable for freshwater aquatic life. In addition, EPA studies have shown PCBs are a suspected carcinogen and can cause nerve damage, reproductive system damage, immune system suppression and liver damage.

PCBs are not a natural material, so there is no natural cycle to reincorporate them into the environment. This is evident in the high concentrations of PCBs existing in the riverbed sediment of the Fox, the Hudson and the Delaware River basins more than 20 years after the chemicals were banned.

Remediation of contaminated sites difficult

Those sites where groundwater or soil are found to be contaminated with PCBs have been difficult to correct. Typically, efforts to filter PCBs from water have included activated carbons, various types of earth, combinations of the two and digestive ponds. Each of these methods has its respective challenges-including high costs, disposal problems and unsatisfactory results.

For example, one case that would require dredging portions of the Fox River to remove PCBs could end up costing the local paper companies hundreds of millions of dollars. Dredging also presents other hurdles, such as possible further contamination once the silt is disturbed and locating a landfill site to accept the polluted soil.

PCBs in the utility industry

The utility industry--like many others seeking to protect the environment, while at the same time reducing their risk of fines, costly cleanup efforts and unwanted public scrutiny--is striving to prevent PCB contamination of soil and water.

For utilities, the problem occurs primarily in manholes where stormwater is exposed to old transformers and capacitors that may still have oil containing PCBs. The stormwater, which contains traces of oils, lead and PCBs, must be pumped out of the manholes and treated before it can be discharged to municipal sewer systems--an expensive process for any organization.

For one utility, this practice--excluding transportation of the water to the treatment facility--cost 25 cents per gallon. The company called on industry consultant Phil D'Angelo to address its need for a more effective and affordable solution to treat the contaminated water. Working in cooperation with utility personnel, he developed a system using particle filtration and MYCELX technology.

MYCELX, a distinctive class of compounds that can instantly remove pollutants, including an entire range of organic chemicals from water, has been issued a composition patent and multiple application patents. The still relatively new compound is infused into numerous materials, providing the ability to address specific pollutants by using the optimal substrate for the required task.

The new compound attracts PCBs like a magnet, but it is highly repellant to water-a characteristic that allows minimal water to be absorbed by the filters and easier disposal through incineration.

Once pollutants, such as PCBs, come in contact with the new compound, they instantly bond to the material and become hydrophobic and viscoelastic, and are entirely removed from the water stream.

The new compound attracts PCBs like a magnet, but it is highly repellant to water-a characteristic that allows minimal water to be absorbed by the filters and easier disposal through incineration.

In June 2000, the utility began testing the new system, called JMOR 2-2. It uses MX-4 MYCELX-infused filters and LaPoint Industries' particulate bag filters, some of which were infused with MYCELX.

The field tests with the JMOR system produced remarkable results. It removed PCBs, oil and grease, copper and hydrocarbons to below detectable limits (BDL). As an unexpected bonus, the filter system also reduced the particulate lead from the effluent water (**See Table 1**).

TABLE 1

	PCB parts per billion (ppb)	TPH parts per million (ppm)	Oil & Grease ppm	Lead Avg. ppm	Copper ppm
MYCELX Effluent	< 1.0	< 5.0	< 5.0	0.020	< 0.01
Avg. Influent	3.74	367.9	17698	33.0	11.6
Max. Influent	40.0	21400	141000	150.0	87.0

Notes:

*** Values presented are from the utility's analysis of influent and**

*** PCB effluent samples were all < 1.0 ppb**

effluent *** All PCB samples were analyzed a PCB Aroclors**	*** PCB influlent samples had a detection limit greater than 1.0 for some samples and were incorporated as absolute values**

As of mid-October, the utility company had processed approximately 950,000 gallons of manhole influent using the new system. Treatment costs dropped from 25 cents to 2.8 cents per gallon. Based on that figure, the utility realized significant savings--nearly $211,000 in approximately five months.

As a result of the initial success of the JMOR 2-2 system, the utility requested that D'Angelo develop a system that could be deployed in the street at the manhole, eliminating the transportation cost entirely.

The resulting JMOR StreeTreat system uses a unique bag filter assembly and incorporates particulate filtration with the new technology into one assembly. Equally successful, the system is now being evaluated by several other utilities.

Lab tests support field results

Independent test results demonstrated MYCELX's efficiency in removing organic compounds, such as PCBs, even at low-level concentrations, to below the acceptable discharge limit of 0.5 ppb instantly (See**Table 2**). The new technology exhibits a first-pass efficiency of greater than 99 percent. In addition, the new technology produces no pressure drop across the filter, even as it becomes saturated, a property that is unique to the new technology.

The analysis, with a flow rate of 1.35 gallons per minute and 4-liter flow volume, used a re-circulating pump with a 10-inch spunbound polypropylene, 5-micron filter infused with the new technology.

TABLE 2

	RBT5 (Filter infused with MYCELX RB1 formulation) for PCB 1260	MYT6(Filter infused with MYCELX Standard formulation) for PCB 1254
Influent	21 ppb	23 PPB
Influent	BDL	BDL

Note: The analysis was performed by Analytical Services Inc. using EPA Method 608

A win-win situation

Given that manufacturers, utility companies, government agencies and others will likely spend hundreds of millions of dollars in efforts to remove residual PCBs from spill sites and riverbeds where siltation and stormwater have deposited the toxins over the years, the recent test results offer effective, affordable options to prevent further environmental damage as a result of PCBs.

The end results of this successful case study and the supporting lab tests are good news for the environment and for the industries charged with preventing PCBs from contaminating our water resources.

e-sources

Monitoring for PCBs -
http://www.state.nj.us/drbc/PCB_info.htm
EPA office of pollution prevention and toxics -
http://www.epa.gov/opptintr/pcb/
EPA region 2 -
http://www.epa.gov/region02/superfnd/hudson

Hal Alper, the inventor of MYCELX, is president of MYCELX Technologies Corporation, a Georgia-based environmental company that is the sole manufacturer and marketer of patented MYCELX technology.

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