

**A report from the Sixth Annual
RadWaste Summit, held September
4-7, 2012, in Las Vegas, Nev.**

Y-12's Mercury Problem

Imagine a 35-millimeter film canister. It's about one and three-quarters inches high, and about an inch in diameter (4.5 cm high by 2.5 cm in diameter). Approximately 1 pound of mercury will fit in that canister. Now imagine 2 million of those canisters gone missing—with an estimated 700 000 of them probably released to the environment. That's the extent of the mercury contamination problem at the U.S. Department of Energy Oak Ridge Reservation's Y-12 plant. The problem was the subject of an extended discussion at the Sixth Annual RadWaste Summit last September, sponsored by Exchange Monitor Publications and Forums.

Sue Cange, acting manager for Environmental Management at the

radius of the Oak Ridge site, Cange stated.

The mercury contamination stems from a procedure used at Y-12 between the mid-1950s and 1963. The Column Exchange—or Colex—process was used to separate lithium isotopes for use in nuclear weapons production. The process used more than 20 million lb of mercury, some 10 percent of which is now “unaccounted for,” with about 700 000 lb suspected to have been released to the environment. The primary sources of contamination, Cange said, are the four large process facilities still standing on the Y-12 site.

A complicating factor, Cange noted, is that Oak Ridge is “blessed” with shallow groundwater, and mercury continues to pollute the waterways in

levels, but concentrations in surface waters still significantly exceed regulatory standards, and mercury-contaminated buildings continue to deteriorate, increasing the risks and costs of demolition.

The path forward, Cange said, involves the development of a strategic plan to address characterization, technology development, decontamination and demolition, and waste disposition. Long-term, the DOE will address mercury sources in a “west to east” approach, following the flow of surface water and groundwater. Sources of contamination must be removed first, followed by remediation of soils and creek sediments, and finally, cleanup of surface waters and groundwaters. But the main impediment to cleanup, of course, remains funding. Cange said taking down the four process buildings alone has a price tag of \$1.6 billion.

Diane McDaniel, senior program manager for Legacy and Environmental Management for B&W Y-12, then operator of the Y-12 site, gave more details about the sources of mercury contamination. The four process buildings are located in two general areas: the Alpha 2 and Beta 4 buildings, both about 300 000 square feet, are located in one area, while the Alpha 4 building (500 000 ft²) and Alpha 5 building (600 000 ft²) are located in the other area. One puzzling aspect of the mercury contamination problem, McDaniel continued, is that while mercury levels in East Fork Poplar Creek, which runs through the Y-12

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DOE's Oak Ridge Office, pointed out that the Oak Ridge Reservation is a site with an ongoing DOE mission. Therefore, cleanup work must be done in places where people continue to work, adding to the difficulty. In addition, some 700 000 residents live and work within a 30-mile

east Tennessee. Despite that, there are no imminent health impacts, she said, primarily because of fish advisories. Over the past two decades, Cange added, the DOE has undertaken several mercury mitigation actions, and, overall, a 75 percent reduction has been measured in released mercury

site, have decreased over the past couple of decades, fish contamination has increased slightly, thus remaining far above consumption advisory levels.

McDaniel detailed some of the mercury abatement steps taken over the past 25 years, including storm drain cleanup, pipe rerouting, and floodplain soil removal. Since 2003, visible mercury removal has yielded some 85 lb of the metal removed. But 85 lb compared to 2 million lb reveals the extent of the remaining problem. Long term, the process buildings must be demolished, so that the underlying soil can be characterized and remediated. In addition, contaminat-

molition. The site is developing waste management strategies to deal with these issues, Bradford said.

Eric Pierce, Applied Remediation Science Program lead at Oak Ridge National Laboratory (ORNL), provided a scientific look at the problem and its possible solutions. We are looking at new ways to help with the mercury cleanup, he said—for instance, can you adapt a technology that works with organics to clean up mercury? Among the various research projects being conducted at ORNL in this regard, Pierce highlighted several, including a look at novel adsorbent material, the devel-

After the mercury is all recovered, Oak Ridge will still face the problem of mercury disposal, as well as the disposal of debris material from soil cleanup and building demolition. The site is developing waste management strategies to deal with these issues.

ed sediments must be removed from Upper East Fork Poplar Creek and Lake Reality, and water treatment must continue.

Jim Bradford, with URS|CH2M Hill Oak Ridge, known as UCOR, noted that the good news is that “we know how to do decontamination and decommissioning and soil remediation.” The challenge, however, is the *scale* of the mercury problem at Oak Ridge. So far, “lots of little things have been done,” he said, but there’s been no overarching project to direct all this work. Now, however, Oak Ridge is creating the various documentation needed to attack the problem in an organized way. And work continues to chip away at the problem. For instance, Bradford continued, characterization of the Alpha 5 building has been completed, and a portion of the legacy waste materials have been removed from the Beta 4 and Alpha 5 buildings.

Furthermore, after the mercury is all recovered, Oak Ridge will still face the problem of mercury disposal, as well as the disposal of debris material from soil cleanup and building de-

velopment of a new approach for locating subsurface mercury, and proposals for an innovative approach to surface water monitoring.

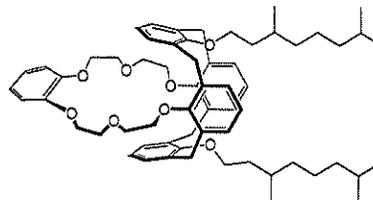
A commercial viewpoint was presented by Jim Blankenhorn, chief operating officer of Perma-Fix Environmental Services Inc. He recommended that Oak Ridge partner with suppliers and treatment companies, bringing them in on the discussions as an overall strategy is developed. The cleanup activities will generate a diverse set of mercury and mercury-contaminated waste streams with varying physical, chemical, and radiological constituents, he said, and so the cleanup will require a “suite of capabilities.” In addition, the treatment capabilities often require secondary waste processing (for offgases, liquid effluents, and other waste streams). Unique waste streams will require the development or adaption of treatment capabilities, he said. Bringing in treatment companies at the beginning of the process is important because it may take companies some time to “gear up” for the work.—*Nancy J. Zacha, Editor*

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