



COMPLETE ENVIRONMENTAL SOLUTIONS



Innovative Pollution Control For Remediation Applications

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CONSULTING ► ENGINEERING ► DESIGN ► PERMITTING ► FABRICATION ► INSTALLATION ► SERVICE

Presentation Overview

1. Remediation Industry
2. Types of Treatment
 - Activated Carbon
 - Soil Vapor Extraction (SVE)
 - Air Strippers
 - Oil Water Separators
3. Thermal Oxidizer Technology
 - Catalytic Thermal Oxidizer
 - Recuperative Thermal Oxidizer
 - Direct Fired Thermal Oxidizer
 - Regenerative Thermal Oxidizer
4. Case Study
5. Ship & Shore Capabilities



Remediation Industry

INDUSTRY TRENDS AND EXPECTATIONS

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- More stringent air quality regulations
- Expected clean up timeline goals
- Need to select safe and cost-effective solution

Activated Carbon

SHORT-TERM SOLUTION

- Activated carbon evaluated first as Best Available Technology (BAT)
- Vapor phase carbon (VPC)
- May not be best long-term solution
- More expensive
 - Carbon usage and cost of carbon
- Safety concern
 - Carbon bed fires if VOC causes exothermic reaction



Soil Vapor Extraction (SVE)

Soil Vapor Extraction (SVE)

- Technique that removes contaminants and hazardous vapors from soil subsurface
- Uses vacuum pressure to pull air through soil that has been saturated with hydrocarbons or VOCs
- Can be combined with a thermal oxidizer to further treat remaining gas



Air Strippers

Air Stripper

- Designed to remove hydrocarbon and or chlorinated compounds from water
- Recovered groundwater pumped into top of system.
- As contaminated groundwater enters through the top of the air stripper, millions of air bubbles are forced by the blower pressure up through the perforated trays, vigorously aerating the water to a froth and removing volatile contaminants (VOC) as gravity pulls the water down through each tray.



Oil Water Separators

- Designed to accelerate natural separation between water and hydrocarbons
- Recovered groundwater pumped into first chamber, where small oil droplets contained in mixture coalesce and form large droplets that flow to surface
- Large oil droplets collected for proper disposal

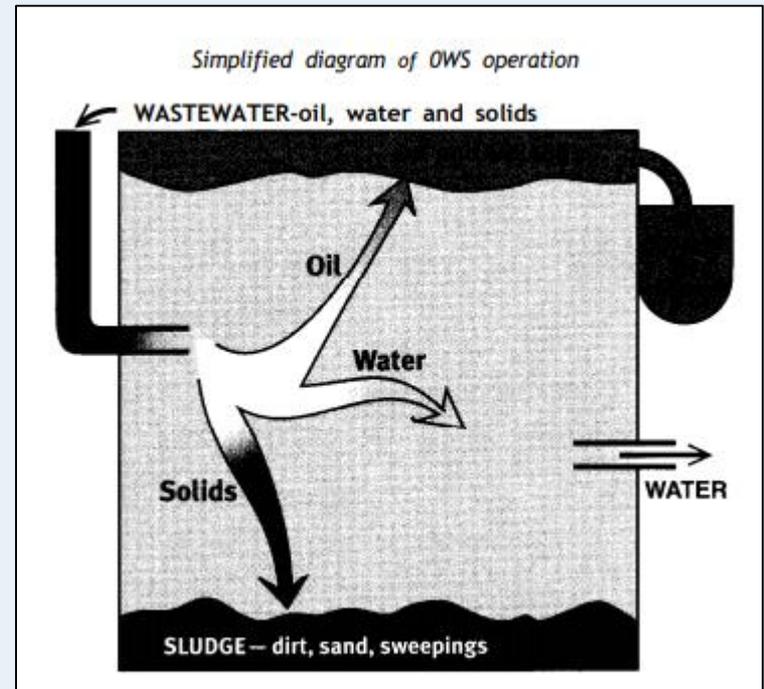


Diagram from epa.gov

Thermal Oxidation Technology

MOST COMMON CHOICES

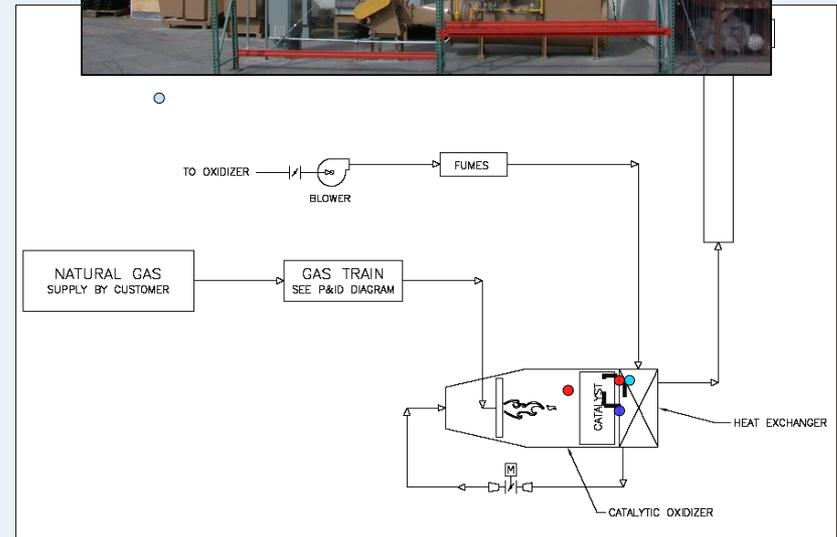
- Catalytic Thermal Oxidizers
 - Recuperative Thermal Oxidizers
 - Direct Fired Thermal Oxidizers (DFTO)
 - Regenerative Thermal Oxidizers (RTO)



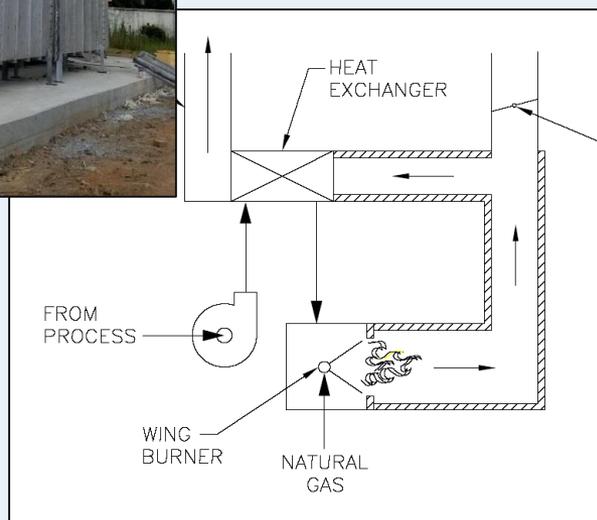
Catalytic Thermal Oxidizers

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- Dilute Waste Gasses
- Destruction: 95-99%,
(700-800°F operating temp)
- Thermal efficiencies of 50 to 65% (Metal gas to gas Heat Exchanger)
- Catalyst Subject to poisoning, sintering, masking
- Expensive to replace - Catalyst
- Not recommended for changing waste gas emissions



Recuperative Thermal Oxidizer

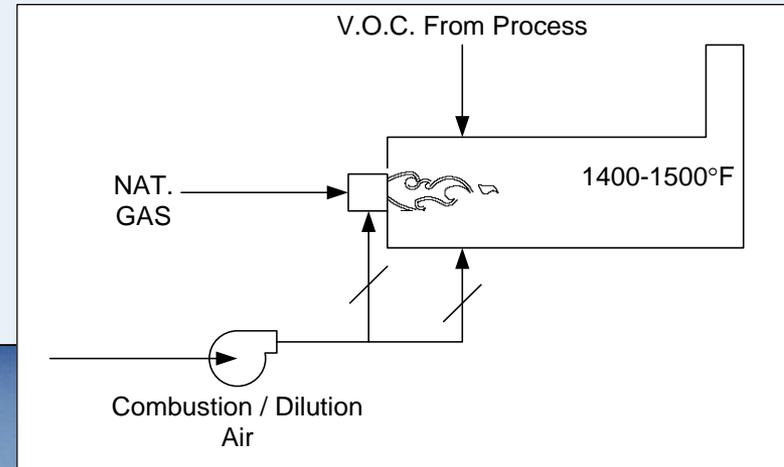


- VOC concentrations 10-35% LEL
- Moderate to high solvent emissions
- Destruction Efficiency – 99%+
- Shell & tube Heat Exchanger with thermal effectiveness up to 70%
- High operating if <15% LEL solvent load

Direct Fired Thermal Oxidizer

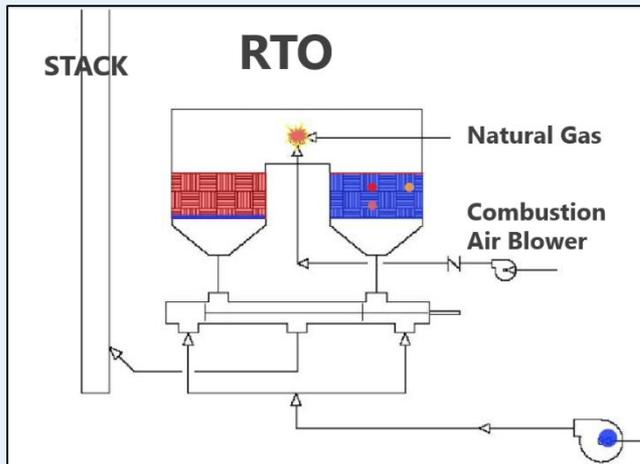
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- Ideal for very high solvent emissions
 - (self-sustain)
 - VOC concentration up to 50% LEL
- Destruction rate 99%+
- Zero energy recovery
- Depending on solvent loading could be high energy user

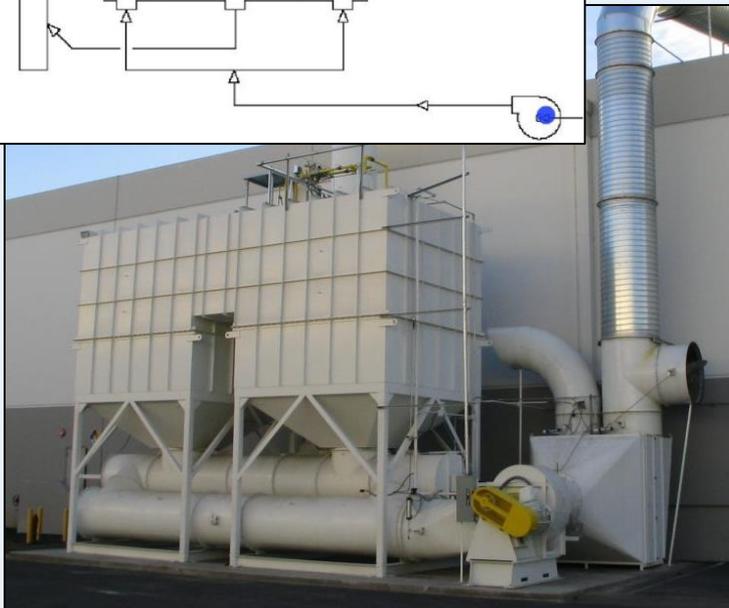


Regenerative Thermal Oxidizer

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- Dilute waste gasses
- Destruction: 95- 99%
(1400-1500°F Operating Temp)
- Thermal Efficiency up to 97%
(ceramic media HX)
- Very low operating costs
- Not designed for high solvent loading (due to high thermal %)



Case Study

Background Info

- Customer in Downey, CA
- Process contained chlorinated constituents
 - Perchloroethene (PCE) & trichloroethene (TCE)
- SCAQMD required 99% destruction efficiency or better
- Length of operational time of unit will be 5 to 7 years

Solution

- 1,500 SCFM Ship & Shore RTO
 - 99.6% destruction efficiency
 - 95% thermal efficiency
- 500 SCFM knockout pot
- Puff chamber to achieve 99.6% destruction efficiency
- Acid scrubber system (wet scrubber)
- Acid protection



The S&SE Advantage

COMPLETE SOURCE FOR ENVIRONMENTAL & ENERGY SOLUTIONS



- ❖ Equipment is Manufactured in the USA.
- ❖ Complete In-House Engineering Team and Disciplines.
- ❖ In-House Project Engineer Manages your Project.
- ❖ 24/7 Factory-Trained Service Available by Telephone.
- ❖ Standard and Extended Warranty on all Manufactured Systems.
- ❖ Installation, Commissioning and Aftermarket Service Provided by Expertly Trained Personnel.
- ❖ State-of-the-Art RTO Control Systems with the Newest, User Friendly HMI/PLC. Fully Functional with Remote Access and Integrated Digital Data Reports.
- ❖ To Date S&SE has Assisted Clients in Receiving over 5.5 Million Dollars in Utility Cash Rebates and Incentives for Energy Efficiency Projects.
- ❖ Our Engineers have been Recognized and Called as Expert Witnesses to Testify Before the AQMD, EPA and other Regulatory Authorities.
- ❖ Equipment is Pre-tested, Pre-piped, Pre-wired and Skid-mounted to Minimize Installation Time and Expense.
- ❖ Ship & Shore Environmental is Proud of our 100% Compliance and Success Rate on all Projects.



Experience & Leadership

INNOVATIVE ENGINEERING SERVICES & SOLUTIONS



SOLUTIONS

Custom Designed Environmental Solutions that Meet Each Clients Interest, Process, Project & Budget.



GOAL

Maximize Performance & Develop Cost Effective Abatement & Energy Recovery Systems for Each Unique Application.



EXPERIENCE

Innovative Engineering Group Dedicated to Excellence and Partnership with Clients and a Proven 100% Compliance Track Record.

REPUTATION

Recognized by SCAQMD, EPA and all other regulatory agencies as BACT. All systems meet & exceed the most stringent regulations and rules.

Technical Industries & Services

AIR POLLUTION CONTROL & ENERGY RECOVERY SPECIALIST

Industries Served

- ❖ Flexible Package Printing
- ❖ Film/Adhesive Coating
- ❖ Landfill Biogas
- ❖ Pharmaceuticals
- ❖ Rendering & Food Processing
- ❖ Refineries/Chemical Plants
- ❖ Resin & Coating Manufacturing
- ❖ Soil Remediation
- ❖ Barge Degassing (Shipyards)
- ❖ Bulk Solvent & Gasoline Terminals
- ❖ Can & Coil Coating
- ❖ Chemical & Petrochemical
- ❖ Composite Material Manufacturing
- ❖ Commercial Printing
- ❖ Electronic Parts Manufacture
- ❖ Expanded Polystyrene (EPS)
- ❖ Fiberglass (Styrene) Operation

Clean-Tech Services

- ❖ Regenerative Thermal Oxidizers
- ❖ Recuperative Thermal Oxidizers
- ❖ Catalytic Oxidizers
- ❖ Steam Generating Thermal Oxidizers
- ❖ VOC Collection Systems
- ❖ Heat Recovery Systems
- ❖ Waste Heat & Energy Recovery Systems
- ❖ Process Testing & Process Design Review
- ❖ Carbon/Zeolite Concentrators
- ❖ Retrofit & Refurbishment
- ❖ Air Quality & City Permit Assistance
- ❖ Utility Rebate & Incentive Program Assistance
- ❖ Repair & Preventive Maintenance
- ❖ Start-Up & Training



S&SE Clean Tech Systems

MOST ECONOMICAL VOC ABATEMENT SYSTEM FOR INDUSTRY



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