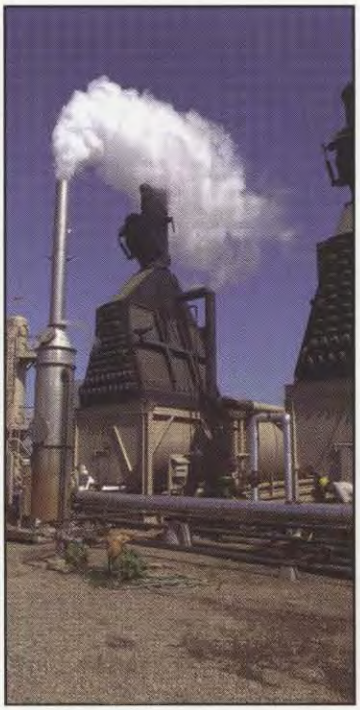
Hot Technology Removes Contamination

If the Laboratory had used conventional methods in 1993 to clean major leaks from its underground gasoline tanks, the project would still be under way. Estimates had pegged the time at 30 to 60 years to remove thousands of gallons of gasoline that had leaked into the soil beneath the shipping and receiving area north of East Avenue. But instead of decades or even years, the 7,600 gallons of gasoline were mopped up in about four months using remediation technologies developed by Laboratory scientists Roger Aines, Robin Newmark, and John Ziagos in collaboration with a University of California at Berkeley researcher.

The technique, called dynamic underground stripping, involves injecting steam to heat the ground. Contaminants are vaporized and driven to extraction wells, where they are easily removed from soil and water. The heat and forced air chemically break down many contaminants in place, leaving harmless compounds. Electric currents heat soils that are too impermeable for steam to penetrate. The treatment of contaminants is even more effective when dynamic underground stripping is combined with two related remediation technologies subsequently pioneered by Livermore researchers: electrical resistance tomography, for monitoring an underground clean-up in real time; and hydrous pyrolysis/oxidation, which destroys pollutants where they are found underground.

Department of Energy officials have estimated that the Livermore-developed environmental technology has the potential to remediate up to one-quarter of the nation's 1,300 Superfund sites. Already, the technology has achieved remarkable success cleaning a Superfund site in Visalia, California, between 1997 and 1999. For nearly 60 years up to 1980, Southern California Edison had treated utility power poles with carcinogenic wood preservatives such as creosote and pentachlorophenol, some of which leaked into the ground. Using older clean-up methods at Visalia, about 275 pounds of contaminants had been removed in one nine-month period. However, with the use of the Livermore technology, Southern California Edison, working with the Laboratory and a licensee, was able in a similar nine-month period to pull about 540,000 pounds of pollutants—almost 2,000 times more. During the entire three-year Visalia clean-up, about 1.2 million pounds of contaminants were removed from the four-acre site using the dynamic underground stripping technology. Now many sites that were considered uncleanable like Visalia are being considered for the steam approach.

To date, three California companies—SteamTech Environmental Services of Bakersfield, Southern California Edison of Rosemead, and Integrated Water Resources Inc. of Santa Barbara—have licensed the Livermore environmental technologies. Beyond the Visalia clean-up project, these three companies have or will be using the dynamic underground stripping technologies to clean nine U.S. sites contaminated with difficult underground pollutants. The sites include Cape Canaveral, DOE's Savannah River Site and Pinellas Plant, and Beale Air Force Base.



Two complementary technologies pioneered at Livermore are successfully cleaning up contaminated groundwater and soil at facilities in several states. Hydrous pyrolysis/oxidation combined with dynamic underground stripping are destroying contaminants in situ as well as bringing them to the surface at 5,000 times the rate of other technologies.