C3 REFRIGERATED CONDENSATION FOR SOIL VAPOUR EXTRACTION

ERR Environmental Remediation Resources

AUSTRALIA AND NEW ZEALAND AUTHORIZED DISTRIBUTOR

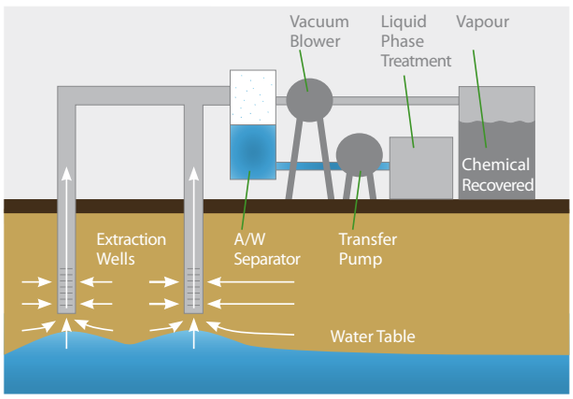
SOIL VAPOUR
EXTRACTION
AND CHEMICAL
RECOVERY
UTILIZING VAPOUR
CONDENSATION

MANUFACTURED BY G.E.O. INC

C3 TECHNOLOGY

C3 Technology, developed by G.E.O. is a combination of cryogenic-cooling and compression processes with a proprietary regenerative adsorption technology that efficiently recovers volatile organic compounds (VOCs) and hydrocarbons from the off-gas vapour stream of soil vapour extraction (SVE) or dual phase extraction (DPE) systems. Condensed chemical is recovered as a non-aqueous phase liquid (NAPL) that is temporarily containerized in appropriate vessels for recycling or proper disposal. Generally, greater than 99.9% of the VOCs are recovered from the vapour stream. Dependent upon the contaminant and state or local agency, final effluent may be polished with granular activated carbon (GAC).

OFF-GAS TREATMENT VIA SOIL VAPOUR EXTRACTION



PROCESS DESCRIPTION

- Soil gas is drawn into the system and delivered to the air compressor.
- Entrained liquids from extraction wells are separated at the water knockout tank. Separated liquids are securely drummed and transported off-site or captured with GAC and discharged to the sewer or storm drain in accordance with all local and state regulatory requirements.
- Process air is compressed to approximately 150 pound per square inch (psi) by the air compressor.
- Water vapour is removed from the process stream at the air-to-air heat exchangers as it is cooled to ambient temperature.
- The vapour stream is further cooled to approximately -40° C in the refrigerated heat exchangers, where the chemical constituents are condensed and separated from the vapour stream.
- The vapour stream is then sent to the regenerative adsorber, which removes any residual VOCs and directs it back to the inlet stream.
- System effluent vapour stream [<1.0 parts per million by volume (PPMV)] is finally polished utilizing granular activated carbon (GAC) prior to discharge to atmosphere.

G.E.O. currently manufactures standard units with flow rates of up to 1,300 cubic meters per hour.

CASE STUDIES

Performance studies of select projects

Location	Constituents of Concern	Initial Concentrations in ppmV	Remediation Time	Condensate Recovered in pounds (lbs)	System Flow Rate (SCFM)
California	Gasoline	12,000	3 months	21,600	200
Texas	Gasoline	98,000	7 months	715000*	1,500
California	Gasoline	8,000	1 month	6,000	300
California	Gasoline and Chlorinated Solvent	19,000	4 months	20,000+	300
California	PCE, TCE, DCE	25,000	30 days	7,500	100
California	1.1-DCA, R-113, cis 1,2-DCE, Methelene Chloride	16,000	1 year	16,000	200
Arizona	CFCs, 1,1-DCE, Methelene Chloride, TCE	24,000	1 year	60,000	200
California	BTEX, MTBE, TCA, DCA, MeCl	26,000	32 days	14,080	200
California	PCE	18,000	1 year	13,500	200
California	PCE, TCE	9,000	1,5 years	12,500	100
California	TCE, Methelene Chloride	27,000	3 months	15,120	200

Notes:

CFCs= Chloroflouroca | HCFCs= Hydrochlorofluorocarbons | PCE= Tetrachloroethelene | TCE= Trichloroethelene

1,1-DCE = Dichloroeth | R-113= Freon 113 | cis 1,2-DCE= cis 1,2 Dichloroethelene | 1,1,1-TCA= 1,1,1 Trichloroethelene

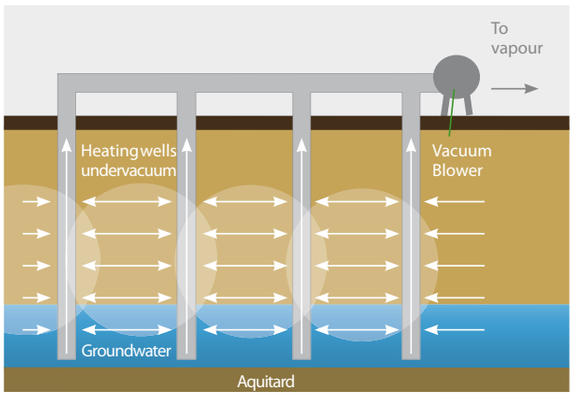
* 110,000 gallons

G.E.O. INC - THE COMPANY

Graduated cylinder with DNAPL underlying water condensate

200 cubic meter / hr pilot unit blower, compressor and after cooler

IN-SITU THERMAL HEATING COMBINED WITH SOIL VAPOUR EXTRACTION



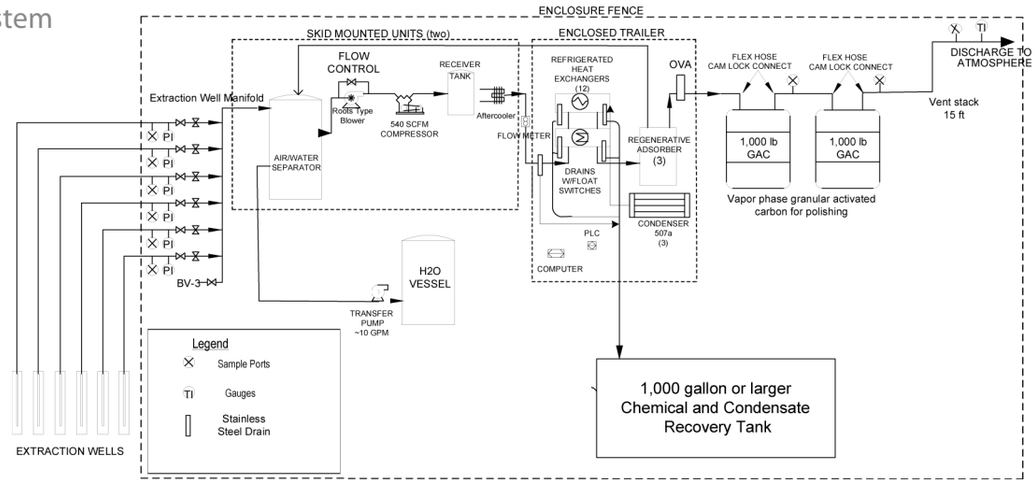
G.E.O. Inc. was founded in 1989 as an environmental remediation equipment and services supplier specializing in the manufacturing and operation of in-situ vapour extraction equipment for the removal of volatile organic compounds (VOCs) from the subsurface.

G.E.O. provides a range of client support services tailored to various project needs, such as air, water and soil sampling. and gas chromatograph analysis of soil gas samples for performance tracking. G.E.O. Inc. provides all equipment necessary to perform the scope of work required including trucks, vapour recovery systems, hand tools, electronic test equipment, instrument calibration systems, and lab grade portable gas chromatograph.

COMPATIBLE WITH OTHER TECHNOLOGIES INCLUDING:

- Soil Vapour Extraction
- Ozone Sparging
- Air Sparging
- Dual Phase Extraction
- Groundwater recirculation with In-well air stripping
- In-Situ Thermal / Resistance Heating
- Tank degassing
- Process Vapour Treatment

Example 850 CMH system



EXPERIENCE

The C3 Refrigerated Condensation has performed successfully on jobs ranging in size from Superfund sites to small dry cleaners and fuel stations. International engineering firms and Fortune 500 companies are among satisfied clients. G.E.O. Inc. has operated the C3 Refrigerated Condensation successfully for more than 20 years on a variety of sites across the United States and growing internationally.

Subsequent clean-up projects have demonstrated system effectiveness in the following applications:

- SVE
- DPE/MPE
- Airsparge/SVE
- In-Situ Thermal Heating and ERH

G.E.O. Inc. also provides mobile units specifically designed for vapour extraction site qualification and testing (SQT). The SQT units (pilot test systems) generate the data essential for design and implementation of full-scale systems.

ERR provides technical support for design and operation of the C3 Refrigerated Condensation system for Australia. Training is available for consultants and clients on a project by project basis. Please Inquire for more information.

For more information please contact ERR
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