

Soil Vapor Extraction & Air Sparge Systems

Installation and Operation Manual



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DOCUMENTATION CONVENTIONS

This manual uses the following conventions to present information:



WARNING

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.



CAUTION

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.



NOTE

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

This manual contains the information required to deploy, operate and maintain the Soil Vapor Extraction and/or Air Sparge System supplied. Its use is intended for field technicians, project engineers or anyone responsible for installing, operating or maintaining site remediation equipment.

Section 1: System Description

Function and Theory

Soil Vapor Extraction System

The Geotech Soil Vapor Extractor (SVE) System is designed for soil degassing and subsurface ventilation applications in the unsaturated zone (above the water table) where the contaminants have a tendency to volatilize or evaporate easily.

SVE, sometimes called *in-situ* volatilization or enhanced volatilization, works by pulling air through ground that has been saturated with hydrocarbon (Figure 1-1). This causes volatile organic compounds (VOC's) and some semi-volatile compounds (SVOC's) to vaporize. These vapors are then carried through the extraction well ductwork to the atmosphere. Often, in addition to vacuum extraction wells, air injection wells are included to increase the air flow and improve the removal rate of the contaminant. An added benefit of introducing air into the soil is that it can stimulate bioremediation of some contaminants. The system is ideal for well point or trench type vapor barriers. If off gas treatment is required, contact Geotech for information on air treatment equipment.

Air Sparging System

Used alone, the SVE System cannot remove contaminants in the saturated (below the water table) zone (Figure 1-1). The Geotech Air Sparging System uses air to help remove harmful vapors from polluted soil and groundwater below the water table. Air pumped into the wells disturbs the groundwater. This helps the contaminants to phase change into vapors, rise into the unsaturated zone and then be pulled out of the ground via the SVE extraction wells.

When both the SVE and Air Sparging systems are operated in conjunction, the process of soil and groundwater remediation is greatly enhanced.

Joint Applications

SVE and Air Sparging may be good choices at sites contaminated with solvents and other volatile organic compounds such as trichlorethane, trichloroethylene, benzene toluene, ethyl benzene, xylene and fuels. Because properties of the soil have such an important effect on the movement of soil vapors, the performance and design of the SVE and Air Sparge systems need to take these properties into consideration. A pilot test is strongly recommended to determine air flow, vacuum and pressure required for optimum results. Figure 1-1 contains an example of an SVE and Air Sparge application.



Geotech provides this equipment based on the parameters provided by the customer and does not warranty the merchantability or fitness for a particular purpose or application. The customer is solely responsible for determining the suitability of the product for customer applications which the purchaser designs, assembles, constructs or manufactures.

Both the SVE and Air Sparge System can be hard-wired to a remote power source or both can easily be controlled with the Geotech GECM Control Panel (described later in this section).

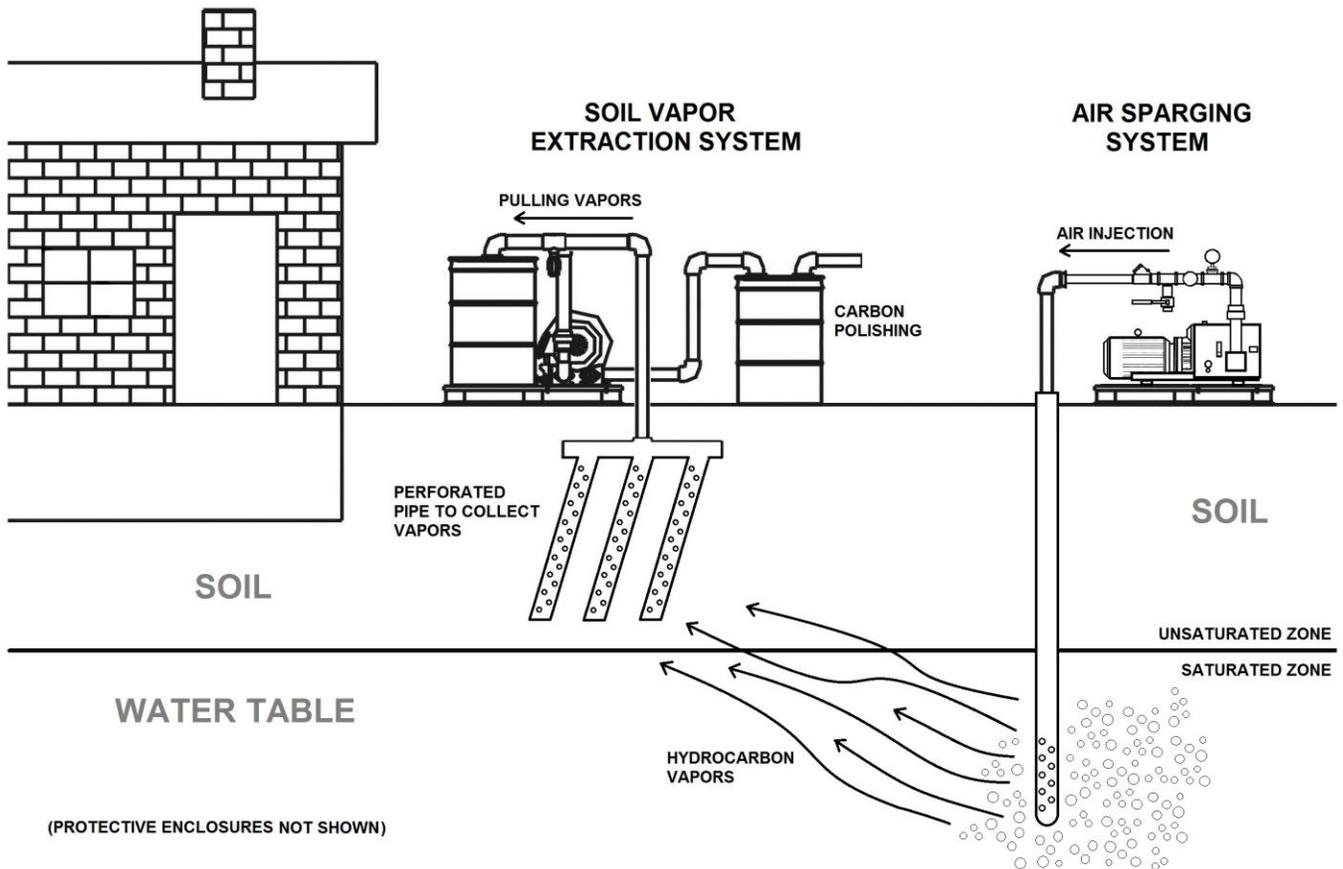


Figure 1-1

System Descriptions and Components

SVE System

Geotech offers several different types of vacuum pumps/blowers based on air flow, vacuum, electrical voltage and classification requirements.

A typical Geotech supplied SVE system (Figure 1-2) consists of a (regenerative) vacuum pump/blower, inlet and outlet plumbing, integral air filter/moisture separator, ambient air dilution valve and vacuum gauges and a power disconnect. Systems with control panels (XP and non-XP) come with thermal overload protection or high amp circuits and additional instrumentation can be provided as required.

SVE Components

Blowers

Blowers are available in various sizes. Basic blower specifications and performance curves are provided in Section 6.

**STANDARD SKID MOUNTED
SOIL VAPOR EXTRACTION
SYSTEM**

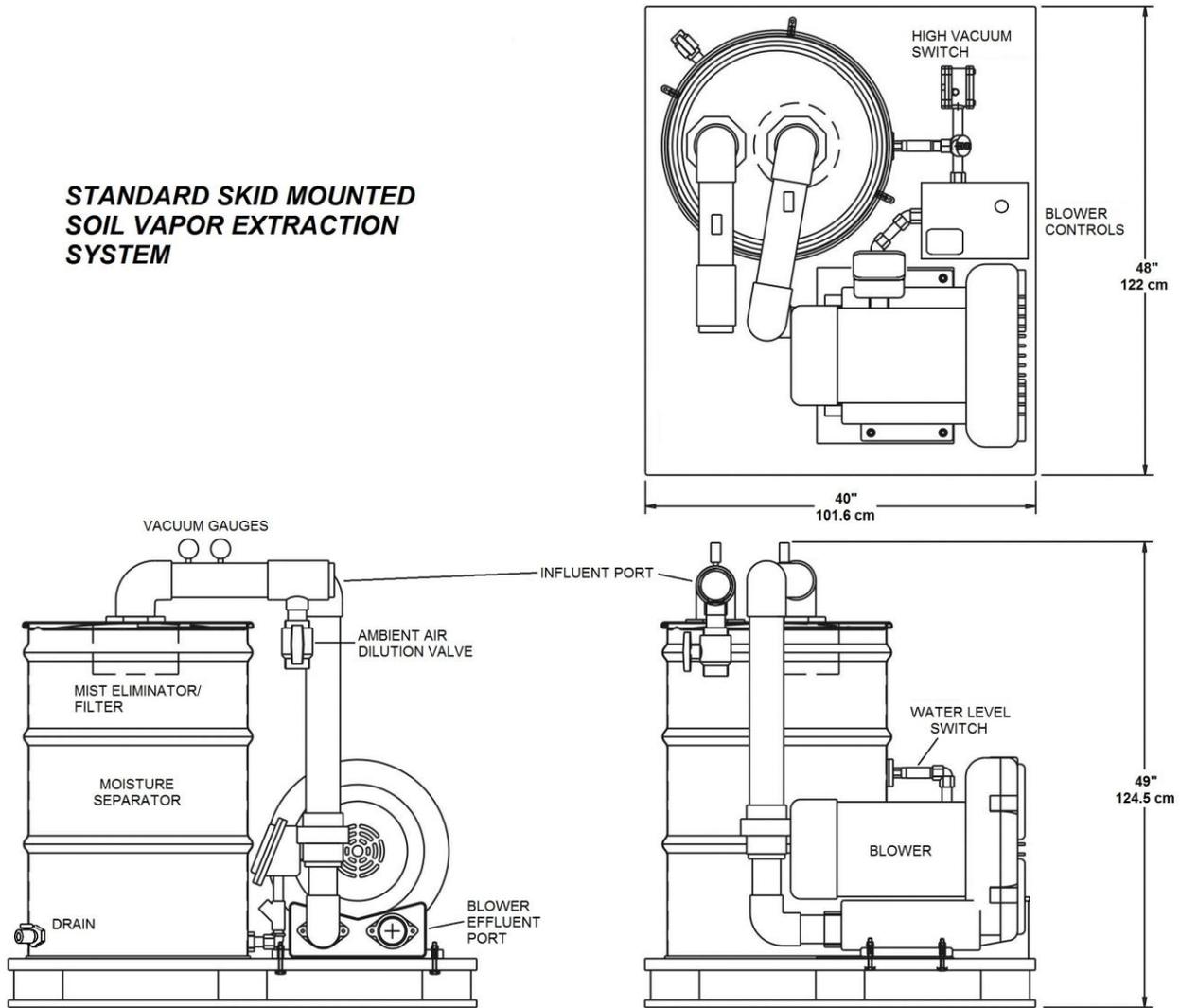


Figure 1-2

Moisture Separator

The moisture separator is positioned between the blower and the extraction well to help protect the blower from corrosion damage caused by excess moisture. In addition, it will protect the end treatment from further contamination. Each moisture separator provides the following features:

- 38 gallon (143.8 L) capacity, steel canister with enamel finish and epoxy coated interior.
- High efficiency cyclonic separation.
- Inherent safe collection design.
- Outfitted with drain for convenient removal of fluids.
- A liquid level float switch that will protect the blower from flooding and shut down the system when the moisture separator is full.

Vacuum Gauges

Vacuum gauges are mounted before and after the air filter for ease of diagnosing a clogged filter. As the filter begins to clog, the difference between gauge readings will increase.

Ambient Air Dilution Valve

The ambient air ball valve is used to adjust the vacuum on the influent side of the blower.

Options

- Single-phase SVE blowers may be supplied with optional power cords and explosion proof plugs.
- Effluent silencer (muffler).
- Effluent temperature gauge.
- Effluent pressure gauge.
- CFM gauge.
- Sample ports.

Air Sparge System

Geotech offers several different types of compressors/blowers based on air flow, PSIG, electrical voltage and classification requirements.

A typical Geotech supplied Air Sparge system (Figures 1-3 and 1-4) consists of a compressor/blower, inlet/outlet piping, air bleed valve, adjustable outlet pressure bleed valve, pressure gauge, temperature gauge and a discharge check valve. Additional instrumentation is provided based on the customer's requirements.

Air Sparge system compressors, depending on the make and model, may come as a rotary claw or rotary vane in design. Figures 1-3 and 1-4 represent a standard rotary claw Air Sparge design with basic factory installed plumbing (control panel not shown).



Rotary Vane compressors usually have one distinct characteristic and that is that they can only operate (rotate) one direction. Damage can occur when running a rotary vane the wrong direction. When using a rotary vane compressor, observe all warnings and procedures for connecting power and establishing the rotation of the unit prior to placing it into service. Most rotary claw models, when determining the flow direction during installation, can run either direction without damage.

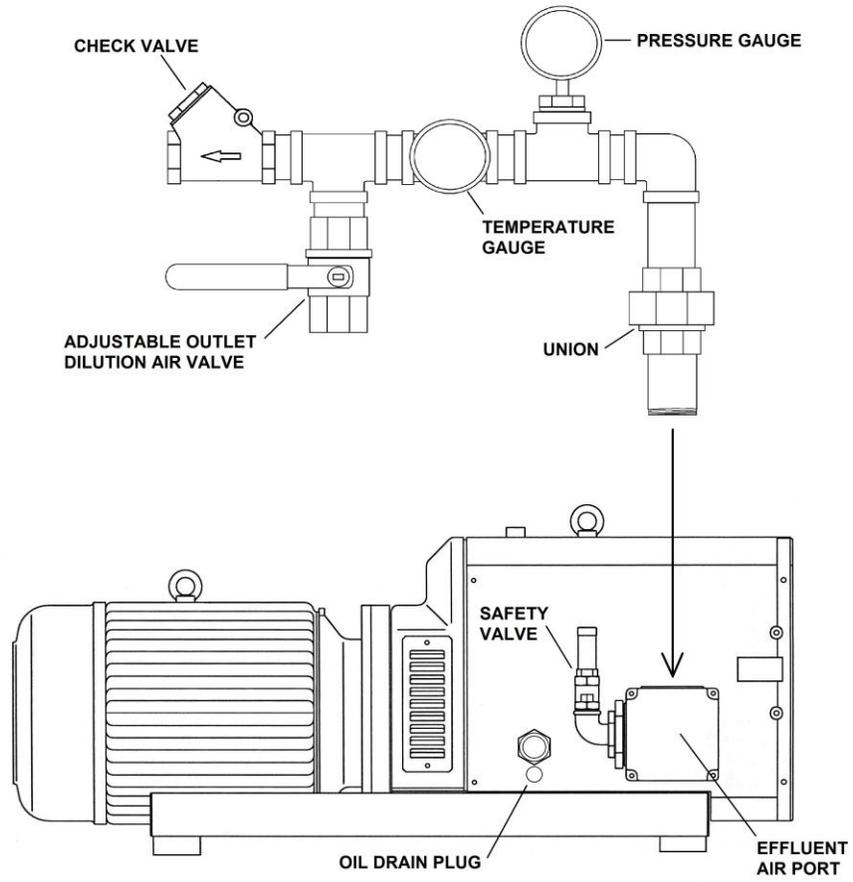


Figure 1-3 – Example of output side of rotary claw sparge with a standard plumbing configuration.

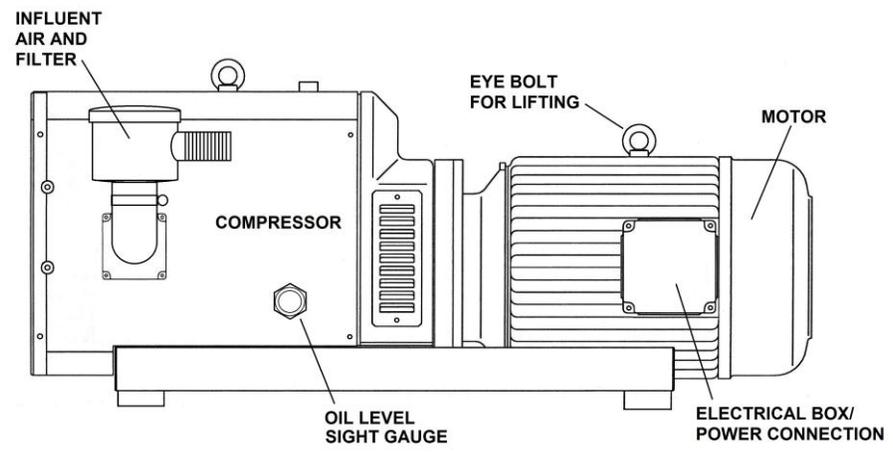


Figure 1-4 – Example of input side of rotary claw sparge.

Options

- Single-phase Air Sparge systems may be supplied with optional power cords and explosion proof plugs.
- Influent silencer (muffler).
- Effluent temperature switch.
- CFM gauge.
- Multi-port plumbing with control solenoids, valves, fittings and flow gauges.

Control Panel

A basic Geotech supplied SVE or Air Sparge system will have a standard ON/OFF/Reset Motor Starter box with auxiliary contacts for alarm switches. These components are housed within a NEMA 4 (non-explosion proof) or a NEMA 7 (explosion proof) enclosure.

When additional controls and logic are required or when interfacing the SVE and Air Sparge equipment, Geotech will supply a NEMA 4, GECM Control Panel, designed to operate both the SVE and Air Sparge systems along with all alarm circuits and fault switches.



A qualified electrician is strongly recommended to provide wiring to and from the remote mount control panel and the systems.

Section 2: System Installation



Disconnect power before opening any enclosure on any system. Only explosion proof systems may be deployed in hazardous locations.

Installation

Location

- Locate and position the unit as desired. Secure the unit to a solid floor or other stable surface keeping the unit relatively level (within 1/8"/3.2 mm per 12"/30.5 cm run.)
- When bolting the unit down all mounting points are to be solidly in contact with the floor before the anchor bolts are tightened. The use of vibration isolators is not required with SVE or Air Sparge blowers less than 25 HP in size.
- There should be adequate room around the unit to perform regular maintenance. Adequate ventilation should also be available; Blower(s) generate BTU's per hour per motor horsepower in heat which needs to be removed. Geotech recommends a 3' (1 m) space around the skids for heat rejection and ease of maintenance.

Plumbing

- Plumb in the inlet and outlet piping. Size the piping such that the pressure drop encountered during maximum air usage is within an acceptable range.
- Utilize piping materials that are rated for pressure and temperature at which the blowers/compressors will be operating.
- Route the piping such that any moisture that condenses in the piping will run to a low point drain.
- Confirm the installed pipe system meets all applicable building codes.
- SVEs are to be manifolded to the vapor source and the effluent vapor plumbed to a desired location.

Control Valves

- All rotary vane Air Sparge units need to have discharge check valves to protect the blower from reverse rotation upon shutdown.
- Units are to have a pressure/vacuum relief valve or switch to protect the blower/compressor from over pressure/vacuum or high amps.

Power

- An adequate power source should be available. A qualified electrician is strongly recommended to wire all blower motors and their control panels. Wire power to the power disconnect switch inside the motor starter box, or plug the unit into an explosion-proof receptacle.
- With three phase power systems, jog the motor and determine the rotation; if rotation is incorrect, switch any two leads of the incoming power.



Some rotary vane units will be labeled from the factory noting that the blower should be detached from the motor when determining the rotation. This is important since some units can be damaged with just a slight bit of power applied with an incorrect rotation.

- Confirm all wiring conforms to the National Electrical Code and any other government codes which apply in your area.

Section 3: System Operation

SVE Operation

To ensure proper operation of the system, the vacuum on the influent air should not exceed the manufacturer's high vacuum switch setting. An adjustable high vacuum switch (shown in Figure 1-2) is pre-set at the factory to shut down the blower when the vacuum exceeds the blower rating or nameplate full load amps. Vacuum in excess of the specified values can over heat and damage the blower motor. Monitor the vacuum by referring to the vacuum gauge mounted closest to the blower (or the piping between the drum and AIR IN port of the blower as shown in Figure 1-2.)

The specified maximum vacuum indicated on the blower identification plate assumes an open discharge. Any pressure drop associated with inlet or discharge piping or discharge treatment will also affect blower motor running amperage. Therefore, maximum allowable vacuum will decrease with an increase in discharge pressure requirements (such as use with vapor treatment equipment, i.e.: carbon vessels.)

An adjustable PVC inlet air valve is also provided. This valve should be open on startup and slowly closed until the desired vacuum is attained or maximum recommended vacuum is attained.

System Faults (SVE)

To prevent equipment damage, the SVE System will automatically shut down due to the following conditions:

High Vacuum

- Clogged demister.
- Obstructions (water or debris) in the influent or effluent plumbing.

High Water Level in the Moisture Separator Drum

- Water level in the moisture separator drum has reached capacity.
- Optional transfer pump not removing water.

Blower Motor Thermal Overload (overheating)

- Incorrect setting of vacuum switch.
- Motor failure or fatigue.
- Electrical service providing excess or insufficient voltage.

Current Overload (High Amps)



Motor starters provided with factory control panels will shut the system down when the amp range is exceeded.

- Incorrect setting of vacuum switch.
- Motor failure or fatigue.
- Electrical service providing excess or insufficient voltage.
- Amp range setting on motor starter has been altered (consult electrician).

Restarting the Blower

To restart the system after one of the above faults has occurred; first identify and rectify the condition that caused the fault (see Section 5, System Troubleshooting). Once the problem has been corrected restart the blower:

1. Set the switch on the control panel to OFF, or set the main switch to OFF.
 - Systems with an ON/OFF/RESET switch require a RESET.
 - Systems using a GECM Control Panel (optional) require that the HOA (HAND/OFF/AUTO) switch be set to OFF and the RESET button depressed to clear the fault.
2. Set the switch on the control panel to ON, or set the main switch to ON.
 - With a GECM, set the HOA switch to AUTO.

Air Sparge Operation

To ensure proper operation of the system, the discharge pressure on the effluent side should not exceed the maximum full load amps of the motor or maximum pressure rating of compressor.

An adjustable discharge bleed air valve is provided. Open the valve ½ way upon start up and slowly close the valve until the pressure desired is attained. Pressure in excess of the specified values can damage the blower motor.

An optional High Temperature or Pressure Switch can be provided to protect the blower from over-heating. The temperature switch is pre-set at the factory based on anticipated compressor temperature rise for the operating pressure and when the ambient inlet air temperature is 100°F (37°C). Pressure switches are set based on the maximum full load Amps of the motor.

Monitor blower discharge pressure by referring to the discharge pressure gauge. This gauge should be placed as close to the discharge of the Air Sparge compressor as possible for the most accurate readings.

Pressure or temperature in excess of the specified values can damage the compressor/motor. A pressure relief valve should be provided to protect the blower from over-pressurizing. This valve should be tested at start up to ensure functionality.

Pressure drops associated with inlet and discharge piping, valves, and instrumentation will also affect compressor motor running amperage.

System Faults (Air Sparge)

To prevent equipment damage, the Air Sparge System will automatically shut down due to the following conditions:

High Temperature

- Temperature has exceeded the setting on the optional High Temperature Switch.
- Obstructions (water or debris) in the effluent plumbing.

High Pressure

- Pressure has exceeded the setting on the optional Pressure Switch.
- Obstructions (water or debris) in the effluent plumbing.

Compressor Motor Thermal Overload (overheating)

- Motor failure or fatigue.
- Electrical service providing excess or insufficient voltage.

Current Overload (High Amps)



Motor starters provided with factory control panels will shut the system down when the amp range is exceeded. Amp range rises with pressure, or blockage of effluent air flow.

- Motor failure fatigue.
- Electrical service providing excess or insufficient voltage.
- Amp range setting on motor starter has been altered (consult electrician).

Restarting the Compressor

To restart the system after one of the above faults has occurred; first identify and rectify the condition that caused the fault (see Section 5, System Troubleshooting). Once the problem has been corrected restart the compressor:

1. Set the switch on the control panel to OFF, or set the main switch to OFF.
 - Systems with an ON/OFF/RESET switch require a RESET.
 - Systems using a GECEM Control Panel (optional) require that the HOA (HAND/OFF/AUTO) switch be set to OFF and the RESET button depressed to clear the fault.
2. Set the switch on the control panel to ON, or set the main switch to ON.
 - With a GECEM, set the HOA switch to AUTO.

Control Panel Operation



Before wiring the control panel, check to make sure the electrical supply matches the specifications of the system and components. Utilize a volt meter to verify the **actual power** supplied. Do not rely on the power supply stated on the electrical supply panel since actual voltage provided can vary widely.

- Wire in all associated motors and control instruments with the proper gauge wire recommend by NEC handbook.
- Double check for correct rotation on all equipment prior to putting the equipment into service.
- Activate all control instrumentation to ensure functionality of switches and equipment protection prior to full operation of the system.

Single System Unit (Basic ON/OFF/RESET Controls)

On stand-alone SVE or Air Sparge systems, Geotech may provide an ON/OFF/RESET motor starter (within a NEMA 4 or NEMA 7 enclosure) with auxiliary contacts to operate high temperature switches, high pressure/vacuum switches, a water high level switch, thermal overload, etc. For these systems, turn ON/OFF the system via the ON/OFF/RESET switch.

A system may shut down in the event of an alarm condition. On panels with an alarm light, the alarm light will illuminate when any of these conditions exist. Simply turn OFF the switch, then set the switch to RESET to reset the system. Prior to turning the system back on, identify and rectify the alarm condition. Turning the system on and having repeated shut downs due to alarm conditions may harm the motor and other electrical components of the system.

Single and Dual System Controls (GECM Control Panel)

Geotech can provide you with a GECM control panel to operate and monitor all equipments at one site. Each device is controlled with a HAND/OFF/AUTO (HOA) switch. During normal operation, all devices are set to AUTO for continuous run time. Should a system fault (alarm condition) occur, a RESET of the panel will be needed prior to turning the equipment back on. The HAND position is used to temporarily apply power to a system, such as to verify rotation or when trouble shooting a problem.

If your system comes with the Geotech GECM Control Panel, the following description is a typical logic process for SVE and Air Sparge operating conditions:

- The standard GECM controller has an LCD screen to identify operating and alarm conditions.
- When the SVE is running, the Sparge system can operate.
- When the SVE is not operating, the Sparge system will not operate, except in HAND mode.
- On the SVE portion, a Water High Level Switch will shut down the SVE and the optional alarm light will illuminate, and the Air Sparge motor will shut down. The alarm condition is set up as a latching control, i.e.; a manual reset is required.
- On the SVE portion a High Vacuum Switch will shut down the SVE, the optional alarm light will illuminate and the Air Sparge motor will shut down. The alarm condition is set up as a latching control, i.e.; a manual reset is required. In addition, the SVE motor thermal overloads are tied to this alarm switch. Therefore, the alarm switch will illuminate and shutdown the system in the event of a blower motor thermal overload.

- An optional High Temperature Switch or Pressure Switch will shut down the Air Sparge motor and the alarm light will illuminate. However, the SVE can continue to operate. The alarm condition is set up as a latching control, i.e.; a manual reset is required.
- An optional Run Light will illuminate when a respective system is operating.
- Optional Elapsed Time Meters can monitor run time for each of the respective systems.



The SVE and Air Sparge system can operate independently of each other when the HOA switches are in the HAND mode.

For additional information refer to the Geotech GECM User Manual and Field Wiring Diagram along with the SVE and Air Sparge User Manual and system wiring diagrams provided with new installations.

Section 4: System Maintenance

SVE Maintenance

The SVE is designed to provide you years of trouble-free operation when the equipment is properly maintained. Some basic maintenance items are listed in the following table:

Frequency of Maintenance Tasks/Monthly Calendar												
	1	2	3	4	5	6	7	8	9	10	11	12
Check vacuum gauges to ensure that max. vacuum is not exceeded.		•		•		•		•		•		•
Inspect air filter on optional CFM gauge for moisture. Drain high vacuum switch.	•	•	•	•	•	•	•	•	•	•	•	•
Check motor amp draw. Check all switches for proper operation. Check all wiring for loose connections.			•			•			•			•
Check water level within the moisture separator drum. Check operation of optional transfer pump.	•	•	•	•	•	•	•	•	•	•	•	•
Check for loose fittings and bolts.			•			•			•			•
Check moisture separator for pressure drop across filter/moisture demister (pressure drop should not exceed 6" H ² O (0.44 in Hg). under normal operating conditions.)			•			•			•			•

Cleaning the intake filter/demister assembly (for standard 55 gallon drum)

Optimum performance of the SVE system is possible only with regular maintenance of the intake filter/demister. Clean the filter/demister assembly inside the moisture separator whenever the vacuum gauge readings indicate significant clogging has occurred. Refer to Figure 4-1 and the following outlined procedure:

1. Loosen and remove the drum lid retaining clamp.
2. Loosen and disconnect the 3 inch union between the moisture separator drum and the blower.
3. Mark and detach any CFM lines (when applicable).
4. Lift the cover off the drum and lay it down with the demister assembly facing up.
5. Remove the demister from the holding tube.
6. Shake excess liquid from the demister unit and wash with warm soap and water.
7. Reassemble the moisture separator.

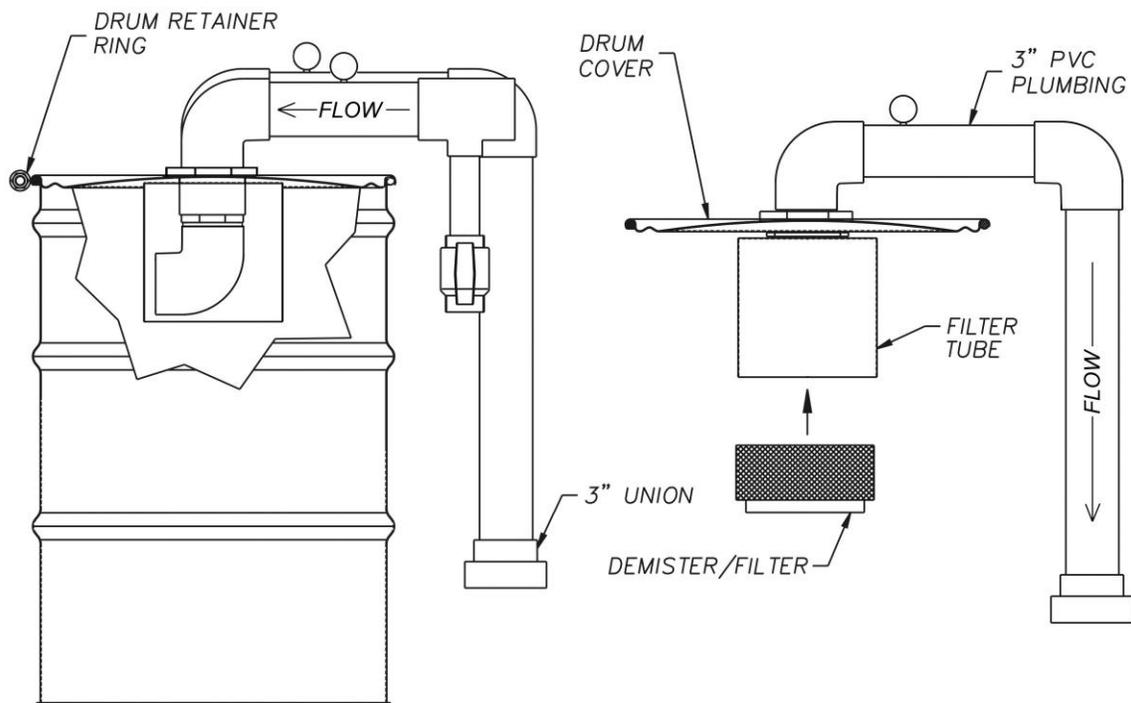


Figure 4-1

Drain Vacuum (Pressure) Switch

The SVE HI vacuum switch should be drained on a regular basis. This is particularly important in applications where excessive condensation may cause a buildup of moisture within the switch. To drain the switch, rotate the vent drain plug (underneath) one turn in a clockwise direction and then return the plug to its original position.

Drain CFM Gauge Air Filter

The filter on the CFM gauge should be checked on a regular basis and drained if necessary. Drain the filter by turning the drain screw (underneath) in a clockwise direction (when viewed from the bottom of the filter) Close the drain by turning the screw counter-clockwise.

Check Poly Tubing

Regularly check the condition of the poly tubing going from CFM gauge to Pitot tube and between the HI vacuum switch and the quick connect fitting on the influent air piping. A cut, kink or loose tubing connection can cause operational problems with the SVE.

Operation of the High Vacuum Switch

Though the High Vacuum switch is called out as a "pressure" switch, and can be used as such, its application on the SVE system is to be used as a "vacuum" (negative pressure) switch. When you see the word "pressure", assume "vacuum" unless the step is defining a physical port on the switch itself, in which case the word "pressure" is used.

SVE "High Vacuum" (pressure) switch

The High Vacuum switch used is always wired for "normally closed". The switch will remain closed until you adjust the vacuum setting screw to have the switch "open" at a specific vacuum (negative pressure) reading (in inches) as shown on the vacuum gauge (normally the gauge on the influent piping closest to the blower AIR IN port.) This is achieved by turning the set screw clockwise (CW) for a higher setting, counter-clockwise (CCW) for a lower setting. When this setting is reached, the electrical contact will "open", breaking the circuit (and in most applications, shutting the system down).

High Vacuum Switch Setting

High Vacuum switch is pre-set at the factory. It is normally set 2" H₂O (0.15 in Hg) below the vacuum gauge reading for the maximum amps called out on the blower nameplate. The purpose of this setting is to shut down the system and prevent over-amping of the blower (in case of clogging to the influent air path) while maximizing the air flow, or CFM. Before proceeding with an adjustment, read the literature provided that came with the switch from the manufacturer.

When adjusting the HI vacuum switch, use the following steps either to verify the current setting, or to make an adjustment to the HI vacuum switch (such as after replacing a faulty switch):

1. Turn off the blower.
2. Disconnect the influent air connection to the lid, usually right before the ball valve in place.
3. Disconnect the effluent air connection to the blower (AIR OUT connection.)
4. Close the PVC valve to the influent air pipe. Close any openings to the top of the drum and to the PVC drain valve at the bottom of the drum.
5. Disconnect the two wires within the High Vacuum switch and connect them together. This will prevent the system from shutting down while setting the switch.
6. Attach an ohm meter to the two points on the switch to verify when it is open or closed.



If over-amping is a concern then it may be necessary to have an electrician open the blower motor electrical box and attach an amp probe to each power leg to verify that the name plate amps are not exceeded while adjusting High Vacuum switch.

7. Turn on the blower. Proceed with one of the following options:

Option 1 - Verifying the current setting of an existing High Vacuum switch

1. With the blower running, gradually cover the 3" inlet pipe with a hard flat object (not your hand) and monitor the increase in vacuum on the vacuum gauge closest in-line to the blower AIR IN port. Keep an eye on the amp reading while doing so.
When the ohm meter shows "open" the inches shown on the gauge will be your current setting. If the ohm meter does not show an "open" after reaching the correct inch setting or upon reaching the name plate high amps, then the switch is either set too high or the switch is stuck (a stuck switch needs to be replaced.)
2. Adjust the switch by turning the Set Range screw on top CCW for fewer inches, CW for more inches.
3. The switch will be set when the circuit "opens" at the correct setting **(without over amping the blower.)**
4. Turn the blower off and restore all electrical connections.
5. If you have a GECM Control Panel, turn the unit back on and cover the inlet pipe to verify that the GECM will turn off the system with the high vacuum setting (this will activate after 5 seconds.)
6. Re-connect all piping and restore the system for operation.

Option 2 - Adjusting the setting for a new High Vacuum switch

1. Turn the set screw all the way CCW. The switch will show "closed" on the ohm meter.
2. With the blower running, gradually cover the 3" inlet pipe with a hard flat object (not your hand) until the Vacuum gauge reaches the desired setting **(do not let the amps exceed the blower specifications)**. With the switch all the way CCW, the meter should already show an "open" circuit.
3. Leave the cover in place on the inlet pipe. Using a flathead screwdriver, turn the set screw CW until the switch "closes". This will "ball park" the adjustment. Turn the set screw back a few turns and continue to "fine-tune" the switch by removing and **slowly covering** the inlet pipe to verify the current setting. Repeat and adjust the set screw as necessary.
4. The switch will be set when the circuit "opens" at the correct setting **(without over amping the blower.)**
5. Turn the blower off and restore all electrical connections.
6. If you have a GECM Control Panel, restore the power and cover the inlet pipe to verify that the GECM will turn off the system with the high vacuum condition (this will activate after 5 seconds.)
7. Re-connect all piping and restore the system for operation.

Transfer Pump

If SVE system includes an optional transfer pump, the following routine maintenance tasks will help to ensure continuous service from the pump. Read the manufacturer supplied User Manual before proceeding.

- Check the flow rate weekly to ensure that the cycling frequency is minimized.
- Inspect hoses and wiring quarterly for cracks, cuts or abrasions.

Air Sparge Maintenance

Your Geotech Air Sparge System is designed to provide years of trouble-free operation when the equipment is appropriately maintained.



During operation, the surface temperature of the compressor and discharge piping can be very hot. Let the unit cool down before doing maintenance to the unit.

Frequency of Maintenance Tasks/Monthly Calendar												
	1	2	3	4	5	6	7	8	9	10	11	12
Check pressure gauge to ensure that max. pressure is not exceeded.		•		•		•		•		•		•
Check optional temperature switch for proper setting and operation.			•			•			•			•
Inspect intake filter and muffler (pressure drop should not exceed 6" W.C. under normal operating conditions.)	•	•	•	•	•	•	•	•	•	•	•	•
Check motor amp draw. Check all switches for proper operation. Check all wiring for loose connections.			•			•			•			•
Check for loose fittings and bolts.			•			•			•			•
Check functionality of check valve.			•			•			•			•
If applicable, check oil level and condition. Replace as recommended by manufacturer.		•		•		•		•		•		•

Section 5: System Troubleshooting

Your SVE and Air Sparge systems are designed for years of continuous trouble free operation. If you encounter problems when using either system, use the following guidelines before contacting Geotech for service.



These procedures are meant to be carried out by personnel qualified to work on electrical circuitry. If in doubt, obtain the services of a qualified electrician.

Getting Help

- Read the entire manual and become thoroughly familiar with all system components before initiating any of the following troubleshooting procedures.
- If the troubleshooting procedures in this section indicate a component failure, prepare a written list of all problems encountered while operating the equipment, then call Geotech Environmental Equipment for assistance.

Service Locations

Geotech Service personnel are trained on all aspects of the equipment and are dedicated to help you maximize the efficiency and cost effectiveness of your SVE or Sparge system. For technical support call our Geotech Service office.

Geotech Environmental Equipment, Inc.
2650 East 40th Avenue
Denver, CO 80205
Toll Free Phone: (800) 833-7958
Commercial Phone: (303) 320-4764
Fax: (303) 322-7242
www.geotechenv.com

Troubleshooting Procedures - SVE

If the blower will not run:

1. Confirm that power is reaching the motor.
 - Check all wiring and connections for breaks, faults, or abrasions.
 - Check for power outages at the service.
 - Check fuses.
 - Check for a tripped motor starter.

Use the following steps to determine if the motor/blower has shut down due to any of the fault conditions discussed in Section 3:

2. Check for high liquid level in the moisture separator drum. If the High Liquid Level switch has engaged and has shut down the system, drain the drum by opening the valve located at the base (see Figure 1-2). Restart the blower using the procedures outlined in Section 3. If an optional transfer pump is included with the SVE, verify functionality of the pump and the optional level control probe. Check for any potential plugging due to sediment around the discharge piping from the vessel.
3. Inspect the demister filter inside the moisture separator drum. A blocked filter will engage the High Vacuum switch. If the filter is dirty, clean as indicated in Section 4.
4. If the High Vacuum switch setting is shutting the system off prematurely, then adjust the setting as described in Section 4.
5. If an optional vapor phase carbon is utilized in the process flow, verify the carbon vessel's pressure drop is not in excess of the vessel manufacturer's performance guide and does not exceed the blower's differential pressure capability.
6. Restart the blower (as described in Section 3). Monitor the current draw using a voltmeter and compare your reading with the motor nameplate amps. Verify that the current is within acceptable limits. If the motor is drawing excess current, please contact Geotech.

If your system does not respond to any of the procedures above, the motor has probably shut down due to thermal overload. Overworking the blower can cause thermal overload; or it may be a symptom of motor fatigue. Allow the motor to cool, and then restart the system using the steps outline in Section 3.

If the blower continues to overheat, monitor the vacuum gauges and determine if the blower is exceeding its maximum vacuum limit. If the blower has not exceeded its vacuum limit, please contact Geotech for further assistance.

Troubleshooting Procedures – Air Sparge

If the compressor will not run:

1. Confirm that power is reaching the motor.
 - Check all wiring and connections for breaks, faults, or abrasions.
 - Check for power outages at the service.
 - Check fuses.
 - Check for a tripped motor starter.

Use the following steps to determine if the motor/compressor has shut down due to any of the fault conditions discussed in Section 3:

2. If a high temperature or high pressure fault is in alarm condition, check all discharge piping for blocks or partially closed valves. A high water level in a recovery well can create additional resistance and a higher discharge pressure condition. Frozen lines can also increase added resistance.
3. If the influent air filter is dirty, a higher differential pressure condition can occur causing the compressor to indicate a high temperature and high amp condition and not show a higher discharge pressure on the pressure gauge. Clean or replace the element.
4. If applicable, check the unit for proper oil level and condition. Add or replace oil as necessary.
5. Restart the compressor. Partially open the bleed valve and monitor the current draw using a voltmeter and compare your reading with the motor nameplate amps. Slowly close the bleed valve until the desired pressure is attained. If the motor is drawing excessive current, please contact Geotech.

Temperature and thermal conditions for the Air Sparge system.

An Air Sparge unit with a temperature switch installed can have a range setting anywhere 100°F (37°C) to 400°F (204°C). A unit with a temperature switch will be factory set to shut off with an air temperature of 200° (93°C) (or per customer requirements).

The motor on an Air Sparge may also be equipped with thermals. The thermals will shut down power to the motor should the motor over heat.

Though a shutdown can occur from other circumstances; i.e., lack of power, blown fuse, etc., perform the following for a high temperature or thermal shutdown:

1. If the temperature on the temperature gauge is satisfactory, set the ON/OFF/RESET switch to RESET, then turn the switch to ON to turn the unit back on. (If necessary, remove the cover to the temperature switch and adjust the shutdown temperature.)
2. If the unit does not power up, then it may be possible that there has been a thermal overload to the motor. Set the main switch to RESET then OFF. When the motor has cooled down turn the main switch back to ON.

Verify all equipment connections and conditions whenever a thermal overload occurs to prevent damage to the motor itself.

Section 6: System Specifications

SVE

Applications: Well point or trench type vapor barriers.
Product Recovery: Volatile Organic Compounds
Dimensions: 40" L x 48" W x 65" H (101.6cm L x 121.9cm W x 165.1cm H)
Blower:
Type: Regenerative blower
Flow Rate: Up to 250 CFM (7.1 CMM)
Voltage: 115/230/460
Phase: single or three phase
HP: 1 – 75 (standard is 1 – 10)

New SVE Specification Sheet

Blower/Motor Type:

Model: _____ S/N: _____

Power Requirements:

_____ Voltage _____ Phase _____ HP _____ Hz

High Vacuum Switch set to: _____ inches (2" H₂O / 0.15 in Hg) under motor nameplate amps)

High Amp on Motor Nameplate: _____

Standard Accessories:

Water Level Switch Y / N

High Vacuum Switch Y / N

Thermal Over Loads on Blower Y / N

Vacuum Gauges Y / N

Options:

Temperature Gauge Y / N

CFM Gauge w/Pitot Tube Y / N

Transfer Pump Y / N

Water Level Probe Y / N

GECEM Control Panel Y / N

GECEM S/N: _____

Cable Length:

Power Cord Length: _____ ft./m

Power requirements SVE:

HP	VOLTAGE	PHASE	ICFM / CMM	INCHES H ₂ O / INCHES OF MERCURY
1	115/230	1	0-95 / 0-2.7	50 / 3.68
1.5	230	1	0-115 / 0-3.3	58 / 4.27
2	230	1	30-145 / .8-4.1	70 / 5.15
2	230/460	3	80-145 / 2.3-4.1	50 / 3.68
3	230/460	1 or 3	30-185 / .8-5.2	72 / 5.30
5	230/460	3	85-280 / 2.4-7.9	82 / 6.03
7.5	230/460	3	80-325 / 2.3-9.2	93 / 6.84
10	230/460	3	125-380 / 3.5-10.8	93 / 6.84

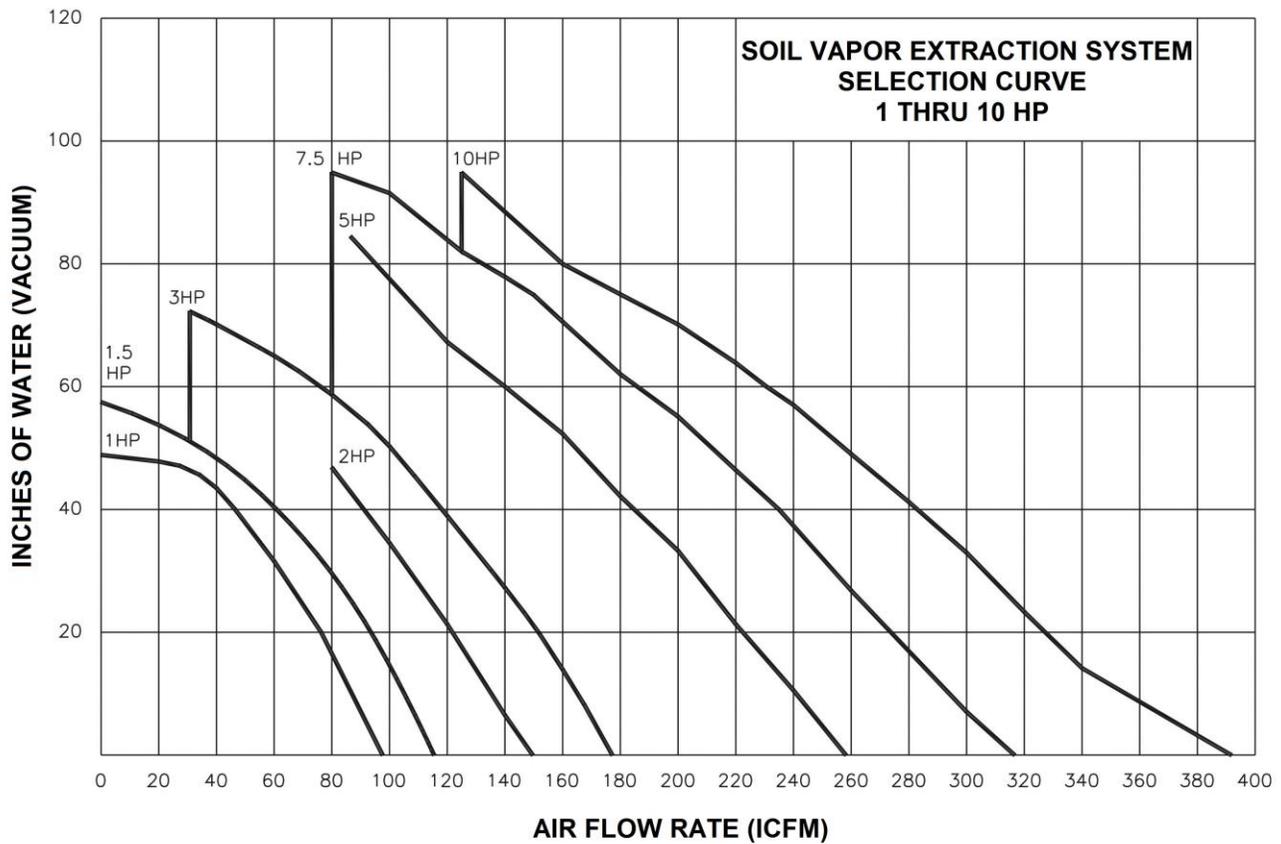


Figure 6-1

SVE and Sparge Wiring Diagrams

All SVE and Sparge systems using a GECM Control Panel will have a GECM Field Wiring Diagram provided detailing all wire connections to the unit. This diagram can be updated or replaced as needed by Geotech.

Without the use of a GECM Control Panel, the on-site electrician will need to wire the air pump/blower motor to an appropriate motor starter and power service. Systems with a basic motor starter box will have wiring diagrams detailing the component wiring.

The wiring from the SVE vacuum switch and water level switch, along with the motor thermals (when supplied) and the high amp circuit from the motor starter, must be integrated as a system shutdown component to the motor starter circuit in order to terminate power in the event of equipment failure.

Geotech can also build unit specific start boxes for use with the SVE, Sparge, transfer pump, and accessories. Contact Geotech for more information on system requirements. Figure 6-2 contains basic wiring for single and three phase blowers (examples do not include junction box integration).

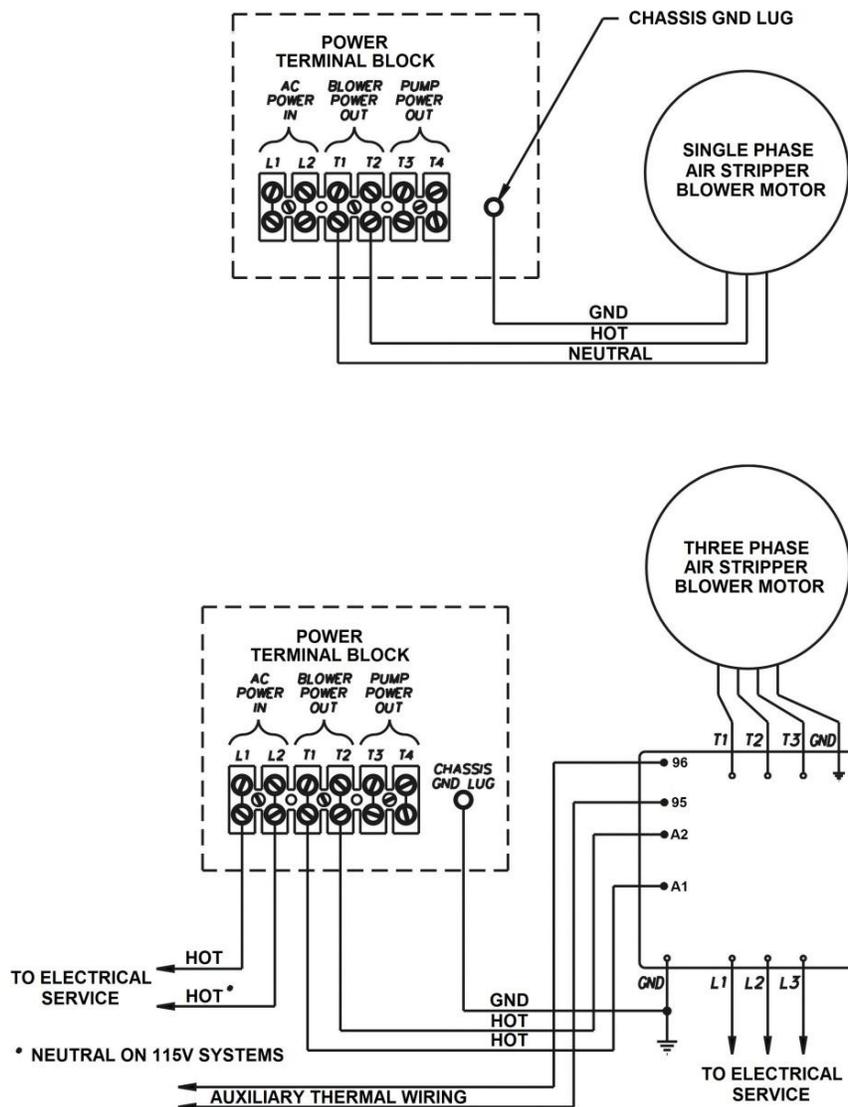


Figure 6-2 – Basic Single and Three Phase Wiring Diagrams

Section 7: System Schematics

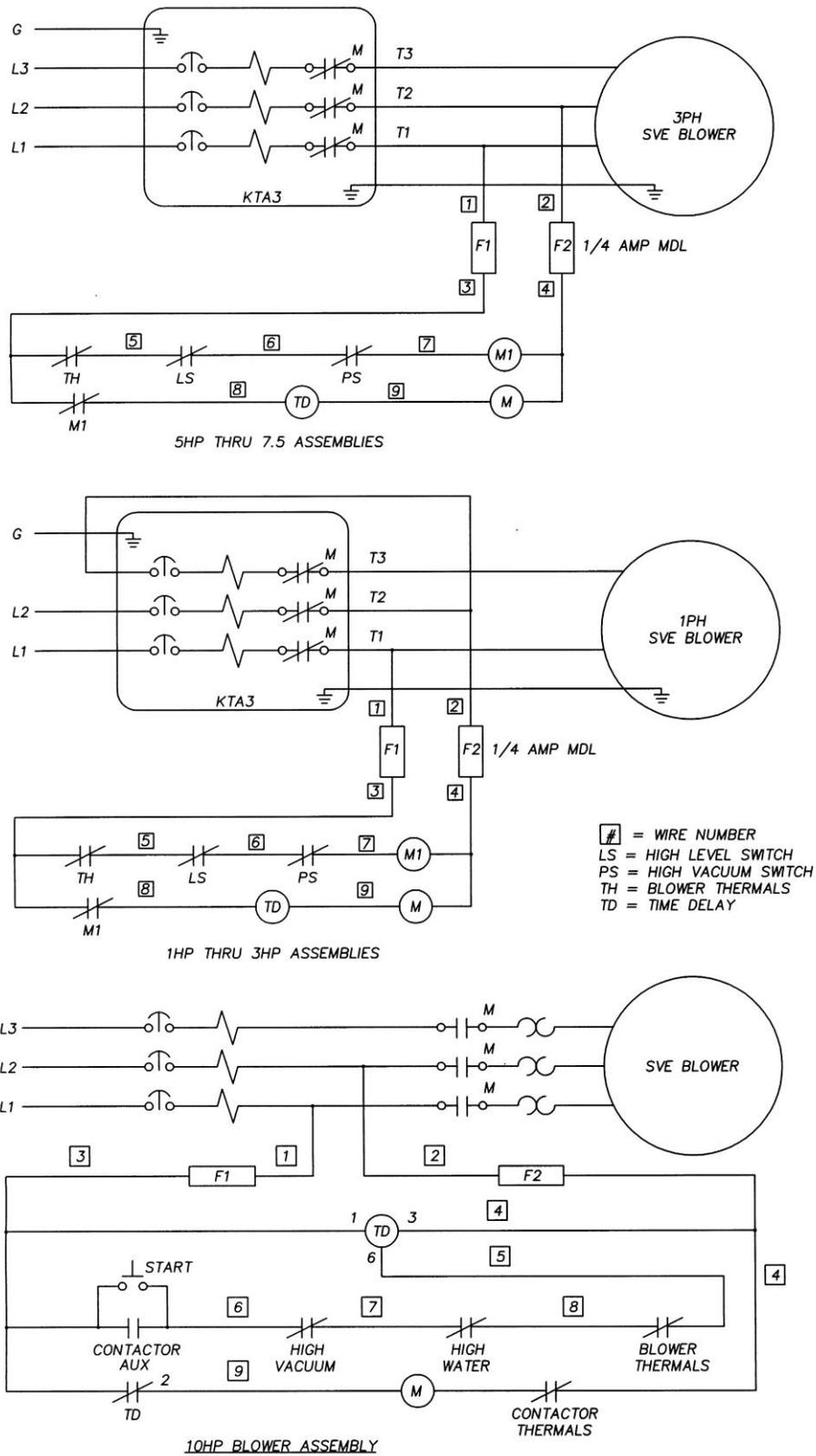


Figure 7-1

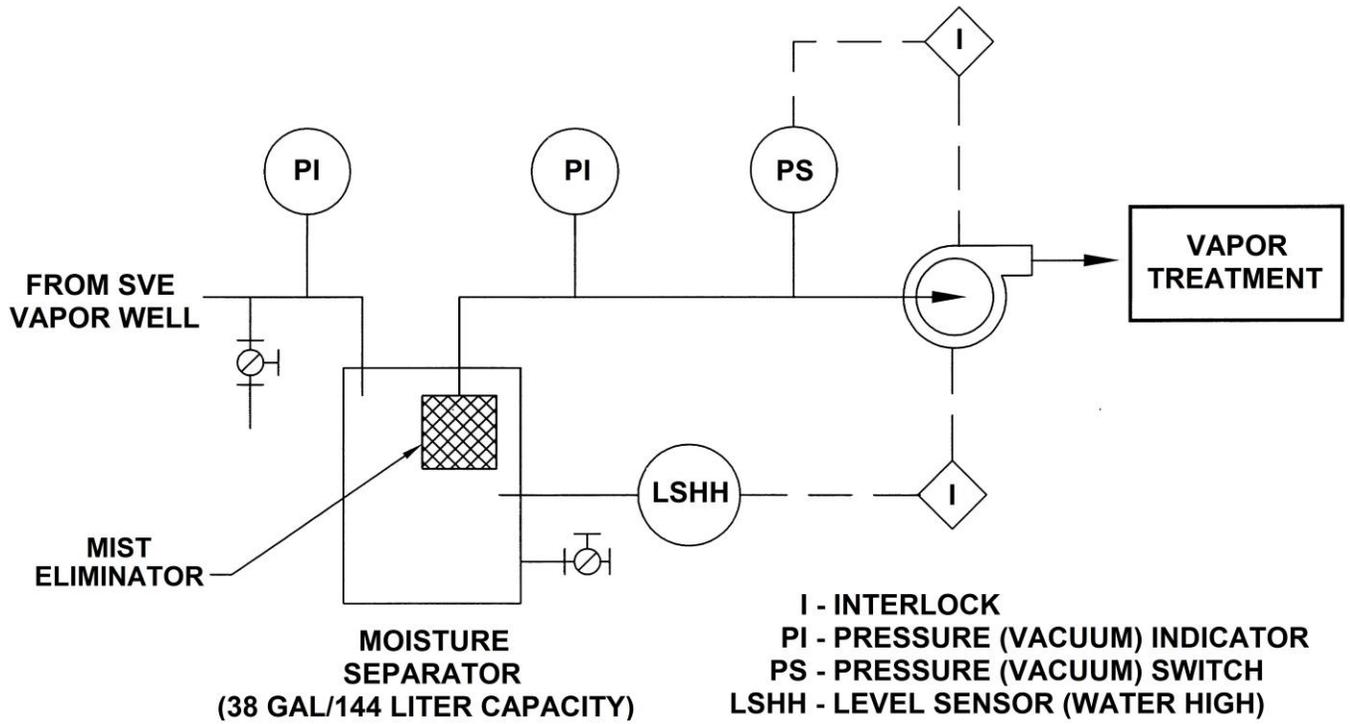


Figure 7-2 The Soil Vapor Extractor P & ID showing optional controls and accessories.

Section 8: Replacement Parts

SVE Parts Listing

Parts Description

Parts List

System Hardware

A variety of system blowers are available through your Geotech Sales Representative.

DRUM,55GAL,STEEL,EPOXY LINED,BLUE,W/2&3/4 BUNG	10759
TUBE,MIST ELIMATOR,PAINTED	10760
MIST ELIM,9"DX4"THK,POLY	10252
CLAMP,DRUM BASE,1/2"COND	10749
SWITCH,LIQ LVL,SPDT,EP,SIDE	10746

Plumbing

FTG,BHD,PVC80,3",FPTxS	PPP088009
FTG,BHD,PVC80,1",FPTxFPT	10748
PIPE,PVC40,3"	PPP035016
PIPE,PVC40,2"	10767
UNION,PVC40,3",SXS	16090006
ELBOW,PVC40,3",SXS	16090005
VALVE,BALL,PVC40,1.5"NPT	10757
VALVE,BALL,PVC40/EPDM,1",TxT	10798
NIPPLE,PVC80,1.5"xCLOSE	00192
NIPPLE,PVC80,1"xCLOSE	PPP009030

In addition to these parts Geotech can provide you with a variety of galvanized pipe and fittings in 1", 1.5" and 2" sizes.

Air Flow and Vaccum

SWITCH,PRESS,SPDT,1.5-8 PSIG 1950P-8-2F	10745
SWITCH,PRESS,0.5-2.0PSI,EP	PPE080017
SWITCH,PRESS,0.4-1.6"WC	PPE080006
SWITCH,PRESSURE,DIFF,10-180"WC EXPL PROOF, H3 SER,H3A-1SL,DWY	16090265
GAUGE,FLOW,0-225 CFM @ 0-3",WC	PPP082020
GAUGE,FLOW,0-325CFM,7.97"WC	10506
FILTER,AIR,.175"NPT,20CFM	10315
GAUGE,VACUUM,0-100",1/4"	PPP092007
QCK CNCT,NCKL,1/4X1/8MPT,PUSH/ PULL	PPP103001
ELBOW,BRS,1/8",MxF,SQUARE	PPP003061
TUBING,PE,.170x1/4,FT POLYETHYLENE	87050501

Non-XP Electrical Components

ENCLOSURE,PIANO HINGE,JIC	16090095
CONN,HUB,3/4"CONDUIT,AL	PPP019022
TRANSFORMER,50V,460 TO 230	16090100
RELAY,110V,DPDT,10 AMP	PPE014090
RELAY,TIMER,120VAC,PC MNT	PPE014094
FUSE HOLDER ASSEMBLY	2010029
FUSE,1A,250V,SLO-BLO	PPE011026
FUSE,.5A,250V,SLO-BLO	PPE011016
SELECTOR SWITCH	17250035
INDICATOR LIGHT,RED,GECM	16110088
INDICATOR LIGHT,GREEN,GECM	16110112
TIMER,EM,1 POLE,120V,24 HOUR 2A517	16110138

XP Electrical Components

SWITCH,OPER,3 POS,EP	PPE015025
LIGHT,IND,RED,120V	PPE102002
MOTOR STARTER	(contact your Geotech Sales Representative to spec out this item)
BLOWER	(contact your Geotech Sales Representative to spec out this item)
TRANSFER PUMP	(contact your Geotech Sales Representative to spec out this item)
MANUAL,SVE AND AIR SPARGE	10804
MANUAL,GECM	16110163

Air Sparge Parts Listing

System Hardware

A variety of system compressors, from rotary claw to rotary vane, are available through your Geotech Sales Representative.

Plumbing

Plumbing accessories vary and are dependent upon the plumbing/pipe size of the system (1", 1.5" and 2"). Contact Geotech Sales for your system specific parts.

Parts Description

Parts List

Air Flow and Vacuum

Temp switch
Pressure switch
Temp gauge
Pressure gauge
CFM gauge w/ Pitot Tube (contact your Geotech Sales Representative to spec out this item)

Non-XP Electrical Components

ENCLOSURE,PIANO HINGE,JIC	16090095
CONN,HUB,3/4"CONDUIT,AL	PPP019022
TRANSFORMER,50V,460 TO 230	16090100
RELAY,110V,DPDT,10 AMP	PPE014090
RELAY,TIMER,120VAC,PC MNT	PPE014094
FUSE HOLDER ASSEMBLY	2010029
FUSE,1A,250V,SLO-BLO	PPE011026
FUSE,.5A,250V,SLO-BLO	PPE011016
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XP Electrical Components

SWITCH,OPER,3 POS,EP	PPE015025
LIGHT,IND,RED,120V	PPE102002
MOTOR STARTER	(contact your Geotech Sales Representative to spec out this item)
BLOWER	(contact your Geotech Sales Representative to spec out this item)
TRANSFER PUMP	(contact your Geotech Sales Representative to spec out this item)
MANUAL,SVE AND AIR SPARGE	10804
MANUAL,GECM	16110163

Appendix A - Decontamination Procedures

Some common decontamination solutions are listed below along with the contaminants they are effective against:

<u>Solution</u>	<u>Effective Against</u>
Water acids, other polar Dilute Acids Dilute Bases Organic solvents	Short-chain hydrocarbons, inorganic compounds, salts, some organic compounds. Basic (caustic or alkaline) compounds, amines, hydrazines. Acidic compounds, phenols thiols, some nitro- and sulfonic compounds. Non-polar compounds (such as some organic compounds)

The use of organic solvents is not recommended because:

- 1) Organic solvents can permeate and/or degrade the protective clothing and
- 2) They are generally toxic and may result in unnecessary employee exposure to hazardous chemicals.

When in doubt, use a dish washing liquid detergent. As a decontamination solution, it is readily available, is the safest of all the above, and is usually strong enough if used generously.

The use of steam can also be effective for decontamination. A water-lazer (pressurized water) is exceptionally valuable.

The following substances are noted for their particular efficiency in removing certain contaminants or for decontaminating certain types of equipment.

<u>Solution</u>	<u>Effective Against</u>
Penetone	PCB Contamination (since penetone may also remove paint, it is a good idea to spot-test before use)
Phosphate free detergent	Contaminated pumps
Ivory liquid	Oils
Diluted HTH	Cyanides
Radiac	Low level radioactivity
Isopropanol down rubber)	Biological agents (should not be used on rubber products since it will break
Hexane	Certain types of lab or sampling equipment (use of hexane is discouraged due to its flammability and toxicity)
Zep	General purpose cleaning
Phosphate free detergent	General purpose cleaning

Decontamination Solutions to Avoid

Some decontamination solutions should be avoided because of their toxicity, flammability, or harmful effects to the environment. Halogenated hydrocarbons, such as carbon tetrachloride, should not be used because of their toxicity, possible incompatibility, and some because of their flammability.

Organic decontamination solutions should not be used on personal protective equipment (PPE) because they may degrade the rubber or other materials comprising the PPE.

Mercurials are sometimes used for sterilization. They should be avoided because of their toxicity.

Chemical leaching, polymerization, and halogen stripping should all be avoided because of possible complications during decontamination.

Sand-blasting, a method of physical removal, should be avoided because the sand used on the contaminated object usually needs to be disposed of as hazardous waste, a very costly proposition. Also, sand-blasting exposes personnel to silica, a carcinogen.

Freon is known to be particularly effective for the cleansing of PCB's but its effect on the ozone layer is extremely harmful. Its use is discouraged.

Strong acids or bases should not be used when cleaning metals and gaskets or tools or other equipment because of the possibility of corrosion.

Disposal of Decontamination Solutions and Waste Water

All solutions and water used for decontamination must be collected. If lab analysis indicates that the water and/or solutions exceed allowable contamination levels, they must be treated as hazardous waste. Alternatively, the solutions and water may be treated on-site to lower the contamination levels and render them non hazardous.

Containers such as 55-gallon drums should be available for storage of wastes.

Spent decontamination solutions can be collected by using heavy-duty plastic sheets, visqueen sheets, kiddie pools, or if needed, a larger containment basin. The decontamination of equipment must be performed on the sheets or in the basins. They could be placed on a slight angle so that the spent decontamination solutions drain into a collection basin or drum.

Recommended Supplies for Decontamination of Personnel, Clothing and Equipment

The list below contains recommendations for supplies which would be on hand for the decontamination of personnel, clothing and equipment. Depending on the site activities, not all of these items may be needed. Alternatively, some additional items not listed here may be required.

- Drop cloths of plastic or other suitable material, such as visqueen, for heavily contaminated equipment.
- Disposal collection containers, such as drums or suitably lined trash cans for disposable clothing and heavily contaminated personal protective clothing or equipment to be discarded.
- Lined box with adsorbent for wiping or rinsing off gross contaminants and liquid contaminants.

- Wash tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system).
- Rinse tubs of sufficient size to enable workers to place booted foot in and wash off contaminants (without a drain or with a drain connected to a collection tank or appropriate treatment system)
- Wash solutions selected to wash off and reduce the hazards associated with the contaminated wash and rinse solutions.
- Rinse solution (usually water) to remove contaminants and contaminated wash solutions
- Long-handled, soft-bristled brushes to help wash and rinse off contaminants.
- Lockers and cabinets for storage of decontaminated clothing and equipment.
- Storage containers for contaminated wash and rinse solutions.
- Plastic sheeting, sealed pads with drains, or other appropriate method for containing and collecting contaminated wash and rinse water spilled during decontamination.
- Shower facilities for full body wash or at a minimum, personal wash sinks (with drains connected to a collection tank or appropriate treatment system).
- Soap or wash solution, wash cloths and towels.
- Clean clothing and personal item storage lockers and/or closets.

The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call our 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION,
PLEASE CALL OUR SERVICE DEPARTMENT AT 1-800-833-7958

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used.

Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate equipment for a fee, which will be applied to the repair order invoice.

Geotech Environmental Equipment, Inc
2650 East 40th Avenue Denver, Colorado 80205
(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com