



INSTALLATION AND OPERATING INSTRUCTIONS FOR CONCRETE VAULT TYPE UNITS

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INTRODUCTION

The MSR coalescing plate module system is an enhanced gravity separation system for the removal of hydrocarbon droplets from stormwater and wastewater. The hydrocarbon droplets can be lubricating oil, jet fuel, diesel fuel, or other non-soluble hydrocarbons. All of these are hereafter generically referred to as “oil”.

Oil droplets are of lower specific gravity – “lighter” than the water, and therefore, rise within the water in the same way as a cork or piece of wood will rise to the surface of water. This property can be used to separate the oil from the water. Likewise, stormwater and wastewater often contain solid particles which are of greater specific gravity than the water – “heavier” than the water. These solid particles will tend to fall to the bottom of a separator and this property can be used to separate these particles from the water.

The separator consists of an inlet section divided from the rest of the separator by an inlet weir, a coalescing module section and an outlet section.

The coalescing plate modules are made of polypropylene coalescing plates stacked and modularized into convenient modules, of either nominal 8 mm or 16 mm spacing, with retaining pins keeping the modularized plates together.

SAFETY

THE FOLLOWING SAFETY PRECAUTIONS SUPPLEMENT THE OTHER WARNINGS PROVIDED WITHIN THE TEXT OF THIS MANUAL. THEY ARE RECOMMENDED PRECAUTIONS THAT MUST BE APPLIED DURING OPERATIONS AND MAINTENANCE. IT IS NOT POSSIBLE TO DETERMINE IN ADVANCE ALL OF THE POSSIBLE SITUATIONS THAT MAY ARISE, SO THE OPERATOR SHOULD EXERCISE CAUTION AND USE GOOD OPERATION PROCEDURES IN THE USE OF THE UNIT. IN ADDITION TO THE PROCEDURES CONTAINED HEREIN, OBSERVE ALL OTHER REQUIRED SAFETY PROCEDURES.

SAFETY IS THE SOLE RESPONSIBILITY OF THE OWNER AND OPERATING AND MAINTENANCE PERSONNEL.

- 1) All personnel performing installation or service on the system must be familiar with normal safety precautions and this manual before doing any work.
- 2) Do not install or service the equipment alone. Do not perform any work on the unit without another person present to render aid in the event of problems.
- 3) Install all equipment and accessories (either by MSR or customer provided) according to the appropriate code and manufacturer's installation instructions.
- 4) Use care and common sense in entering and working in any vault and always observe all regulatory and owner rules and regulations concerning entering confined spaces. Remember that the vault may contain hydrocarbon vapors that can be harmful and operators and maintenance personnel should take all necessary precautions before entering or working in any vault.

OPERATING PRINCIPLE

The oil that is present in the inlet of an oil-water separator exists in the form of droplets. These droplets rise by their buoyancy within the flowing water. The rise rate of the oil droplets is governed by Stokes's law. Droplets rise following Stokes's law so long as laminar (smooth and gentle) flow conditions prevail.

The water entering the separator passes through the coalescing modules and as it does so, the oil droplets rise up by buoyancy and meet the undersides of the coalescing plates. The droplets are temporarily captured on the underside of the plates, and as other droplets are captured, they coalesce to form larger droplets. These droplets eventually become large enough that the buoyancy force on the drops overcomes the very weak adherence to the coalescing plates and they "slide" up the underside of the plate surface, coming in time to the holes in the top surface of the plates. The droplets congregate there, growing large with the addition of more small droplets, until they eventually become large enough to have enough buoyancy to rise to the surface of the separator by "weeping" from hole to hole, up the plate pack.

Please note that all of this process depends on the interfacial tension between the hydrocarbon droplets and the water. If something (such as a soap or detergent) disturbs this tension, the droplets will tend to dissolve or at least convert to very small droplets

and separation will be damaged. For this reason, the use of soaps and detergents is prohibited.

SYSTEM INSTALLATION

The installation of an oil-water separator is not independent of the inlet and outlet piping and conditions. The efficient and proper operations of the separator depend on the flow upstream of the separator being as smooth and gentle as possible, so as to preserve the average droplet size as large as possible. For this reason, it is necessary to install an inlet pipe of the same diameter as the inlet and extending straight, without elbows or other fittings at least ten (10) pipe diameters upstream of the separator. Inlet piping should be as smooth as possible to avoid turbulence caused by pipe roughness. Smooth PVC is preferable to rough concrete.

Separator vaults are designed to operate in true gravity flow mode. The use of any pump, to pump into the inlet of the separator, will cause small droplet sizes and may cause effluent oil content to be more than design. If it is necessary to use a pump, please consult the factory for proper sizing.

The various water levels in the separator are carefully designed to make maximum use of the coalescing modules, while ensuring that there is no flow over the top or around the sides or bottom of the modules. The operation of the separator and removal of oil can only be accomplished when all of the water flow is directed through the modules. For this reason, it is necessary to ensure that the separator is installed level and with the outlet piping sloped adequately so that the outlet is free flowing to the receiving waters.

It is necessary to ensure that adequate size piping is provided for downstream treated water removal in order to avoid flooding the separator, and perhaps, filling the oil reservoir (if provided) with water.

A downstream sample point should be provided to allow for effluent testing. A convenient point for this sample taking is the effluent chamber downstream of the water overflow weir. It is recommended that samples be analyzed by using *USEPA Method 1664*.

Note: Obtaining representative effluent samples can be difficult. Always take samples in new bottles. Never rinse the sample bottle with sample, as this will give false high readings. For suggestions on getting representative samples, please consult the factory.

INITIAL START-UP

After installation of the separator, observe the following procedure for initial start-up of the unit. This procedure assumes that the vault is delivered with modules installed, if the modules are to be field installed, please install the modules per the module installation instructions.

- Inspect the separator to ensure no parts have shifted during shipment and that the seal of the oil dam and water weirs against the walls are intact.
- Ensure the inlet and outlet piping are correctly installed and that there are no obstructions in the piping. If inlet and/or outlet valves are installed, ensure they are in the *FULL OPEN* position.
- Remove covers or access hatches.
- Fill with clean water to avoid contaminating the outlet section with oil.
Note: this is important as a contaminated outlet section could release oil into the environment.
- Check drainage of area that will feed the vault with water and ensure it is not heavily contaminated with solid particles that could wash into the separator or trash that could plug the plate modules if allowed to enter the separator. Remove solids and trash as necessary.

The separator is now ready for processing any rainwater that may fall, up to the design flow capacity.

SYSTEM OPERATIONS

The separator vault system is designed for a recommended maximum flow rate as given in the specifications. If this flow rate is exceeded, it is possible that effluent hydrocarbon content may increase above the design quantity. Operating at any flow rate *LESS* than design will improve performance.

There are no moving parts or parts that require normal replacement. The oil that is captured by the coalescing plate modules will float to the surface and form a layer there until removed. Oil is only captured and forms a layer on the surface when it is present in the inlet flow. If the area that drains into the separator is kept very clean, it may take a large amount of time for any oil layer to form on the surface of the water in the separator.

If skimmers are provided, these should be adjusted to about 9 mm above the normal flowing water level.

If skimmers are not provided, oil should be removed with a vacuum truck or portable pump system at least twice per year. If large quantities of oil are present when the normal maintenance interval arrives, the maintenance interval should be shortened.

Frequency of solids removal is dependent on the amount of solids in the inlet flow and can be determined based on experience in cleaning the system. A probe may be used to estimate solids depth and the amount of solids found during regular maintenance should be used to determine frequency of cleaning. Please see maintenance instructions below.

TROUBLESHOOTING

Problem	Possible Cause	Diagnosis	Corrective Action
No oil is discharged <i>Note: Oil will not flow into skimmers unless layer is about 12 mm thick</i>	Skimmers (if installed) set too high	Check oil layer thickness	Adjust skimmers
Processed water contains oil greater than design content	1) Flow more than design 2) Leakage around oil dam 3) Modules blocked with solids	1) Check flow 2) Open and inspect dam for leaks 3) Remove modules and inspect	1) Reduce flow to design 2) Caulk or putty to close leaks 3) Clean modules
Separator is overflowing	Output line restricted or incorrectly installed	Check for restrictions and correct installation	Remove restriction/repair

RECOMMENDED MAINTENANCE PROCEDURES

Maintenance

1. After approximately 250 hours of actual flowing operation (or six months installation, whichever is sooner), the inlet area of the separator should be checked to determine if an excessive amount of solids has accumulated. If this happens, a settling tank should be installed upstream of the separator to remove the solids. Otherwise, the solids may accumulate enough to plug the lower part of the modules. In this case, efficiency will be reduced and hydrocarbons in the outlet water may exceed allowable limits.

2. After approximately the first 1000 hours of operation, the inlet area should be cleaned as follows:

- I. Remove cover or open lids as appropriate.
- II. Remove the water from the vault.
- III. Remove any sludge accumulation. Note sludge quantity and position.

The plate modules may either be cleaned in place or removed and cleaned.

To clean the modules, first stop the flow to the unit, remove the oil, and drain or pump out the water.

Provide a vacuum truck or other means of disposing the sludge and dirt in the vessel. Spray the modules from either end or the top to flush out as much dirt as possible from the pack. If two rows of modules are provided, it may be necessary to move one row of

modules to allow access to the ends of the downstream modules. As the water flushes the dirt out of the plate modules into the inlet chamber, it should be removed by the vacuum hose or to an oily water sewer.

Note: The solids accumulation within the plates usually is present only within the first (upstream) 150 mm of the plate modules. The downstream end of the plate modules usually remains relatively clean.

For cleaning out of the vessel, remove plate modules and fiberglass sheets. Flush with hose to oily water drain. **NOTE: DO NOT DISASSEMBLE PLATE MODULES.** Use a hose to flush the tank and sweep all sediment out of the drain connections. A fire hose, at 10-15 psi, or a standard garden hose at normal domestic pressure, are effective cleaning tools. In a similar manner, steam hoses can be used to flush plate modules.

Take extreme care using steam as high temperatures will damage the plates.

Examine tank interior for damage and repair any damage to internal coating (if provided). Inspect skimmers (if provided) for damage and replace as necessary.

To restart unit, reinstall modules and seals per the drawing below. To reinstall modules, use the following steps:

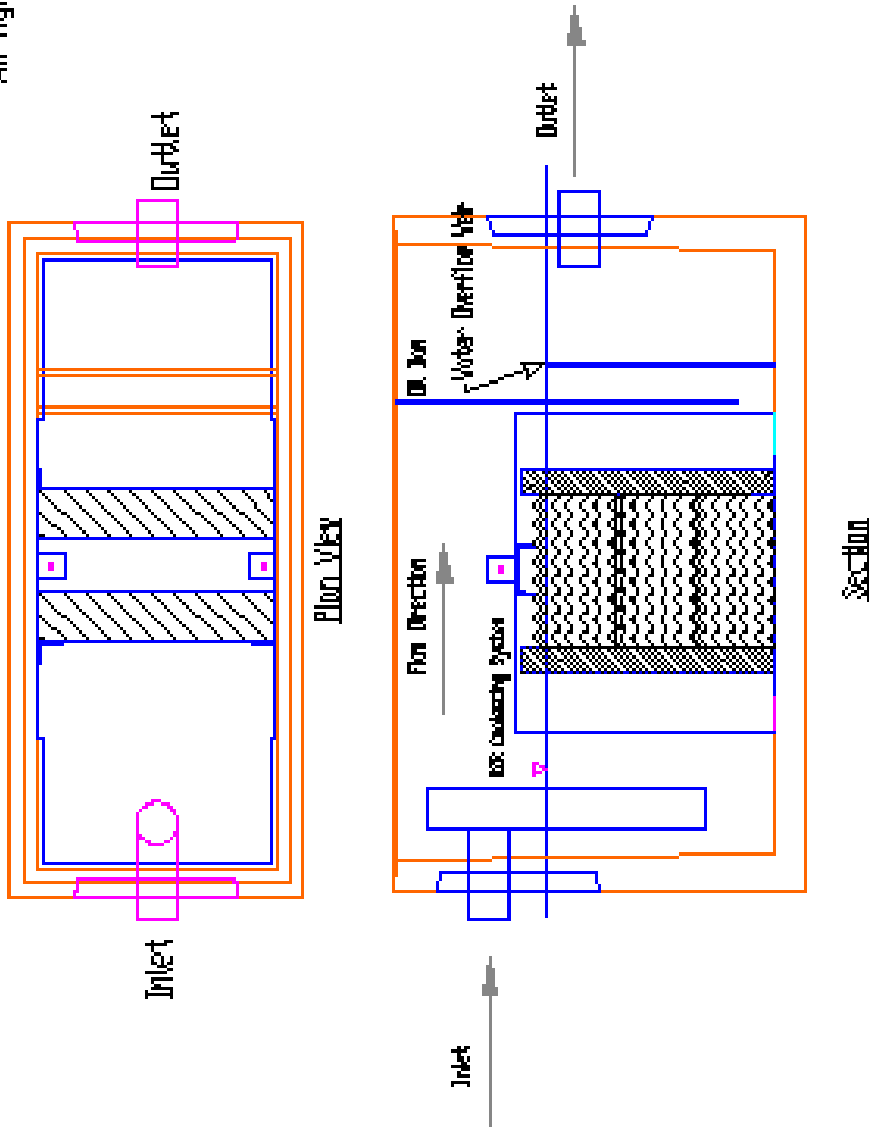
1. Install plate modules, stacking them the same way they were previously installed. Move the plate packs to the side of the plate area, next to the oil holding tank. Install plate hold-down.
2. Install the flat fiberglass sheet in the space between the plate packs and the inlet baffle. Install the corrugated fiberglass sheet between the flat sheet and the vault wall.
3. For start-up, fill with clean water and open any valves that might have been closed, so that water will flow in the event of rain. **Note: The quantity of sludge found in the Inlet section should be used as a basis for determining the next interval before cleaning.**

If the sludge level is very low, the cleaning interval can be extended. If sludge is more than 1/3 up the plate modules, the interval should be shortened.

Notes:

- 1) **Plates do not need to be cleaned until white. Some oil on the plates will not cause deterioration of performance. It is only necessary to remove all sludge from between the plates and any very heavy oil coating.**
- 2) **Some units will be provided with plastic flat plates instead of fiberglass. The function and use is the same.**

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Underground Vault
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