

Evaporative Desorption Technology (EDT) as Remedial Measure for On-site Soil Treatment during RCRA Facility Closure Process

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• Fundamentals of Evaporative Desorption Technology (EDT)

- Case Study of a RCRA Facility Closure using EDT
 - Site background
 - Selection of EDT as Remedial Solution
 - Approach to Site Clean up
 - EDT Results



Fundamentals of EDT



Evaporative Desorption Technology (EDT) is a **flameless electric**, **ex-situ**, **batch**, low temperature thermal desorption, soil remediation technique performed **static**ally in a **closed chamber under light vacuum**.

Convection, rather than conduction, is the primary means for delivery of heat energy to the process chamber and for removing extracted contaminants.







Blue-shaded boxes indicate operations outside of the Reterro processing equipment.







Case ND03 Case ND05 Soil Temperature **Convective Soil** 700 638 Heat Transfer 575 513 within EDT 451 388 **Treatment Bin** 326 264 201 139 77 [F] Time = 40 [s]























Automated EDT Process Controls

- Sets process parameters
- Monitors and records
 treatment process
- Provides early warning of process variance













Site Characteristics	Soil <u>Characteristics</u>	Contaminant Characteristics
Project size	Plasticity & Density	Type(s)
Accessibility	Particle size distribution	Concentration(s)
Weather	Moisture content	Vapor pressure & Boiling point
Operating restrictions	Humic content	Water solubility
Electrical service	Metals content	Thermal stability



Implementation of EDT for RCRA Facility Closure Fullerton, CA 2014-2015



Case Study Facility Information

- 45-acre Former instrument manufacturing plant in Fullerton, CA
- Operated between 1954 and 2010
- Designated a large quantity generator for hazardous waste
 - Chlorinated solvents PCE and TCE







• Site Geology

- Man-placed Fill Predominantly Clayey silt w/inorganic debris
- Native Soil Predominantly fine-grained clayey silty sand, silt and clay
- Hydrogeology
 - Groundwater zones between 30' and 100' bgs

Contaminants of Concern

• PCE, TCE and degradation products in soil, soil vapor and groundwater

Identified Exposure Pathways

- Vapor Intrusion
- Dermal Contact
- Leaching to Groundwater





- Soil and soil vapor impacts within fine-grained soils (0 - 15 feet bgs)
- Vapor plume delineated to:
 - Residential Screening Level (0.18 ug/l)
 - Industrial Screening level (0.53 ug/l)
- Maximum PCE Concentrations in vapor and soil:

Development Phase	Vapor (ug/l)	Soil (mg/kg)
Phase 1 (mix)	6.59	0.11
Phase 1 (com)	15.9	<0.002
Phase 2 (res)	390	13
Phase 3 (res)	243	16





Proposed Property Sale for Residential/Commercial Development

Considerations

- Expedited soil remediation and facilitate unrestricted property use
- In situ technologies eliminated from further consideration given low permeability soil and treatment time needed to achieve the cleanup goals





Soil Remedial Action Objectives

 Reduce contaminant mass in soil and soil vapor (*originally estimated at 60,000 tons*) to:

Consultant Retained Two Remedial Alternatives

 Off-site Transportation and Disposal
 ➤ Eliminated alternative due to trucking emissions

2. On-site Treatment using EDT

Retained for Pilot Testing







Initial EDT Pilot Test Scope of Work

- 1,100 tons in Areas 1, 2 & 3
- Determine level of VOC reduction for a range of soil types and VOC concentrations

Preliminary Soil Remediation Goals

сос	Regional Screening Level (RSL)	
PCE	4.4 mg/kg	
TCE	0.182 mg/kg	

EDT Pilot proved successful in ~1 month -Regulatory Agency approved extended test





Extended EDT Pilot Test Scope of Work

- 8,800 tons across site
- Confirm that final soil and soil vapor goals can be achieved

Soil and Soil Vapor Remediation Goals

сос	RSL	Soil Goal SSL (gw)	In situ Soil Vapor Goal (res)
PCE	4.4 mg/kg	0.0023 mg/kg	0.18 ug/l
TCE	0.182 mg/kg	0.0018 mg/kg	0.52 ug/l





Soil and Vapor Sampling of Treated Stockpiles

Case Study Extended Pilot Test Summary





Multiple Lines of Evidence used to Confirm Cleanup Goals and to Show Mass Removal







Case Study Full Scale EDT Soil Remediation

Full Scale EDT selected for Soil Remediation

- ~97,000 tons soil for EDT processing
- Installed 2nd EDT system in Bldg 8
- Grid power connection
- 24/7 operation
- Treat & stockpile pending Regulatory approval













Results of EDT Soil Treatment







EDT Soil Treatment Baseline Process Schedule Requirements



3 significant "soil stops" in July, August & September

Confidential









Confidential



Conclusions



- ~100,000 tons of soil treated by EDT in 14 months
- 6.4% (~7,000 tons) required reprocessing to meet treatment goals
- Soil backfilled and additional round of confirmation vapor samples collected to confirm final cleanup goals for residential reuse (no rebound)
- Regulatory agency issued "Soil Corrective Action Completion" within 2 years of the start of remediation project
- Property sold for redevelopment with on going groundwater remediation



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Stockpile Management

Case Study Full Scale EDT Results

