



<b>FS</b>
<b>Floatables Skimmer</b>

## Description

Floatables skimmers (or also called oil/water separators or oil/grit separators because most designs generally remove coarse sediment) are intended to remove floating gasoline, oil, grease, light petroleum products and other floating liquids and debris from stormwater runoff. Floatables skimmers are especially applicable as pretreatment before detention ponds. See Section 8.2 Media –Sand Filters for similar structures, which also have some capabilities for removing oil and grease. Various systems discussed in this section should be evaluated for targeted constituents, site area constraints, cost, frequency of maintenance, reliability, and inspection requirements.

There are two basic types of floatables skimmers, conventional and Coalescing Plate Interceptors. Conventional separators rely upon gravity, physical characteristics of oil and sediments, and good design parameters to achieve pollutant removal. CPI separators contain closely-spaced plates which greatly enhance the removal efficiency for oils and grease. In addition, a wide variety of systems are commercially available in a variety of layouts, for which vendors have design data and procedures.

## Selection Criteria

Floatables skimmers are commonly used for industrial applications, which have a constant flow of known quantity. Skimmers are very efficient in these types of applications. However, it is much more difficult to remove smaller concentrations (such as 10 ppm) from stormwater runoff which has a much broader range of flows.

Due to many unknown variables concerning oil and grease pollutants, theoretical equations for oil separation are not usually applicable for stormwater runoff. There are a wide variety of empirical guidelines when evaluating manufactured floatables skimmers. The most important selection criteria are the long-term maintenance and operation costs, regular inspections, and cleanout procedures. The floatables skimmer system should only be constructed if: 1) there is a maintenance plan to regularly inspect and maintain the floatables skimmer on a long-term basis, and 2) there is an agreement or fiscal guarantee that the required maintenance resources will be available for the life of the system. Without regular inspection and maintenance, a floatables skimmer will fail and generally create a worse pollution problem.

Another very important decision is whether to bypass large storm events around the floatables skimmer without damaging the system, exceeding design flow capacity, or re-suspending collected pollutants. For larger storm events, stormwater runoff will become turbulent and remix the floatable fluids droplets. Large flows can also scour

sediments that have been deposited on the bottom of a floatables skimmer over the course of several months. Essentially, pollutant removal is only ensured when the skimmer is cleaned out regularly, and the sediments are properly analyzed and disposed.

Stormwater runoff is only detained briefly within the skimmer because of size constraints for an engineered structure. Therefore, it is important that all factors leading up to the skimmer and also downstream from the skimmer are favorable for its effective operation. A floatables skimmer is frequently used as the upstream pretreatment measure in a series of stormwater treatment BMPs, ahead of a detention basin or constructed wetland.

Advantages of a floatables skimmer may include:

- Efficient use of valuable space (since it is usually located underground)
- Does not require as much vertical drop as some other types of BMPs
- Easily accessible and easy to clean with proper equipment
- Reliable if carefully designed (including upstream and downstream reaches)

Floatable skimmers are ideal for the following situations:

- Parking lots, streets, driveways, truck loading areas
- Runways, marinas, loading wharves
- Gasoline stations, refueling areas
- Automotive repair facilities, oil-change businesses, fleet maintenance yards
- Recycling or salvage yards which accept automotive equipment
- Commercial vehicle washing facilities
- Pretreatment in combination with detention ponds, infiltration systems, constructed wetlands, etc.

## Design Considerations

A scientific basis for sizing a floatables skimmer relies upon the rising velocity of oil droplets and the rate of runoff through the system. However, other than stormwater from oil refineries, there is generally no relevant method for describing the characteristics of petroleum products in urban stormwater. It is known that conventional oil/water separators are probably not efficient for removing oil droplets with diameters smaller than 150 microns. Therefore, design is performed on the basis of engineering judgment and guidelines.

Design procedures for commercially available floatables skimmers are usually given by simplified tables or graphs based on field testing and observed pollutant removal rates. It is desirable to maintain reasonable dimensions by bypassing larger flows in excess of the 1-year storm rainfall rates (preferably by placing the separator “off-line” rather than “on-line”). An off-line separator can be an existing or proposed manhole with a baffle or other control. Bypass mechanisms must minimize potential for captured pollutants from being washed out or re-suspended by large flows.

Some petroleum products may become attached to coarse sediments which are easily removed in the first chamber. A significant percentage of petroleum products also become attached to fine suspended solids and therefore are not removed by settling or flotation. Consequently, the performance of floatables skimmers can be difficult to estimate prior to installation and monitoring.

### **Conventional Floatables Skimmer**

Oil and other floatable fluids do not separate easily from water. By careful design of upstream and downstream reaches, it is possible to reduce turbulent flows, drop heights, mixing or swirling stormwater runoff, and excessive velocities. It is highly recommended that maximum subbasin size for a floatables skimmer should be no larger than 1 acre; this will keep units to manageable sizes and allow for accurate monitoring of stormwater quality.

### **Manufactured Floatable Skimmers**

Manufactured skimmers should be selected on the basis of good design, suitability for desired pollution control goals, durable materials, ease of installation, and reliability.

Manufacturers generally provide design methods, installation guidelines, and proof of effectiveness for each application where used. These structures tend to include innovative methods of providing high-flow bypass. However, it is incumbent upon the landowner to carefully investigate the suitability and overall trustworthiness of each manufacturer and/or subcontractor. For examples of floatables skimmers see below:

Highland Tank (CPI unit)	<a href="http://www.highlandtank.com">www.highlandtank.com</a>
Vortechincs, Inc.	<a href="http://www.vortechincs.com">www.vortechincs.com</a>
CDS Technologies	<a href="http://www.cdstech-us.com">www.cdstech-us.com</a>
Stormceptor Corporation	<a href="http://www.stormceptor.com">www.stormceptor.com</a>
H.I.L. Technology, Inc.	<a href="http://www.hil-tech.com">www.hil-tech.com</a>
BaySaver, Inc.	<a href="http://www.baysaver.com">www.baysaver.com</a>
Aquashield, Inc.	<a href="http://www.aquashieldinc.com">www.aquashieldinc.com</a>
Environment 21, LLC	<a href="http://www.env21.com">www.env21.com</a>
StormTreat System, Inc.	<a href="http://www.state.ma.us/step/stepasst.htm">www.state.ma.us/step/stepasst.htm</a>

Note: The product list is not intended to be inclusive, nor is it intended to be an endorsement for each listed product. It is merely a list of separator manufacturers that are known to work in the Tennessee area.

Each manufacturer may specify its design based upon an average design storm in order to achieve the recommended pollutant efficiency, but it is recommended that the floatables skimmer should capture and treat the 1-year design storm. Other storms which are mentioned in the vendor catalogs are also the 6-month design storm (80% of the 1-year storm) and the 3-month design storm (62% of the 1-year storm).

### **Coalescing Plate Interceptor (CPI)**

The CPI separator requires considerably less space than a conventional oil and water separator to obtain the same effluent quality. Stormwater will either flow across or down through the plates. A CPI is able to process smaller oil droplets by collecting them upon polyurethane plates or other materials. It is recommended that the design engineer consult vendors for a plate package that will meet site and flow criteria. Manufacturers typically identify the capacity of various standard units.

Check geometry and necessary volume to contain the coalescing plates. Allow 1 foot below the plates for sediment storage. Add 6 to 12 inches above plates for fluids to accumulate, and then allow an additional 1 foot above that for freeboard. Include a forebay to collect floatable debris and evenly distribute flow if more than one plate unit is needed. Larger units have a device to remove and store fluids from the water surface, such as a vacuum. Plates are easily damaged when removed for cleaning. Install plates at an angle of 45° to 60° so that most sediments slide off. Placing plates closer together reduces the total volume, but may allow debris such as twigs, plastics

or paper to clog plates. Use a trash rack or screen to reduce clogging.

## Maintenance

Install floatables skimmers to manufacturer's specifications. Follow vendor recommendations for manufactured floatables skimmers. The following general instructions may be used in absence of conflicting data or guidelines.

- Floatables skimmers should be inspected on a regular basis (such as every three months) to ensure that accumulated oil, grease, sediment, trash and floating debris do not disturb the proper functioning of the system. Record observations in an inspection log and take pictures as necessary to document conditions. Make immediate repairs as needed, and make arrangements for cleanout if needed. Consider using a licensed commercial subcontractor, who may have special equipment and abilities to perform periodic cleanout of floatables skimmers.
- Perform cleanout on regular basis using confined-space procedures and equipment as required by OSHA regulations, such as nonsparking electrical equipment, oxygen meter, flammable gas meter, etc. Remove trash and debris and dispose properly. Remove floating oil, grease and petroleum substances using special vacuum hoses; treat as hazardous waste. Sediments may also contain heavy metals or other toxic substances and should be handled as hazardous waste. Removal of sediment depends on accumulation rate, available storage, watershed size, nearby construction, industrial or commercial activities upstream, etc. The sediment composition should be identified by testing prior to disposal.
- Some sediment may contain contaminants for which the Tennessee Department of Environment and Conservation (TDEC) requires special disposal procedures. Consult TDEC - Division of Water Pollution Control with concerns about sediment or other contaminants. Give special attention or sample sediments accumulated in industrial or manufacturing facilities, fueling centers or automotive maintenance areas, large parking areas, or other areas where pollutants are suspected to accumulate.

## Limitations

There is often uncertainty about what types of oil or other liquid petroleum products may be encountered. Significant percentages of petroleum products are attached to fine suspended solids and therefore are not easily removed by settling.

The design loading rate for floatables skimmers is low; therefore, they can only be cost-effectively sized to detain and treat nuisance and low storm flows, and particularly first flush volumes. It is usually not economical or feasible to size a floatables skimmer to treat a design storm with a return period longer than 1 year.

Floatables skimmers require frequent periodic maintenance for the life of the structure. Maintenance can be minimized and performance can be increased by careful planning and design, particularly upstream and downstream from separator. It is difficult to remove small concentrations (such as 10 ppm) from stormwater runoff, which has a broad range of flows. The performance of floatables skimmers can be difficult to estimate prior to installation and monitoring.

## References

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