geotech

Gravity Feed Filter Scavenger

Oil Water Separator System

Installation and Operation Manual

Rev 6/28/2018 Part # ORS999009002

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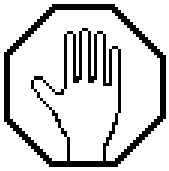
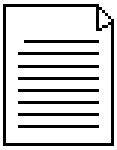
Documentation Conventions

This manual uses the following conventions to present information.

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.



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.



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

Section 1: System Description

Function and Theory

The Geotech Gravity Feed Filter Scavenger is a floating oil/water separator which passes recovered oil through an output hose connected to a tank or other collecting reservoir. Actual separation of oil or other hydrocarbons from water is effected by a mesh screen located in the floating buoy assembly. This screen is specially treated to pass oil and repel water. The screen is therefore termed oleophilic/hydrophobic (oil loving/water fearing).

During normal operation, the buoy supports the oil/water separator cartridge precisely at the oil/water interface. When oil or fuel contacts the screen, the hydrocarbon flows through while water is held back. Oil then travels out the buoy base and down the connected output hose.

As the buoy assembly recovers oil, the output hose fills and sinks allowing oil to drain through it. The output hose can also be held in a submerged position with the provided clamp on ballasts and floats which are shipped on the hose. Male and female, ¾" brass quick-connect fittings are provided to connect the output hose to the recovery tank.

System Components

The basic parts of the Gravity Feed Filter Scavenger (shown in Figure 1-1), are described as follows:

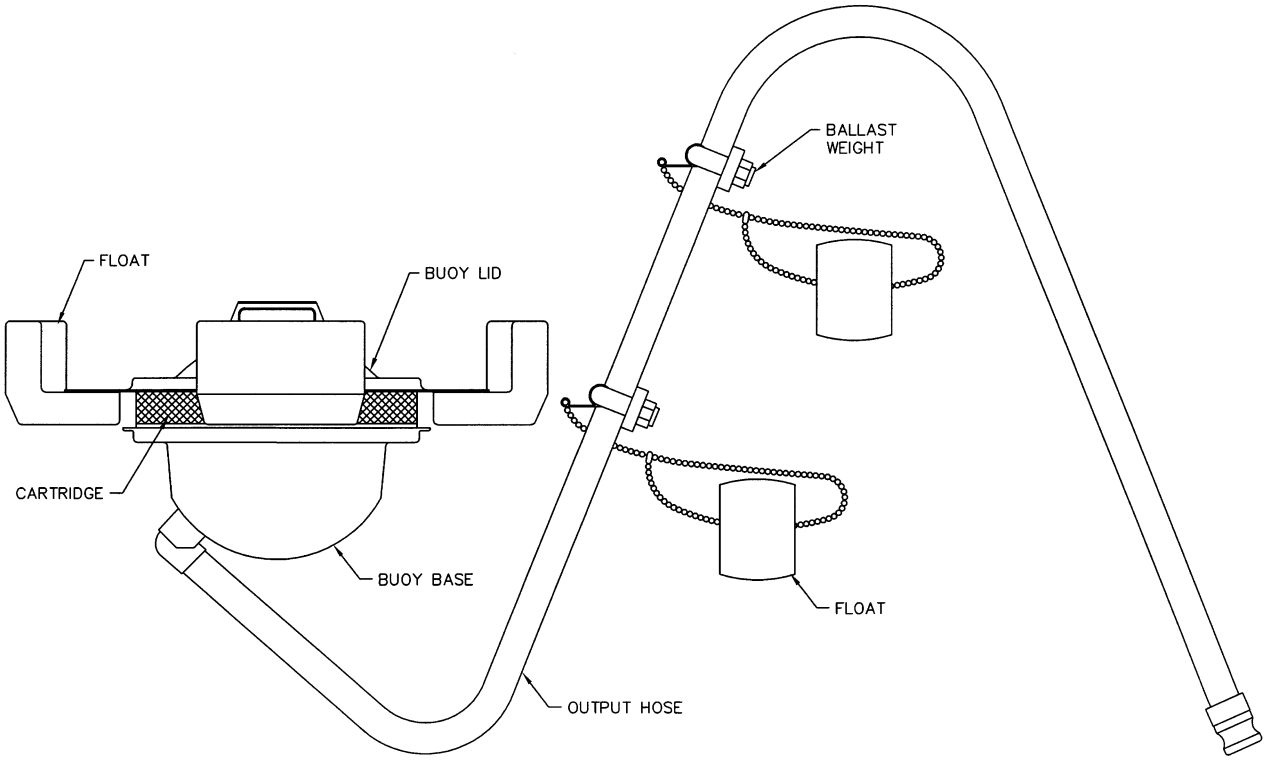


Figure 1-1: Gravity Feed Filter Scavenger Assembly

Buoy Base

The buoy base is made of anodized aluminum and collects the recovered oil and delivers it to the output hose.

Intake Cartridge

The intake cartridge is clamped between the buoy base and the lid. The base and lid have smooth, seating surfaces by which the cartridge is positioned and makes a water tight seal. The intake cartridge is available in two mesh sizes - a standard 100 mesh for gasoline, kerosene, etc. and a coarser 60 mesh for hydrocarbons with viscosities between 100 – 400 SSU's. The mesh sizes represent tradeoffs between oil flow and the ability to hold back water. The larger the hole sizes, the more easily oil flows through, but the more likely water is to enter the system. *Section 6: System Specifications* contains a few graphs which show the recovery rates of common hydrocarbons.

The screen is stainless steel with a PTFE coating. The 100 mesh screen has a blue coating while the 60 mesh is colored green. The screens are molded to an anodized aluminum frame with epoxy which has two affixed Viton O-rings. The cartridge is then sealed between the buoy lid and base by tightening the cover cap to the threaded center post.

Section 6: System Specifications contains a few charts showing an assortment of recovery rates vs. product viscosities. Geotech Sales can also help you to determine which cartridge is best suited for the product being recovered. Hydrocarbon Viscosity Test Kits (described in *Appendix C: Hydrocarbon Viscosity Test Kits*) are also available from Geotech. These test kits can be used to evaluate the product being recovered to help determine the best cartridge type to use.

Buoy Lid

The lid is made of anodized aluminum and has four blue polyurethane floats that serve as edge guides (thereby keeping the unit from getting hung up) as well as keeping the unit afloat. Flotation is provided by the four lid floats and the orange output hose floats. The lid floats may be adjusted with spacers to change the floating height of the oil/water separator cartridge with respect to the oil/water interface. Figure 1-2 shows one of the floats with the spacers adjusted for a rough water position. See *Section 3: System Operation* for further information on changing the float height of the buoy.

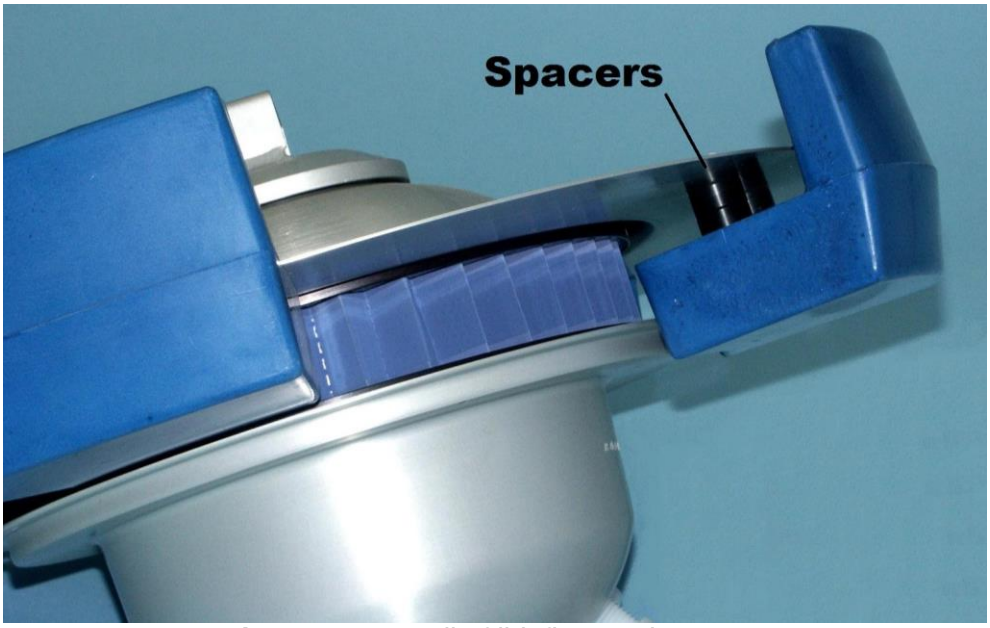


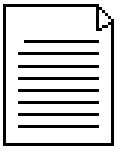
Figure 1-2: Detail of lid, float and spacers

Section 2: System Installation

To prepare the site for the Gravity Feed Filter Scavenger:

1. Remove the male quick-connect fitting (shipped connected to the female quick-connect fitting on the end of the output hose) and attach it to the output drain of your collection reservoir.
    - The male quick-connect has ¾" female NPT threads.

2. Connect the female quick-connect end of the output hose (described above) to the male quick-connect on the output drain of the collection reservoir.



The output drain fitting must not be more than 5' (1.5m) from where the Scavenger buoy will float.

Install the buoy in an above ground tank or reservoir by simply grasping the buoy by the cover handle and placing it in the water. Do not twist the cover handle as this will loosen the cartridge and let water pass into the buoy. Only if the system is floated correctly will maximum efficiency be achieved. For optimum efficiency, the buoy should be level on the oil/water surface so that the cartridge will have the maximum amount of area exposed to the oil to be recovered. The four blue lid floats should sink into the water evenly. With the output hose connected to the drain fitting, the buoy should float so that the four floats sink about 1/16" (1.6mm) to 3/16" (4.8mm). This will ensure that the cartridge will be exposed to the oil/water interface.

The level of the buoy can be affected by the way the output hose is ballasted. One way to deploy the system is so that the output hose fills and sinks as the buoy recovers oil. Ballast weights can be clamped onto the hose to make it easier for the hose to "prime" itself and sink. Additional weight can be clamped on next to the drain manifold to "pull" the buoy level. The depth at which the hose is held is adjusted by the length of chain clipped onto the weight. The effective length of chain is adjusted by how much the chain loops back on itself.

Alternatively, the output hose can be held in a constantly submerged position by using the floats and weights as shown in Figure 2-1. The weight also serves as a clamp to hold the float and float securing chain. The weights hold the hose submerged and the floats keep the hose from sinking too low and tipping the buoy. The hose float closest to the buoy may be moved for proper buoy flotation. Be careful to maintain the buoy horizontally when breaking the oil/water surface.

Once floated on the water and connected to the output drain, the buoy will recover and pass only hydrocarbon product through the output hose and on to the collection reservoir.

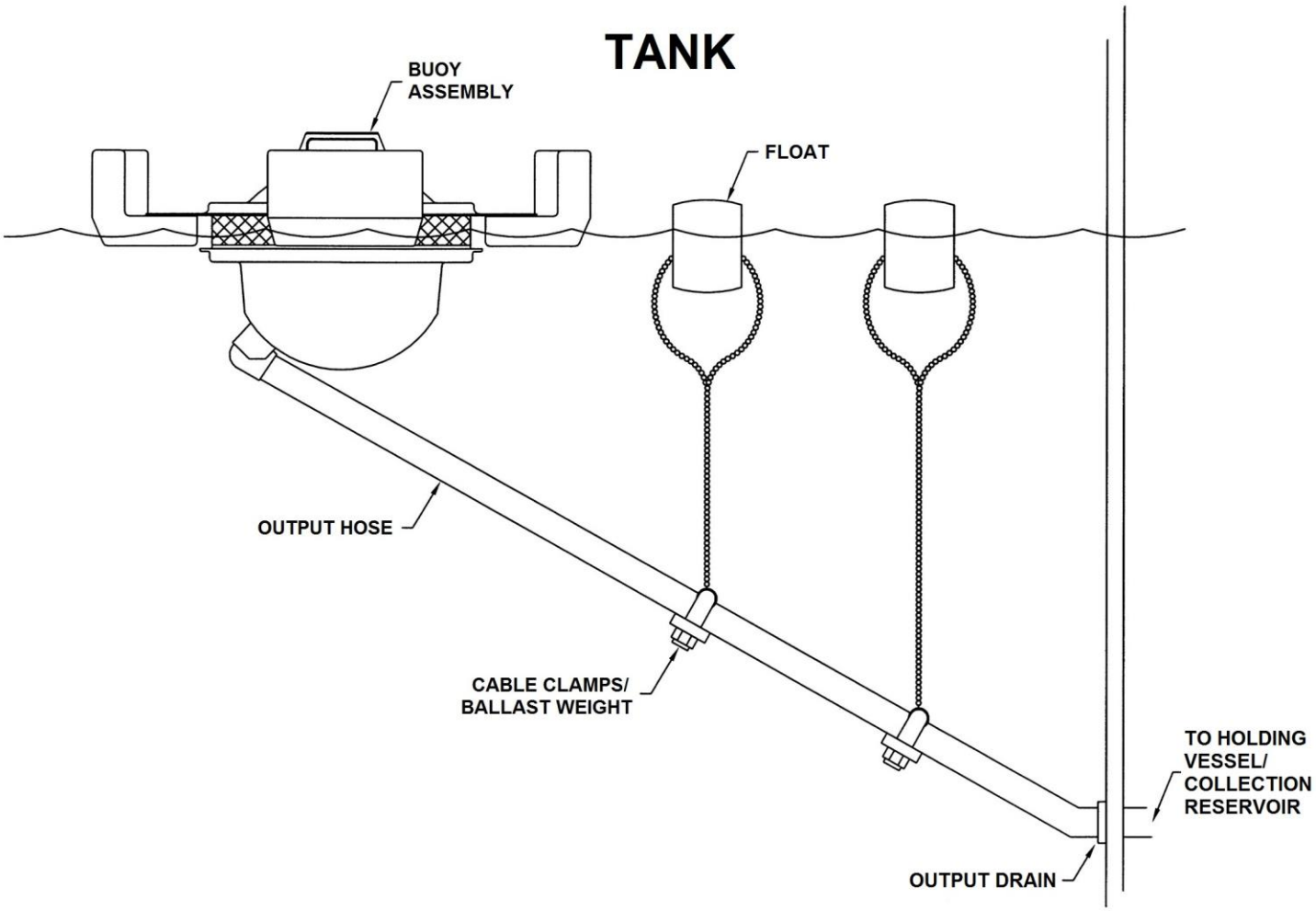


Figure 2-1: Example of buoy and float positioning in an above ground tank/reservoir.

Section 3: System Operation

The buoy assembly is designed to float an oil/water separator cartridge at the oil/water interface. Once product enters the cartridge it will exit the buoy through an elbow in the bottom of the base, flow down through the output hose, then into the collection reservoir.

For example: Assume the buoy is floating in clear water. Through factory pre-set ballasting, the four lid floats sink into the water about 1/8" (3.0 mm) exposing the cartridge to the oil/water interface. The intake cartridge passes oil and its derivatives. The oil "wets" the screen and prevents water from entering the cartridge. The screen is thus termed oleophilic/hydrophobic (oil loving/water fearing).

The Scavenger is limited by:

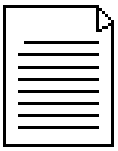
1. Water Parameters
2. Product Type Recovered

Water Parameters

The water parameters are classified into physical, chemical, and debris divisions.

Physical State

The buoy is designed as a surface follower to minimize its heave and pitch. When the water is "rough", the effect is to reduce the ability of the cartridge to repel water. Under certain conditions, the cartridge will pass water. The slight density difference of the two is inconsequential for the buoy flotation. If the unit is used exclusively in sea water, certain parts may need long-term replacement due to salt water corrosion.



Consult Geotech for protective coatings of the buoy assembly and modifications to hoses and exposed parts.

Chemical State

The cartridge will collect water if surface tension is reduced. Detergent or surfactant concentrations greater than 100 ppm (grams/liter) will cause the cartridge to pass water.

If the Scavenger is placed in an area with no oil to "wet" the screen, natural biological growth (called "slime" which is the first step in the plankton, algae, and barnacle food pyramid) will reduce the ability of the cartridge to repel water. Since this slime or fouling increases drastically in warmer water, the cartridge will pass water more easily in warm environments.

In general water-in-oil emulsions will pass through the membrane. Oil-in-water emulsions pass less easily depending on the actual percentage of oil. The oil/water interface always has both emulsion types present as well as high concentrations of surfactant. Hence, whenever the Scavenger is dealing with only thin layers of oil, the percent of interface is high and some water may pass through the cartridge.

Debris

Debris causes reduction of oil flow rate. Most debris accumulates on the mesh when a large volume of oil is going through the cartridge. Debris is easily removed when cleaning the cartridge. Often, the unit may be gently pulled up and down in its site area to remove some of the accumulated debris.

Product Type Recovered

The Scavenger will recover any non-polar liquid with density less than water. This leaves out such dense materials as chloroform, carbon disulfide, carbon tetrachloride, and Freon. Certain materials will dissolve the ABS cartridge seals, but the unit may be used in an emergency or if concentrations of such materials are low. These materials are usually aromatics: common ones are pure, 100% benzenes, xylenes, toluenes, and styrene monomers. The aluminum buoy/ETP Fluoroelastomer cartridge system can handle these materials.

Common materials besides gasoline, kerosene, and oils which will readily be recovered are: hexanes, heptanes, octanes, petroleum, napthas, pentanes, or mixtures of the above. An extensive listing of recoverable materials can be found in *Appendix A: Recoverable Materials*.

Skimming Only Operation

In situations when the water is frequently rough or the cartridge has become contaminated with detergent it may be necessary to float the buoy above the oil/water interface in order to prevent water intrusion. The two pair of washer shims above each lid float may be placed between the lid and the float as shown in Figure 1-2. Note that a total of three float positions are possible with the spacers provided.

To convert the buoy for skimming operations:

1. Unscrew the eight 1/4-20 nylon cap nuts located on top of the lid.

2. Carefully pull out the four floats and re-insert them with either one or two spacers between the float and the lid (see Figure 1-3).

3. Rethread the cap nuts. With one spacer between the lid and the float, the buoy will skim to approximately 1/10” (2.5 mm) of product. With two spacers between the lid and the float, the buoy will skim to approximately 1/5” (5mm) of product.
4.

Buoy replacement parts are available from Geotech. See *Section 7: Replacement Parts List* for list of available parts.

Section 4: System Maintenance

Proper functioning of the Gravity Feed Filter Scavenger requires that the oil/water separator cartridge, buoy and hoses be regularly monitored for leaks and clogs. Maintenance procedures for these components are described within this section. Normal maintenance requires an occasional cleaning of the cartridge which in high flow and/or debris laden situations may clog and cut down on flow. While normally only petroleum and its products are collected, water that has emulsified with the oil or highly detergent laden water will pass through the cartridge.

Oil/Water Separator Cartridge

Two basic types of problems may afflict the oil/water separator cartridge: clogging of the separator screen and leakage of water into the cartridge.

Screen Clogging

Although the separator screen has been designed with corrugations to provide maximum surface area, buildup of debris will reduce the rate of hydrocarbon recovery. In most well sites, debris clogging is a minor problem because the hydrocarbon has already been filtered somewhat in moving through the earth. Where industrial waste oil must be recovered, screen clogging is potentially a more serious concern.

In the event of screen clogging, remove and disassemble the buoy, then gently clean the intake screen using a soft brush and other hydrocarbon (such as kerosene or diesel). Then re-install the buoy. It may be necessary that you install a separate screened area for the buoy to be placed into in order to prevent future clogging.

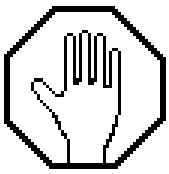
Water Leaks (also used for Cleaning the Buoy Assembly)

Factors that may cause water to leak through or past the oil/water separator cartridge include improper buoy flotation, improper sealing of the cartridge to the buoy housing, improper priming, and the presence of detergents on the screen itself. If a problem with the oil/water separator cartridge is suspected, the following procedure should be followed.

1. Unthread the buoy cover handle and lift off the buoy lid.

2. Lift the cartridge from the buoy base.

3. Wash and rinse the cartridge and the sealing surfaces on the buoy base and lid.
    - Use kerosene, hexane or any common aliphatic hydrocarbon.



DO NOT USE other cleaning solvents, aromatic, or ketone. DO NOT USE detergents unless the unit is then carefully washed in water followed by one of the approved solvents mentioned above. Confirm that the oil and water floats are free to move up and down through the full range of their travel. Clean the floats with one of the approved solvents.

4. If the cartridge is visibly damaged, replace the cartridge.

5. Inspect the aluminum surface of both the buoy and lid.
    - If there is a dent or bend in the metal where the cartridge O-rings rest then water can leak through these areas.

6. Once the cartridge and its two sealing surfaces have been cleaned, prime the screen with kerosene (or with the hydrocarbon to be collected), then re-insert and center the cartridge in the base.
    - Confirm that the cartridge is not wet with water before installation.

7. Set the buoy lid in place and tighten the cover handle.
    - Only moderate torque is necessary for a water tight seal.

8. Arrange the two floats on the output hose if needed.

Buoy Lid and Cover Cap

The cover cap is aluminum with a 5/16-18 threaded center hole. Its handle provides easy lifting and tightening of the buoy assembly.

Three screen covered holes go through the buoy lid and allow air to escape from the buoy as product accumulates. The vent holes are protected from rain by the cover cap, which is held off the lid surface by the three nylon bolts in the lid.

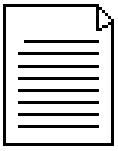
Section 5: System Troubleshooting

Problem: Buoy fills with water.

Solution:

1. Check the floating height of the buoy. Adjust the floats if necessary.

2. Check for a damaged oil/water separator screen. Check for the presence of detergents in the water.



Occasionally, water which has leaked into the buoy may become trapped below the oil in the output hose. After the cause of the leak has been cured, this water may leak back into the buoy.

3. Check for dents or scratches on the buoy surface near the oil/ water separator sealing ring. Such irregularities can cause water leakage around the screen. On older models, aluminum lids were made of a soft alloy that could be distorted by rough handling. A distorted lid could change the position of the floats thus changing the level of buoy flotation and allowing the intrusion of water.

4. Clean and re-prime the screen as described in *Section 4: System Maintenance*.

Problem: Buoy fills with oil and sinks.

Solution:

1. Check for any obstructions to the screen within the buoy base and throughout the output hose.

2. Check for a collapsed or kinked output hose.

3. Check for a clogged connection at the output drain and verify that the collection reservoir is not full.

Section 6: System Specifications

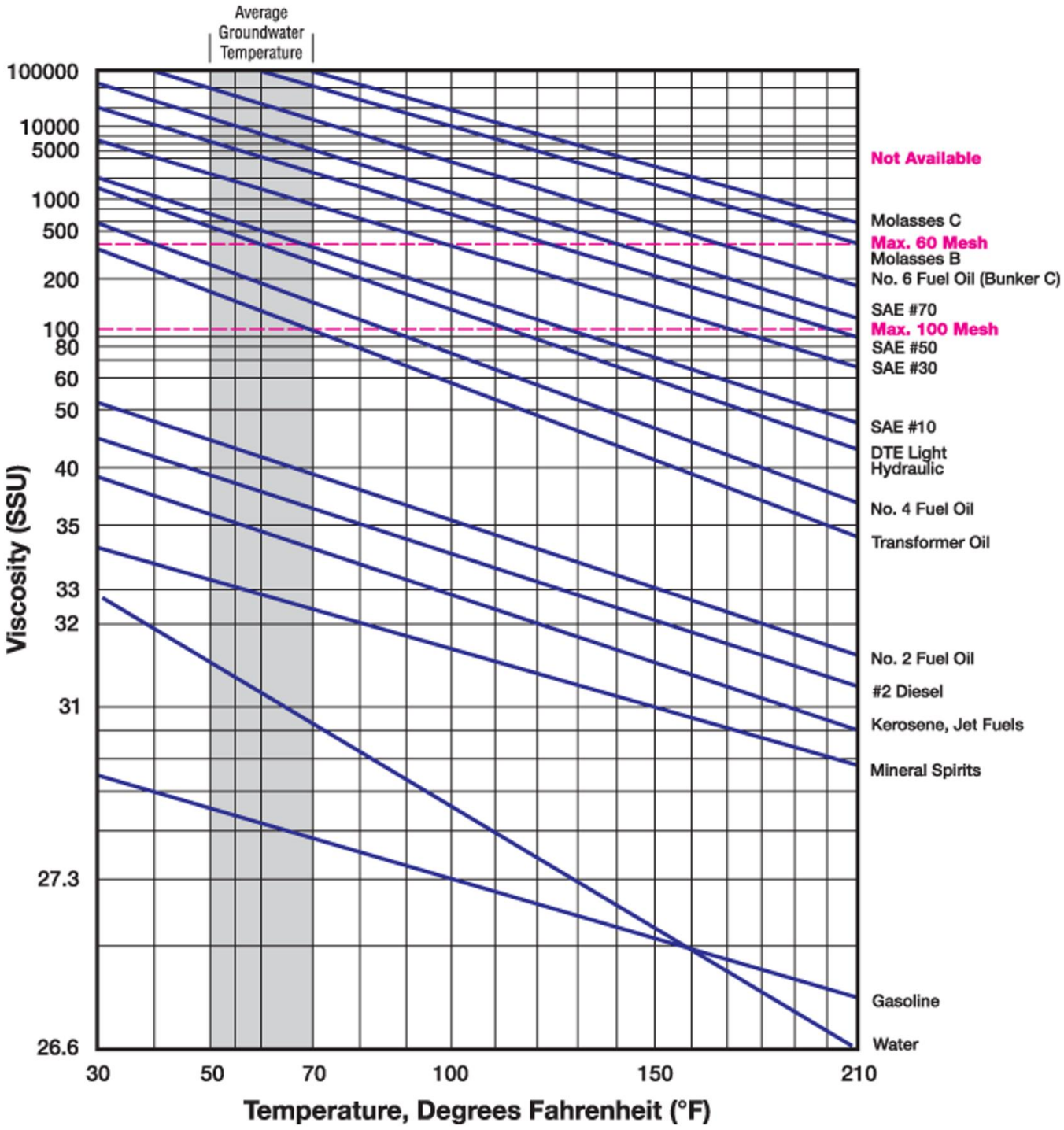
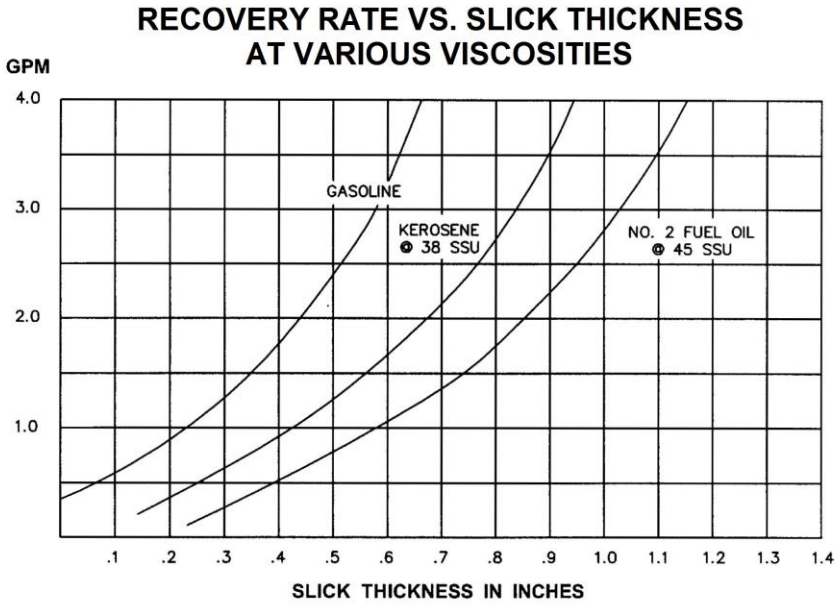


Figure 6-1: Viscosity chart and temperature

Scavenger "Light Oil" Separator Cartridge



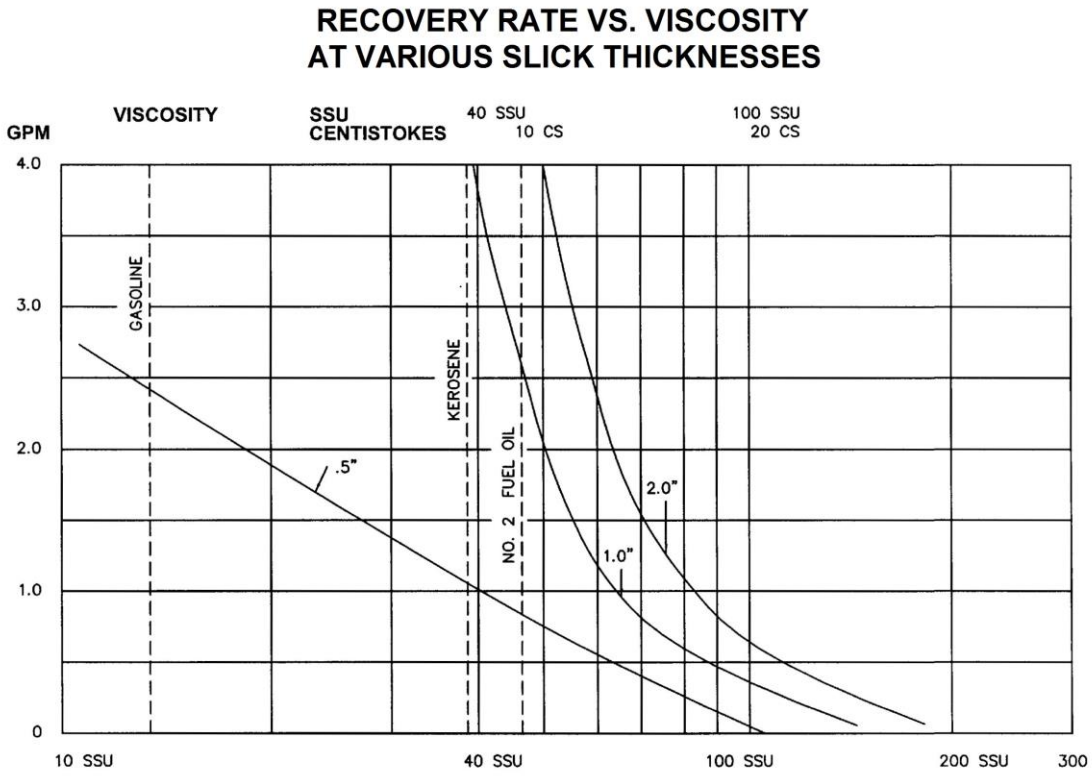
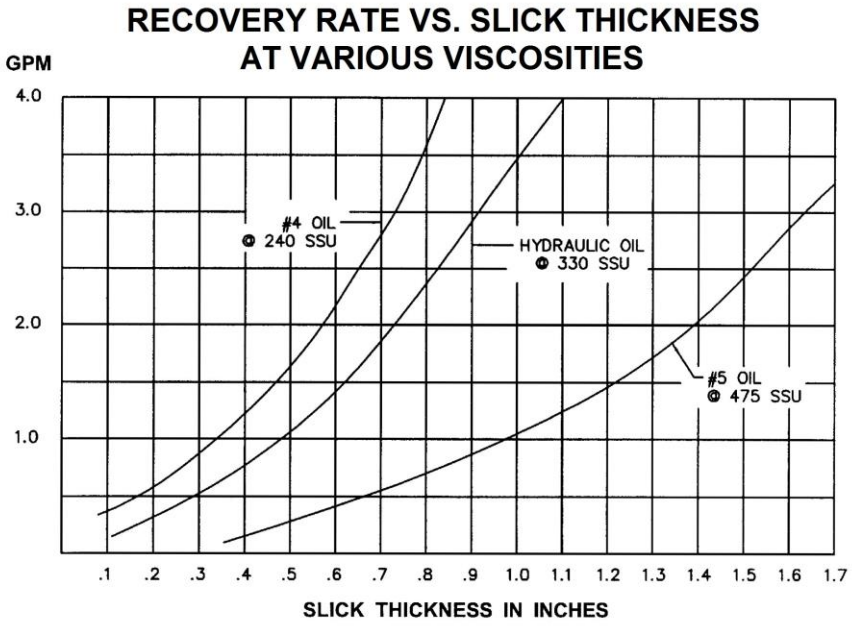


Figure 6-2: 100 mesh (blue) screen recovery rate and viscosity chart.

Scavenger "Heavy Oil" Separator Cartridge



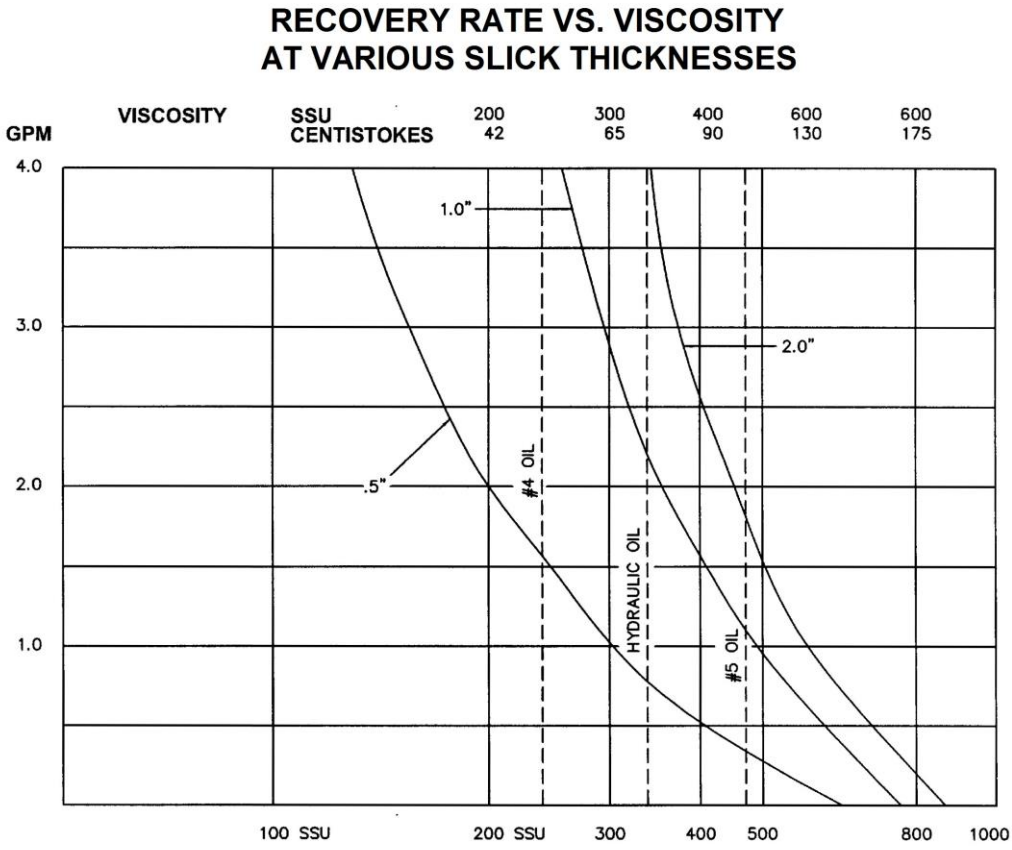


Figure 6-3: 60 mesh (blue) screen recovery rate and viscosity chart.

Section 7: Replacement Parts List

Part Description	Part Number
GRAVITY FEED SCAV, 100 MESH	1090001
GRAVITY FEED SCAV, 60 MESH	1090002
ASSY,CARTRIDGE,#100 MESH,LIGHT	2010054
ASSY,CARTRIDGE,#60 MESH,HEAVY	2010056
TEST KIT,HYDROCARBON VISCOSITY 60MESH & 100MESH	86020001
COVER HANDLE ASSY	2010007
ASSY,LID,BUOY	2010006
FLOAT,LDFS LID	2010011
NUT,1/4-20,CAP,SLTD	PPF025001
SPACER,.75x.35	ORS362001
HOSE ASSY,6'HOSE,OUTPUT	2090003
FLOAT,HOSE,1"ID,ORANGE	PPM020002
CABLE,SS-FEP,1/16X3/32 FEP COATED/STAINLESS	77051004
CLAMP,SS6,CABLE,LOW PRFL	16650327
CLAMP,HOSE,SST,1x3/8"	PPF029021
QDISC,BRS,.75"Mx.75"MNPT 75-F-BR	PPP007002
QDISC,BRS,.75"Fx.75"BARB	PPP004002
HOSEBARB,NYL,5/8 X 3/4MPT	17200414
CLIP,CABLE,GALV,5/8"	PPF084003
MANUAL,GRAVITY FEED SCAV	ORS999009002

Appendix A: Recoverable Materials

In order for a material to be recovered by the Gravity Feed Filter Scavenger, it must have the following properties:

- It must float on water.
- Its specific gravity must be less than 1.0 and its kinematic viscosity less than 100SSU, for use with the "light" oil filter cartridge, and between 100 and 400SSU for use with the "heavy" oil filter cartridge.

This means that short chained alcohols, carbon disulfide, chloroform, carbon tetrachloride and other dense solvents which are heavier than water can only be recovered by using a Geotech Probe Scavenger. Solvents that are lighter than water can be recovered with the filter cartridges that come with the Scavenger. See Section 6 and Appendix C for more information.

The following will work with the average Scavenger filters:

Alkanes: e.g. pentanes, hexanes, heptanes, etc.
Alkenes: e.g. 2-pentane, 3, 4-dimethyl-2-hexane, etc.
Aromatic hydrcarbons: e.g. benzene, toluene, xylene, vinyl benzene, etc.
Alcohols with 4 or more carbon atoms: e.g., nbutyalcohol, hexanol, octanol, etc.
Esters with 5 or more carbon atoms: e.g. pentyl acetate.

Mixtures of the above: fuel oils, gasoline, kerosene, mineral spirits, naphthas, etc.
Mono-alkyl halides: e.g. ethylchloride, allyl chloride, etc.

The Aromatic Scavenger must be used to recover materials containing aromatic hydrocarbons. It has epoxy/ETP Fluoroelastomer filter cartridge, modified floats, etc. Materials requiring an Aromatic Scavenger are marked with an asterisk (*) on the following list.

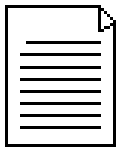
If the water in which the Scavenger buoy is floating is very acidic or basic, a pH Scavenger and buoy may be necessary. This Scavenger employs all the features of the aromatic unit, as well as resistance to extreme pH conditions. This unit should generally be used when pH is lower than 5 or greater than 9 (requires specific information on the water and materials to be recovered prior to final specification of components for the pH Scavenger).

The following list is taken from a composite of materials deemed hazardous by:

1. Environmental Protection Agency, Hazardous Substances, Federal Register, December 30, 1975

2. Environmental Protection Agency, Contingency Plan, Region II for spills of Oil and Other Hazardous Materials for Inland Waters of Region II.

3. National Fire Protection Association, Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids, NFPA #325M-1969.



Many other non-hazardous substances, not on this list, can also be recovered. Examples of this are the variety of Edible Vegetable Oils. When in doubt, materials should be tested using a Hydrocarbon Viscosity Test Kit. See Appendix C for more information.

All materials listed here will work with the Scavenger System.

allyl chloride
amyl acetate
amyl alcohol
sec-amyl alcohol
amyl benzene*
amyl chloride (1-chloropentane)
tert-amyl chloride
beta-amylene-cis
beta-amylene-trans
amyl ether
amyl formate
amyl maleate
amyl propionate (pentyl propionate)
amyl toluene*
benzene*
benzyl formate*
bicyclohexyl (dicyclohexy)
butyl acetate
sec-butyl acetate
butylbenzene*
sec-butylbenzene*
tert-butylbenzene*
butylchloride (1-chlorobutane)
sec-butylchloride (2-chlorbutane)
ter-butylchloride (2-chloro-2-methylpropane)
butyl butylrate
tert-butyl carbinol (2,2-dimethyl-1-propanol)
butylisovalerate
butylmethacrylate
2-chlorobutene-2
chloroethane
1-chlorohexane
cumene (2-phenyl propane, osproply, benzene)*
cycloheptane
cyclohexane
cyclohexene
cyclohexyl acetate
cyclohexyl benzene*
cyclohexyl chloride
cyclopentane
cyclopentanol
decane
decanol
1-decene
decylbenzene*
diamylene
Diesel Fuel #1
Diesel Fuel #2
O-diethyl benzene*
m-diethyl benzene*
p-diethyl benzene*
diethylcyclohexane
3,3-diethylpentane
diisopropyl benzene*
2,2-dimethylbutane
2,3-dimethylbutane
2,3-dimethyl-1-butene
2,3-dimethyl-2-butene
1,4-dimethylcyclohexane
1,4-dimethylcyclohexane-cis
1,4-dimethylcyclohexane-trans
2,4-dimethyl-3-ethylpentane (3-ethyl-2,4-dimethylpentane)
3,3-dimethylheptane
2,3-dimethylhexane
2,4-dimethylhexane
2,3-dimethyloctane
3,4-dimethyloctane
2,3-dimethylpentane
2,4-dimethylpentane
dipentene
1,1-diphenylbutane*
1,1-diphenylpentane*
1,1-diphenylpropane*
dodecene
1-dodecanol (lauryl alcohol)
dodecylene (1-dodecene)
ethyl acetate
ethylbenzene*
2-ethyl-1-butene
2-ethylbutyl acetate
2-ethylbutyl acetate
2-ethylbutyl alcohol
ethylcyclopentane
ethyl formate
2-ethylhexyl chloride
ethyl isobutyrate
3-ethyloctane
4-ethyloctane
ethyl methacrylate
ethyl propionate
m-ethyltoluene (1-methyl-3-ethylbenzene)*
o-ethyltoluene (1-methyl-2-ethyltoluene)*
p-ethyltoluene (1-methyl-4-ethyltoluene)*
Fuel Oil #1(kerosene, range oil,coal,oil)
Fuel Oil #2
Gasoline
hendecane
heptane (all isomers)
2-heptanol
3-heptanol
heptylene (1-heptene)
heptylene-2-trans (2-heptene-trans)
1,4-hexadiene
hexane
1-hexene
2-hexene
hexyl acetate
hexyl alcohol
sec-hexyl alcohol (2-hexanol)
isoamyl-alcohol
isoamyl chloride (1-chloro-3-ethylbutane)
isoamyl butyrate (isopentyl butyrate)
isobutane
isobutyl benzene*
isobutyl chloride
isodecane
isoheptane
isophorone
isoprene
isopropyl bicyclohexyl
Jet Fuels
Kerosene
methallyl chloride
methyl methacrylate
2-methyl-1-butanol
2-methyl-2-butanol
2-methyl-1-butene
2-methyl-2-butene
3-methyl-1-butene
methcyclohhexane
2-methylcyclohexanol
3-methylcyclohexanol
4-methylcyclohexanol
methylcyclohexanone
methylcyclopentadiene
methylcyclopentane
2-methyldecane
1-methyl-3,5-diethybenzene*
2-methyl-4-ethylhexane
3-methyl-4-ethylhexane
2-methyl-3-ethylpentane
2-methyl-1,3-pentadiene
2-methyl-1,3-butadiene (isoprene)
2-methylpentane
3-methylpentane
2-methyl-1-pentanol
4-methyl-2-pentanol acetate
2-methyl-1-pentene
4-methyl-1-pentene
2-methyl-2-pentene
methyl propionate
methylstyrene*
mineral oil (less than 45cs)
mineral spirits
naphtha
nonane
nonane (iso), 2-methylloctane, 3-methyloctane, 4-methyloctane
nonylbenzene*
octane
2-octanol
1-octene
octyl formate
octyl alcohol (1-octanol)
octyl chloride
pentachlorophenol*
pentane
3-pentanol
petroleum, light crude
Petroleum ether (benzene,naphtha)
Pinane
Propylbenzene (phenylpropane)*
propyl chloride
propyl propionate
Stoddard solvents
styrene (cinnamene, phenylethylene vinyl benzene)*
2,2,3,3-tetramethylpentane
2,2,3,4-tetramethylpentane
Toluene*
Toluol*
1,2,3-trimethylbenzene*
1,2,4-trimethylbenzene (pseudocumene)*
1,3,5-trimethylbenzene (mesitylene)*
2,2,3-trimethylbutane
2,3,3-trimethyl-1-butene
2,5,5-trimethylheptane
2,2,5-trimethylhexane
2,6,8-trimethylnonane
2,3,4-trimethyl-1-pentane
2,4,4-trimethyl-1-pentene
2,4,4-trimethyl-2-pentene
3,4,4-trimethyl-2-pentene
Turpentine
4-vinyl cyclohezene
vinyl propionate
m-xylene*
o-xylene*
p-xylene*
xylol

Appendix B: Decontamination Procedures

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

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

Solution	Effective Against
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	Biological agents (should not be used on rubber products since it will break down rubber)
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.

Appendix C: Hydrocarbon Viscosity Test Kits

Hydrocarbon Viscosity Test Kits are used to determine hydrocarbon viscosity vs. applicability of the oleophilic/hydrophobic screen technology. They are especially useful when your Filter Scavenger is going to be used to recover varying products. The test kits come with a glass container and lid and a floatable sample of both 100 mesh and 60 mesh screen. These screens are used on Geotech's product line of assorted intake cartridges and assemblies.

The test kits do not measure viscosity – they help to verify if the screen technology is applicable for the site. The blue screen is 100 mesh, which is good for gasoline, kerosene, diesel, JP-4 and #2 fuel oil viscosities. The green screen is 60 mesh, which is good for hydrocarbons that fall between #2 and #4 fuel oil viscosities. When testing for product viscosity, always start with the 100 mesh (blue) Hydrocarbon Viscosity Test Kit (a complete kit is shown in Figure AC-1).

Viscosity is temperature dependent. When testing for applicability, make sure the hydrocarbons tested are at the same temperature as the environment they will be recovered. Testing at 75° - 80° F (24° - 27° C) room temperature may prove applicable, but may not function in a 45° - 50° F (7° - 10° C) ground water environment.

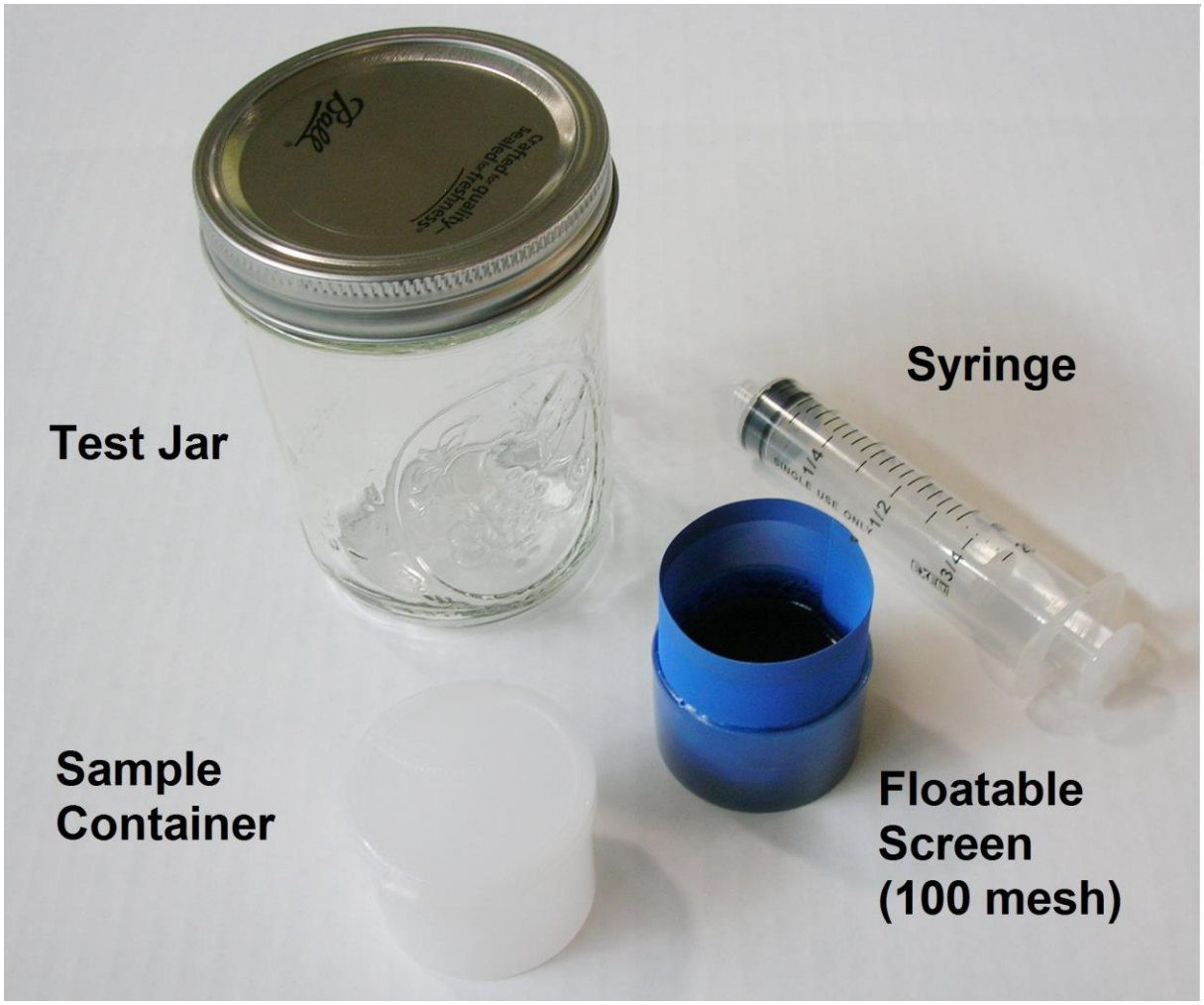


Figure AC-1: Hydrocarbon Viscosity Test Kit

To use the test kit partially fill the glass container 1/3 – 1/2 full of water, then introduce the hydrocarbon layer into the jar. Using a soft bristle brush, condition (or prime) the outside of the test screen with the product to be recovered. Once the hydrocarbon in the jar has settled to the top of the water, slowly place the floatable screen on top of the product/water surface. The screen is designed to float at the oil/water interface and allow hydrocarbon to pass through the screen.

Do not put too much hydrocarbons in the glass jar. Too much product may cause the floating screen to fill up and sink to the bottom of the glass jar.

If the screen does not pass product, the viscosity may be too great. Re-test using the 60 mesh (green) test kit. If the green screen will not pass product, the product's viscosity is too great for this type of technology.

Special Note:

The specific gravity of the product to be recovered must be less than 1.0 and its viscosity less than 100 SSU for use with the "light" oil filter (100 mesh), 100 to 400 SSU for use with the "heavy" oil filter cartridge (60 mesh). Geotech application engineers should be consulted for product recovery operations with viscosities outside that range.

Silts and fines in the product can clog the screens ability to recover hydrocarbons. Alternatives should be discussed if their presence in the product is anticipated. This technology is designed to be used in wells with free product of at least 1/8" (3.2 mm) thickness. The presence of surfactants or detergents in the product can also affect the screens ability to differentiate between water and hydrocarbons. Please call Geotech at (800) 833-7958 to discuss your special applications.

Maintenance

Hydrocarbon Viscosity Test Kits are re-useable and can be easily cleaned with a soft bristle brush using either kerosene or diesel. Afterwards, clean the equipment with a mild detergent and air dry before storing. See *Section 7: Replacement Parts List* for a list of available test kits and intake cartridges supporting your Filter Scavenger.

REVISION HISTORY		
PROJECT #	**DESCRIPTION**	**DATE**
1659	Removed PNs: 1010911, 1910912, ORS285001, ORS568001, ORS027001, PPF027006. Added PNs: 8602001, 1090001, 1090002. Revised manual for formatting and consistency. Added revision history. – StellaR	6/28/2018

NOTES

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.

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