



International partnership produces innovative technology for nuclear cleanup in Russia

As part of a four-member international partnership, CH2M HILL is testing new technology to stabilize high-level radioactive nuclear waste and other materials at the Mayak nuclear complex, a radioactive waste management plant located in the Chelyabinsk region of Russia's Southern Ural Mountains.

The project is a long-term commitment to the region and provides strategic benefits to CH2M HILL's nuclear services resume, while putting the firm in the forefront of helping to clean up and secure dangerous materials across the globe.

Radioactive waste is managed at Mayak using reservoirs, storage tanks, waste burial sites and a vitrification plant. By the late 1990s, the site had accumulated more than 650,000 cubic yards (500,000 cubic meters) of solid radioactive waste, and 520,000 cubic yards (400,000 cubic meters) of liquid radioactive waste. As a result of accidents and discharge of liquid waste over the years, Russian President Vladimir Putin issued a mandate to clean up the site and mitigate risks to public health and the environment.

Key to the success of the project is a four-party agreement between the Vernadsky Institute (Russian Academy of Sciences), Mayak Chemical Combine, Argonne National Laboratory (U.S. Department of Energy) and CH2M HILL. While this can present a set of management challenges regarding varying objectives, strategies and funding sources, CH2M HILL has worked with the partnership team through diplomacy, respect and intense collaboration to keep the project on budget and on schedule.

Project sensitivity is heightened by the fact that the proposed pilot plant will be a joint U.S./Russian design-build-operate project inside a Russian production site. CH2M HILL is working closely with Argonne to test new technology for the high-level



Two signs are posted near the Mayak site. One advertises the nearby natural reserve area, while the second warns of high radiation doses.

waste at the site. If successful, CH2M HILL will have the chance to continue the process and conduct the actual site cleanup.

The new stabilization technology, involving an ambient temperature process for converting the waste to a ceramic mineral in a simple cement mixer, is designed to achieve acceptance standards for high-level waste disposal as well as create a material that is no longer attractive to terrorists seeking materials for weapons.

The ceramic mineral process has inherent advantages over the conventional glassification process. The technology is inexpensive, simple and versatile, and operates at ambient temperature and pressure conditions. Essentially, chemicals are added to the waste to convert radioactive metals into insoluble compounds, and then chemically bind the compounds into one of several stable ceramic forms.

"Until now, all countries have focused on developing glass forms," said David Maloney, CH2M HILL's project manager. "But glass is a high temperature process with inherent processing hazards, and research indicates that glass has difficulty incorporating many of the waste constituents at high concentrations. Russia has officially changed its policy such that glass is now considered only an intermediate solution. The (U.S.) National Academy of Sciences has issued recent reports that ceramics may be better forms."

Once demonstrated on actual production (fuel reprocessing) waste at Mayak, the CH2M HILL/Argonne process can be implemented at other sites, or even deployed in the field where materials are stored or intercepted.

In addition, 8,000 weapons scientists and engineers will be indirectly kept employed because the site will be allowed to continue its operations during technology testing. Otherwise, these experts' employment would be at risk, making them attractive to organizations that pose potential threats. The Mayak site will also eventually accept and reprocess spent nuclear material from the Russian Navy and from Kazakhstan and other Former Soviet Union states—making it all the more important that the project succeed in keeping the site operating and its weapons experts employed.

CH2M HILL's Mike Rengel, who is spearheading the strategic effort as well as coordination with the firm's international partners, sums up the Mayak project by comparing it to the firm's cleanup expertise in the United States. "Mayak is considered by many as the Rocky Flats (in Denver, Colo.) site of Russia. The clean up of 50 years of nuclear weapons production at the Mayak site is the greatest nuclear cleanup challenge in the world. What better place for CH2M HILL to bring its nuclear cleanup expertise." LIN Ltd

CH2M HILL is part of a four-member international team testing new technology at a nuclear site in Russia.

