Air Waste Stream Treatment Technologies

Cleanup
CU-131

LEAD AGENCY: Air Force

LAB: McClellan AFB

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PROBLEM STATEMENT: With the passage of the Clean Air Act, development of acceptable technologies for remediation of air waste stream has become an urgent issue. At McClellan, installation of a remedial action (e.g., Soil Vapor Extraction) was jeopardized because of a lack of acceptable air treatment technology. Most of the current technologies use incineration or activated granular charcoal to destroy or contain VOCs. Both the technologies are inefficient. Incineration produces a number of byproducts (e.g., HCl, NOx, etc.), while charcoal is ineffective with a number of contaminants, such as vinyl chloride. In a number of cases, the base's mission is jeopardized because of the air quality issues.

This project is in the technology demonstration and transfer category.

McClellan was selected as Tri-Services National test site for chlorinated solvents remedial technologies. Air Waste Stream treatment technologies need to be tested and developed at McClellan as there is a great need for these systems across DoD.

PROJECT DESCRIPTION: At McClellan, a number of remedial systems have been implemented that produce air waste streams. There are three pump and treat systems where water is air-stripped and VOCs are then incinerated. In addition, a soil vacuum extraction system has also been constructed and VOCs are then destroyed by catalytic oxidation. However, both systems produce unacceptable levels of NOx and HCl that is affecting the base mission capabilities. The current systems at McClellan produce a number of VOC in high concentrations in air phase. The compound detected are 1,1,1-TCA, 1,1-DCE, TCE, 1,1-DCA, C-1,2-DCE, Freon 113, Vinyl Chloride, Toluene, and Methylene Chloride at concentration of over 3000 ppm. Two air treatment systems are being considered for demonstration and development at McClellan. They are:

1) Air Biofilters: The system being considered uses bacteria to destroy the contaminants. The biofilter uses molded HDPE trays (covered with a patented media) in series to aerobically biotreat VOCs. The waste stream is mixed with non-chlorinated water to facilitate bacterial activity. This technology process was successful for petroleum hydrocarbon; however, it has to be developed for chlorinated solvents and 2) Photocatalytic System: The technology removes and destroys organic pollutants from air waste streams by using an illuminated titanium dioxide catalyst (Ti02-coated mesh). Photocatalytic reactor cells are arranged in series or parallel. The reactors contain a stainless steel jacket, a photocatalytic matrix, and a lamp for illumination. The lamp emits low intensity ultraviolet light and is mounted coaxially within the jacket. A sleeve of fiberglass mesh coated with Ti02 is wrapped around the lamp. The Ti02 catalyst is activated by the light to create hydroxyl radicals which break down the organic molecules. Air flows into the reactor and passes through the catalyst matrix.

The remedial systems are McClellan AFB are designed to facilitate testing of these technologies. These will be attached to current systems through slip stream.

This project directly contributes to the objectives identified in the Tri-Service Environmental R&D Strategic Plan, Pillar 1: CLEANUP: 1.I: "Treatment of Solvents in Groundwater; 1.M: Treatment of Solvents in Soils and 1.N: Treatment of Fuels in Soils.

EXPECTED PAYOFF: Currently, pump and treat are perhaps the most widely used groundwater treatment technologies available. The insitu bioremediation is an extremely cost effective clean alternative that will reduce the risk quickly. In addition, it has wide applicability across the country.

TRANSITION PLAN: McClellan, under EPIC, has set up a number of initiatives to transition the information generated by demonstration quickly to potential users. They are:

a. Greensheets: Information is sent out regularly to over 2000 people.

b. Public/Private Partnership: EPIC has an agreement with EPA (TIO & SITE) and seven private companies (AT&T, Monsanto, DOW, DuPont, Southern California Edison, Beazer, and Xerox) to jointly test and share cost and performance data of innovative remediation technologies.

c. National Test Site: McClellan was identified as a Tri-Services National Test Site for chlorinated solvent remediation technologies. The result from this demonstration will be transferred within DoD to potential users.

d. McClellan is proposing to be Western Governors' Association demonstration site and will be developing plan to help in the deployment and commercialization of the technologies tested at the site.

e. McClellan is proposing to enter in an understanding with the State of California where the technologies tested at McClellan will be jointly evaluated and "certified" by the State.