NAVFAC Naval Facilities Engineering Command
Engineering and Expeditionary Warfare Center

TechData Sheet

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Zero-Valent Zinc to Treat 1,2,3-Trichloropropane (TCP)

Technology Description

Test Columns: zinc (gray), iron (black)

Recently concern has arisen regarding 1,2,3-Trichloropropane (TCP) at DoD sites. The presence of TDP is most likely due to spills associated with its use as a solvent for paint and varnish removal and cleaning/degreasing activities. Because its toxicity to humans appears to be high relative to other chlorinated solvents, even low-level exposures to TCP could pose significant human health risk. TCP non-cancer endpoint data have led the U.S. Environmental Protection Agency (EPA) to propose a reference dose of 4 µg/kg-day and place TCP on its drinking water contaminant candidate list (CCL3). The California EPA, Department of Public Health (CDPH) has set a notification level of 0.005 parts per billion (ppb) for TCP in drinking water, which is much lower than the corresponding level for 1,1,1-trichloroethane (TCA) or trichloroethene (TCE) and has established a public health goal (PHG) of 0.0007 ppb in drinking water. CDPH is currently developing a Maximum Contaminant Level (MCL) for TCP, which is expected to be released for public comment in 2014.

EXWC has demonstrated at pilot scale a promising ex situ technology capable of meeting health-protective concentrations without compromising secondary water quality characteristics. Zero-Valent Zinc (ZVZ) reductively degrades TCP to innocuous non-chlorinated end products, similarly to zero-valent iron (ZVI) which is used to degrade TCE. Scale up information for ex situ application of this technology is included in the demonstration project's final report.

Value to the Warfighter

Use of ZVZ technology allows the continued use of existing, developed wellfields and precludes diversion of significant resources to connect to municipal water supplies. One southern California water supply would charge in excess of $140M in a one-time Readiness-To-Serve (RTS) fee, in addition to commodity and water delivery costs.

Economics of the Technology:ROI or Payback

Calculations in this section are based on ex situ treatment. The cost of full-scale wellhead treatment infrastructure sized for 1200 gallons per minute capacity is estimated at $1M. Material costs (zinc only) for treating this flowrate range from $0.05 to $0.12 per 100 cubic feet of water treated, or $4M to $10M per year. However, connection to a municipal water supply could cost approximately $146M in a one-time Readiness-To-Serve fee, plus approximately $2M in annual commodity costs and $20,000 in annual delivery costs.

Technology Transition Documentation

This is a Transition Category 4 for improving knowledge base for waste treatment operators in the Navy.

Site Implementation

An in situ application of the technology using a permeable reactive barrier is currently being installed in Area 22/23 at Camp Pendleton, CA to secure the drinking water supply.

Specific Applications

The Final report on the ex situ demonstration of this technology is available through Dr. Nancy Ruiz, This technology was developed under the OSD's Strategic Environmental Research and Development Program (SERDP), project ER-1457, and pilot tested under the Navy's Environmental Sustainability Development to Integration (NESDI) Program, project 434.

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