



INSTALLATION AND OPERATING MANUAL

**Mohr Separations Research, Inc.
Model: MSR-22 P Oil-Water Separator**

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BACKGROUND AND INTRODUCTION

The MSR Model MSR-22 P Oil-Water Separator is a passive gravity operated system for the separation of oil from oil-water mixtures. The design utilizes the difference in specific gravities between oil and water (buoyancy force), enhanced by the use of Mohr Separations Research, Inc. modular coalescing system. The separator is designed to receive oily water in pumped flow at a relatively low (less than 9 US GPM maximum) flow rate. Please see the process flow simulation in the appendix. The separator vessel is constructed of heavy duty ½" thick polypropylene, utilizing all welded construction. The coalescing plates are manufactured of an oleophilic ("oil-loving") polypropylene.

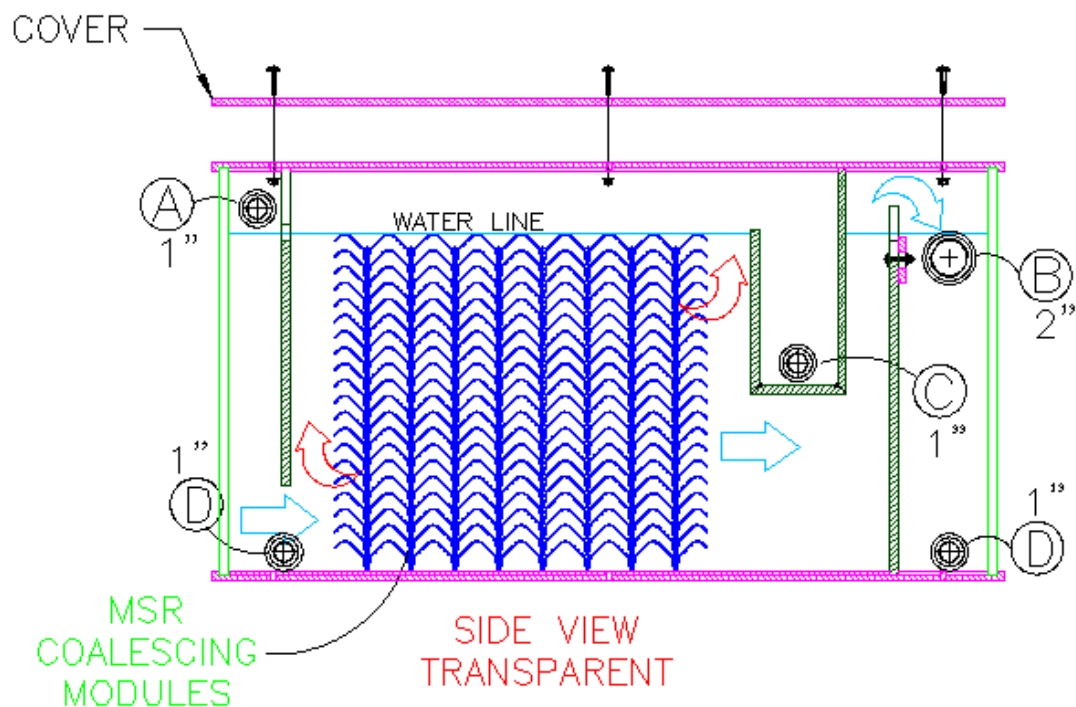
For purposes of this manual, please see the attached drawing. Information from the manufacturers of the accessories (if any) is provided in the appendix.

The oil in this mixture is usually in the form of droplets of various sizes. As the oil-water mixture flows through the plates, the oil droplets rise within the water, due to their buoyancy. As the droplets rise, they come into contact with the underside of the plates and coalesce, forming a thin film of oil on the underside of the plates. This film flows upward along the plate surface until it reaches the plate peaks. Oil accumulates into a thicker oil layer on the underside of the plates until it disengages and moves up through the modules. Holes have been provided in the module plates at the peaks, so that the oil collected in this manner may percolate through the holes and eventually come to the water surface in the separator.

The separated oil, that comes to the top, flows out and over the oil overflow weir into the oil holding tank, which is located downstream of the media. The clean processed water is discharged via the outlet underflow/overflow into the clean water tank and, thence, to the customer's downstream system. The outlet water and collected oil must be able to flow by gravity (or pumped if outlet pump is provided) to their respective containers, so the system must be elevated slightly so that this may happen.

INTERNAL CONFIGURATION

The modules provided in the MSR-22 P unit consists of special polypropylene coalescing plates held together with polypropylene retainer pins. Spacing between the plates in the modules is maintained by pin and socket arrangements molded into the plates. The purpose of these plates is to enhance the coalescing of small droplets. As the oil-water mixture passes through the modules, small droplets are coalesced into larger ones, which rise to the surface of the liquid in the tank. The oil then forms a layer in the tank, which overflows the skimmer weir into the oil holding tank. A schematic of the unit is shown below.



In this view, the connections are:

- A. Inlet 1"
- B. Outlet 2"
- C. Oil Drain 1"
- D. Drain 1"

The relationship between the flowing water level and the overflow weir is set by adjusting the outlet weir. The weir should be set so that when the water is flowing through the system, the water level upstream of the oil overflow weir is about 1/4" to 1/8" below the top of that weir. The weir is preset at the factory (20.25" above the inside bottom of the separator), but the elevation of the water level should be checked during the initial installation and should be approximately 20.5" above

the inside bottom of the separator. It is not expected that it will be necessary to adjust the weir, unless operations change substantially.

Adjust the overflow weir by loosening the bolts, sliding to the desired elevation and re-tightening bolts. Make sure the weir is level.

INITIAL INSTALLATION REQUIREMENTS AND SETUP

The separator system must be provided with support to keep it level and elevated so that the water flow and oil flow out of the separator by gravity.

The separator must be installed as level as possible. The system should be level within at least 1/8" end to end and side to side.

CAUTION: THE SEPARATOR IS PROVIDED WITH PLASTIC NPT PIPE FITTINGS. THE PLASTIC THREADS CAN BE DAMAGED IF OVERTIGHTENED WITH METAL FITTINGS. IT IS SUGGESTED THAT PLASTIC FITTINGS BE USED OR OTHER MEASURES TAKEN TO PREVENT SUCH DAMAGE!

SAFETY AND ENVIRONMENTAL CONSIDERATIONS

- All normal safety precautions should be taken with this equipment to prevent accidents and fires.
- Normal fire prevention measures must be taken to prevent fire danger from the separated oil.
- Care should be taken to keep the area around the separator clean to prevent accidents.
- Dispose of the separated oil properly, preferably by recycling.
- When full of water, separator is heavy.
- Separator is not designed to be moved full of water. Drain before moving.
- ***SAFETY AND ENVIRONMENTAL PROTECTION ARE THE RESPONSIBILITY OF THE USER. MOHR SEPARATIONS RESEARCH, INC. ASSUMES NO LIABILITY FOR MISUSE OF THIS SEPARATOR OR FOR USE OUTSIDE THE PARAMETERS FOR WHICH IT IS DESIGNED.***

INITIAL REQUIREMENTS

The separator must be installed as level as possible, preferably within 1/8" per foot. Excessive slope of the unit may adversely affect performance.

To install the separator, follow these steps: (*Please refer to attached cross-sectional flow schematic above*)

- Place the separator in the position near the water source to be purified.

- Install inlet pipe, allowing at least 10 pipe diameters of straight pipe into the separator.
- Install outlet pipe and downstream equipment. Be careful to avoid damage to the threads in the connections.
- Install valves or plugs in the drain and oil outlet connections.

INITIAL CHECKS

Before putting the MSR-22 P unit in service, initially or after maintenance, the following procedures should be performed.

- Ensure that the unit is installed at a level position and check inlet and outlet connection to ensure that they are properly made and leak tight. Be careful to avoid damage to the threads in the connections.
- Remove bolts and nuts securing the cover and open the two ends of the cover. Remove packing materials and the spare gaskets if provided. Save the gaskets for possible later use.
- Check to ensure that the modules have not moved out of place. The modules should be positioned so that it is correctly in position, as shown on the drawing.
- Ensure that the corrugated and flat plastic seal plates are correctly installed. It is important that both of these should be flush against the bottom of the separator. A small piece of wood such can be a convenient way to push down on the top of the corrugated plates to get them to the bottom of the separator without damaging the corrugations.

INITIAL START-UP

This procedure is to be followed after the installation of the separator or after the separator has been drained and is ready to be restarted.

- Before starting the flow to the unit, open or remove the cover and ensure that the coalescing modules have not shifted and that the corrugated plastic is in place. The separator should contain two coalescing modules, and the corrugated plastic sheet between the modules.
- Ensure that there are no obstructions in the water outlet hose/piping and that adequate oil disposal facilities are provided.

Note: Pump adjustment will be required (if provided), so it is advisable not to hard pipe the outlet water flow at this time.

- Fill the separator tank with clean water to avoid contaminating the downstream end of the separator with oil. This should be filled to the point where it overflows the outlet weir into the sewer.
- Provide a source of clean water for flow adjustment.

- Adjust the pump flow to 9 US GPM (or lesser desired flow). Test flow by using the “bucket and stopwatch” method. Greater flows may damage separation efficiency.
- Adjust for the desired flow rate as above and allow unit to stabilize for a few minutes.
- Check to ensure that the stabilized water level is at least 1/8" below the oil overflow weir. Water should not overflow into the oil collection tank – if this happens, the flow is too great, the system is not level, or the overflow weir is adjusted incorrectly.
- Check for leaks, both external and internal and remedy any found.

At this point, the separator is ready for actual use. The only difference between operations and the flow setting above is that oil will build up on the surface of the water and eventually overflow into the oil collection tank.

- Check to ensure that oil is building up on the surface of the water. If oil buildup is very slow, ensure that there is no oil in the outlet water flow. If the outlet water is clean, wait for oil to build up on the surface. If the outlet flowing water contains oil, check for emulsification of oil and upstream conditions. Ensure that emulsifying detergents are not being used in the inlet water.

NORMAL OPERATION

Carefully maintain flow at the rate set when flow was established, or less. The oil flow into the oil tank, once a sufficient quantity of oil has accumulated in the separator, varies with the concentration of oil in the incoming water. Only oil will be removed. Some traces of water will exist in the oil because some of the water will become entrained in the oil going over the weir. This is not a problem as long as it is not too great because the oil should be recycled. If excessive water is found, check the water weir adjustment.

Note: *An oil layer will always remain on the surface.*

MAINTENANCE

1. After approximately 250 hours of operation, the inlet area of the separator should be checked to determine if an excessive amount of solids has accumulated. If this happens, 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 250 hours of operation, the system should be cleaned as follows:
 - a. Stop flow to the unit.
 - b. Remove system cover.
 - c. Drain the system using the plug at the front of the separator.

- d. Remove the seal and coalescing modules and clean the modules. Please note, the modules can be heavy and careful lifting methods should be used. Always lift safely. The modules can be cleaned using a standard garden hose at normal domestic pressure. **DO NOT USE DETERGENTS OR SOAPS. DO NOT DISASSEMBLE MODULES.** It is not necessary to return the modules to as-new condition or to remove all of the oil, only to remove the solid particles that may be present in the module. Some oil on the plates will not cause deterioration of performance.
- e. Use a hose to flush the tank and sweep all sediment out of the drain connections.
- f. To restart unit, reinstall modules and seals. To reinstall modules, use the following steps:
 - i. Install modules, being careful to install them with the flat metal plate down. Move the modules to the side of the modules area.
 - ii. Install the corrugated plastic sheet between the modules.
 - iii. For start-up, follow instructions listed in the *Initial Start-up* section above.

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 interval can be extended. If it is more than 1/4 up the plate packs, the interval should be shortened.

TROUBLESHOOTING

Problem	Possible Cause	Diagnostic Technique	Corrective Action
Processed water effluent contains large amounts of oil	Flow too great for separator	Check flow rate	Reduce flow rate
	Module plates blocked	Remove module and inspect	Clean system per instructions above and reinstall
	Seal corrugated plate not installed or incorrectly installed	Inspect for correct installation	Install correctly
	Surfactants (soaps and detergents) in use upstream of separator	Determine if soaps or detergents are in use	Eliminate use of soaps and/or detergents
Tank overflowing	Outlet line restricted or blocked (2)	Check flow	Remove restriction and/or clean line
	Pump flow too	Check flow	Adjust flow per

	great		instructions above
For other problems or advice, please consult with MSR at (918) 299-9290			
Notes: <ol style="list-style-type: none"><i>1. For oil flow, the oil layer on top of the water in the main separator area must be at least 3/8" thick. Oil layer thickness for flow will depend on the specific gravity of the oil removed.</i><i>2. Outlet line must be at least as large as outlet nozzle unless unit is operated at very low flows.</i>			

APPENDIX