CLEANUP

VOC OFF-GAS TREATMENT TECHNOLOGIES DEMONSTRATION AND COMPARISON

LEAD ACTIVITY
Southwest Division Naval Facilities
Engineering Command (SWDIV)

STATUS
Active

MISSION
Integrate efforts of the Installation Restoration (IR) Program and the Research and Development (R&D) program by demonstrating an innovative volatile organic compound (VOC) off-gas treatment technology and producing a searchable database tool to assist Remedial Project Managers (RPM) in technology selection

REQUIREMENT
Members of the Navy-established Alternative Restoration Technology Team (ARTT) recognized a gap between IR needs and proposed R&D projects. An effective process to integrate needs and projects was required. Since the Navy has many sites where VOC emissions (off-gases) are generated during both remediation projects and normal operations, innovative technologies to provide faster, better, and cheaper VOC emissions treatment are also required. An easy-to-use database of VOC off-gas treatment technologies would assist RPMs in choosing a suitable technology.

DESCRIPTION
At the January 1997 ARTT meeting, members recommended a process change to better integrate IR needs and R&D efforts by (1) successfully demonstrating an innovative technology related to a specific IR need, (2) creating an easy-to-use technology selection tool for RPMs, and (3) improving the process to integrate the programs in the future. A proposal to perform a VOC off-gas treatment technology demonstration through NELP was submitted and approved as a part of this effort.

PTI System at Site 9

At Naval Air Station (NAS) North Island IR Site 9, a soil vapor extraction (SVE) system was operating using carbon adsorption with on-site steam regeneration to treat VOC off-gas emissions. A NELP project also was underway at Site 9 to demonstrate an in-well air stripping technology (see NoVOCs™ project) using flameless thermal oxidation as the VOC off-gas treatment technology. The IR program had a need to find a treatment system that had an increased removal efficiency to address community concerns regarding VOC off-gas. A proposal to demonstrate the Process Technology, Inc. (PTI) ultra violet (UV) oxidation system on a slip-stream of the Site 9 VOC off-gas to determine its efficiency in treating the off-gas was submitted to, and approved by, R&D program managers. Thus, a direct comparison of three treatment technologies could be achieved for a specific IR need.

To fast track this project and facilitate the success of this project, innovative contracting mechanisms were used. PTI was already an approved vendor through the Naval Facilities Engineering Service Center (NFESC) Broad Agency Announcement (BAA) process (see NFESC BAA in the partnerships section), thereby reducing considerably the time required to establish a contract. In addition, the project team opted for a combined fixed price and fixed unit price contract to increase incentive and minimize risk. The Navy agreed to pay for all mobilization, demobilization, work plan, report, and sampling requirements on a fixed price basis. All of the field work was based on a negotiated fixed unit price basis, such that PTI was paid only for the mass of contaminants treated.

In addition, the project team held over-the-shoulder review meetings to shorten the work plan preparation time. PTI's system was used to treat a slip-stream that was then discharged back to the inlet of the carbon adsorption system, so no new waste streams were generated, helping to convince regulators of a quick buy-in to the demonstration.

The demonstration results indicated that the PTI system, consisting of a fluidized bed concentration unit and a photolytic destruction unit, was successful at removing VOCs in the SVE off-gas to below the maximum allowable emissions at Site 9 of 25 parts per million by volume. The PTI system achieved an average total VOC destruction and removal efficiency of 95.44 percent. The estimated unit cost of implementing a 3,000 standard cubic feet per minute PTI system at Site 9 was $3.77 per pound of VOC treated.

Once the demonstration was complete, the project team wanted to develop a tool for RPMs to make the demonstration data more useful. NFESC performed a comprehensive literature search to find all of the available, proven VOC off-gas treatment technologies. Cost and performance data were compiled into a searchable database that used tools to evaluate and screen those technologies. The database has a built-in *Unit Cost Estimator* for calculating unit treatment cost in dollars per pound of VOC treated. The database also provides two kinds of graphics-based screening tools: *Screening Matrix* and a version of *Expert Choice™ Pro 9.0.* The *Screening Matrix* rates each treatment technology and its associated commercial configurations according to thirteen criteria. *Expert Choice* is a system for the analysis, synthesis, and justification

of complex decisions and evaluations. NFESC will continue to maintain and update this database to provide RPMs with an easy means to research the available VOC off-gas treatment technologies for their needs.

Based on the success of this project, a revised process for integrating IR cleanup needs with R&D efforts was implemented immediately. R&D projects that can be applied at a current IR site are submitted on an annual basis to the ARTT. All applications are reviewed and compared by the ARTT members and NFESC technical experts. The projects deemed to have the greatest potential overall program cost savings are then funded for implementation. Approximately $250,000 is awarded per project. Two additional projects were selected in fiscal year (FY) 1998 and three more have been selected for FY 1999.

BENEFITS

- Integration of IR needs with R&D capabilities helps focus R&D projects on immediate field needs
- The database allows the user to compare and select technologies that meet site-specific conditions by letting the user make tradeoffs on different parameters in order to determine the optimum technology or system, saving time required to research these technologies
- Use of innovative contract and cost mechanisms reduced government risk in demonstrating innovative technologies and saved the Navy $60,000

ACCOMPLISHMENTS/CURRENT STATUS

Date	Activity
JAN 1997	ARTT meeting implementing first integration of IR and R&D programs
APR 1997	PTI UV oxidation system project approved
JUN 1997	PTI contract awarded
AUG 1997	Request for project proposals sent to all Navy Engineering Field Division (EFDs) and Engineering field Activities (EFAs)
SEP 1997	PTI workplan approved
OCT 1997	Two ARTT projects selected for implementation in FY 1998
OCT 1997	PTI mobilized at NAS North Island
FEB 1998	Demonstration of PTI completed at NAS North Island
APR 1998	PTI contract deductive modification awarded, allowing funds to be used on another project
MAY 1998	PTI technology evaluation report completed
JUL 1998	Comparison database developed for off-gas treatment technology
AUG 1998	Another request for proposals sent to EFDs and EFAs
OCT 1998	Two additional ARTT projects selected for implementation in FY 1999
JAN 1999	Internet version of the database to be available

FUTURE PLAN OF ACTION & MILESTONES

Date	Activity
Ongoing	Ongoing request for more project proposals

COLLABORATION/TECHNOLOGY TRANSFER

The project team consisted of SWDIV and NFESC. Because of the quick success of the PTI demonstration, the new IR and R&D integration process was immediately implemented. A request for additional projects was submitted in August 1997, and 2 of 15 new project proposals received were selected for implementation in fiscal year (FY) 1998 by ARTT. Another request for proposals was submitted in August 1998, and 19 proposals were evaluated by ARTT; 3 were selected for implementation in FY 1999.

BIBLIOGRAPHY

- Volatile Organic Compound Off-gas Treatment Technology Demonstration and Comparison Summary, SWDIV/NFESC/NAVFAC.
- NAS North Island. Thermatrix NELP Technology Demonstration Report. San Diego, CA. February 1996.
- PTI's Photolytic Destruction Technology Demonstration Final Report, NAS North Island.
- Volatile Organic Compound (VOC) Off-Gas Treatment Technology Demonstration and Comparison, SWDIV/ NFESC.
- VOC Off-Gas Treatment Technology Database (final report) for the Remediation Project Manager, SWDIV/NFESC.

RELATED GOVERNMENT INTERNET SITES

Naval Facilities Engineering Service Center Home Page

RELATED NAVY GUIDEBOOK REQUIREMENT

- 01002 VOC and HAP Emissions Control from Solvent Cleaning Operations
- 01005 VOC and PMO Emission Control on Paint Spray Booths

UPDATED: 03/01/02