TechData Sheet

Naval Facilities Engineering Service Center
Port Hueneme, California 93043-4370

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Assessment and Remediation Technologies for Environmental Cleanup

Photolytic Destruction Technology for Chlorinated and Petroleum Hydrocarbons

The Naval Facilities Engineering Service Center (NFESC) and Southwest Division (SWDIV) are completing an innovative installation restoration project at Site 9 at NAS North Island. The project demonstrated photolytic destruction technology for the remediation of chlorinated and petroleum hydrocarbons. This remediation project is being completed under the Broad Agency Announcement Program (BAA) and the Navy Environmental Leadership Program (NELP).

NAS North Island Site 9 is located across San Diego Bay from the City of San Diego. Trenches at Site 9 have historically been used for the disposal of: chlorinated solvents, caustics, acids, and ceramic and metallic compounds.

Eighteen specific volatile organic compounds (VOCs) and carbon dioxide have been identified in the exhaust vapor of the existing soil vapor extraction (SVE) system. Process Technologies, Inc. (PTI) was selected by SWDIV to use "photolytic destruction (PD)" for removal of VOCs from the exhaust of the SVE system. See Figure 1.

Figure 1. Photolytic destruction system adsorber tank.

Photolytic Destruction Technology

Photo-chemical oxidation of VOCs mimics the natural process of breaking down ozone-depleting chemicals in the stratosphere. As the light wavelength decreases or becomes shorter than that of visible light, the energy level of the photons increases. Short-wavelength photons (UV light in the 170 to 254 nm range) are capable of efficiently destroying halogenated hydrocarbons. The bonds between the hydrocarbon chains are broken and the molecules are left in a "free radical state."

Breakdown products and acids produced in the photolytic reactor are controlled through the use of a reagent panel that chemically reacts with gaseous breakdown products forming solid, stable products (Figure 2).

Field Demonstration

The PD demonstration was completed within 8 months. Remediation was performed on vapor phase contaminants at Site 9 through a series of treatment steps. These

NOTE: This document is for informational purposes only and is not an endorsement. Applicability for remediation must be evaluated on a site-specfic basis.

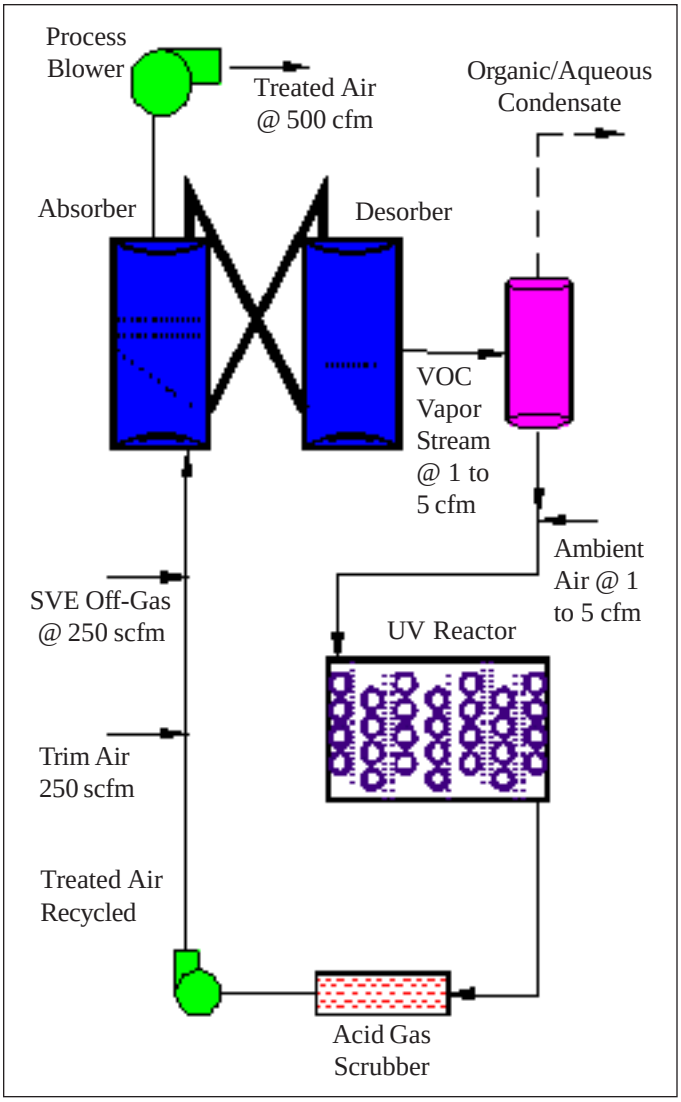

Figure 2. Schematic diagram of the photolytic destruction process.

steps involved the use of a "concentration unit" and a "photolytic reactor" as follows:

- The concentration unit consists of a fluidized bed adsorber/desorber unit that consolidates organics up to 1,000 times their original concentration while maintaining a low flow vapor stream. The flow rate of the vapor stream from the SVE system is approximately 250 scfm.

- The concentrated vapor stream is treated in the photolytic reactor with ultraviolet (UV) lamps with emission wavelengths in the 185 to 254 nm range.

- The reaction by-products are stabilized with a reagent composed primarily of calcium hydroxide. The resulting compounds are stable salts, such as calcium chloride.

- The spent reagent does not exhibit any characteristic of a hazardous waste and can be used as feedstock for cement production.

The photolytic destruction technology demonstration schedule was:

Contract awarded	30 Jul 1997
Mobilized to site	20 Sep 1997
Completed installation/began startup	9 Oct 1997
Field demonstration completed	22 Jan 1998
Issued final report	7 Mar 1988

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