Typical Machine Tool Coolant Purification Unit Installation and Operating Manual

Note: MSR provides a custom manual for every application

Mohr Separations Research
Model MSR-33 S Separator

Customer: _____

Background and Introduction:

The MSR Model MSR-33 Oil-Coolant Separator is a passive gravity operated system for the separation of oil from oil-coolant mixtures such as machine tool coolant. The design utilizes the difference in specific gravities between oil and coolant (buoyancy force) enhanced by the use of Mohr Separations Research Inc. modular coalescing system. The separator is designed to receive oily coolant in pumped flow at a relatively low (less than _____ US gpm maximum as shown on the process simulation calculations) flow rate in coolant service. Please see the process flow simulation in the appendix. The separator vessel is constructed of 304 stainless steel, utilizing all welded construction. The coalescing plates are manufactured of an oleophilic ("oil-loving") polypropylene.

It is very important to keep machine tool coolants free of tramp oil and solid matter to maximize coolant life and minimize coolant and labor costs.
MSR coalescing plate technology, which has been used successfully in solving petroleum and chemical industry problems can also be applied to the processing of metal-cutting coolants. This technology, featuring the use of coalescing plate separators, provides a very effective and low cost method of removing solids and tramp oil in one process. Removal of these contaminants, especially the oil dramatically extends coolant life and reduces maintenance costs. Proper use of purification equipment can extend the life of machine tool coolant by 30% or more.

If tramp oil is not removed from circulating coolant systems, it can be used as a food by various types of bacteria, causing runaway bacterial growth. This bacterial growth can cause odor problems, allergic reactions among the workers, and can also affect the machining properties of the coolant. All of these problems can cause higher expenses, lower productivity, and can also cause possible machine breakage and / or excess bearing wear.

MSR coalescing plate separators can be used to clean to coolant to increase coolant life, reduce costs and increase productivity with the added bonus of possibly creating a healthier workplace. Many methods can be used to purify coolant, but the MSR system is one of the best because it does not utilize absorbents or other consumables and does not utilize any high speed centrifugal equipment. For these reasons it is economical and easy to operate.

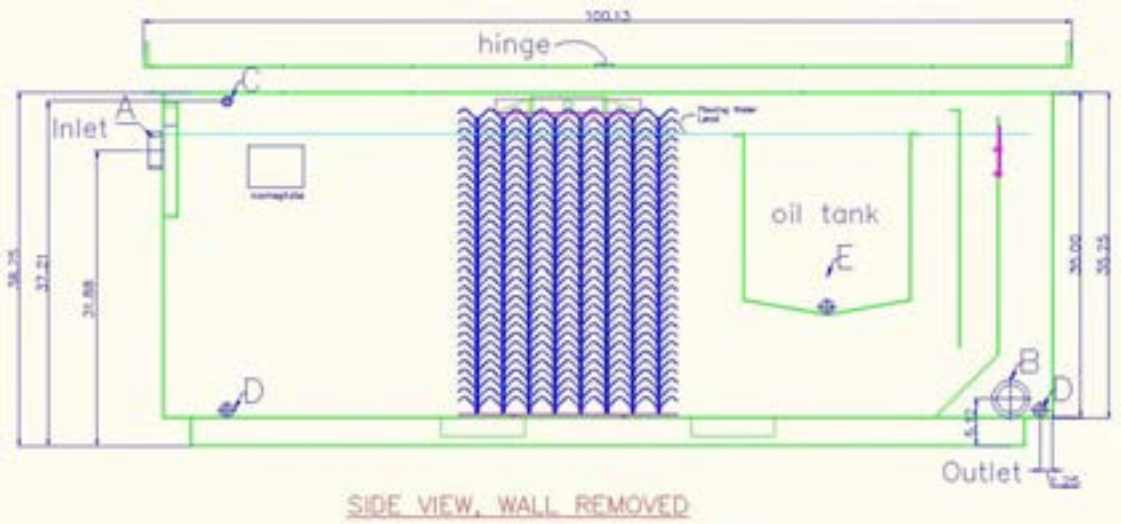
For purposes of this manual, please see the attached drawing. Information from the manufacturers of the accessories (if any) is provided in the appendix.

The oil in this mixture is usually in the form of droplets of various sizes. As the oil-contaminated coolant mixture flows through the plates, the tramp oil droplets rise within the coolant due to their buoyancy. As the droplets rise, they come in 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 in a thicker oil layer on the underside of the plates until it disengages and moves up through the module. 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 coolant surface in the separator.

The separated oil that comes to the top flows out over the oil overflow weir into the oil holding tank, located downstream of the media. The clean processed coolant is discharged via the outlet underflow/overflow into the clean coolant tank and thence to the customer's downstream system. The outlet coolant 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 coalescing module provided in the MSR-33S unit consists of special polypropylene coalescing plates held together with stainless retainer pins and provided with lifting eyes. Spacing between the plates in the module 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-coolant mixture passes through the module, 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, 3” NPT
B. Outlet, 3” NPT
C. Vent, ½” NPT
D. Drain, 1” NPT
E. Oil Drain, 1” NPT
F. Level connection in cover, ½” NPT (not shown this view)

The relationship between the flowing coolant level and the overflow weir is set by adjusting the stainless outlet weir. The weir should be set so that, when the coolant is flowing through the system, the coolant level upstream of the oil overflow weir is about 1/4” to 1/8” below the top of that weir. This requires the weir to be set at approximately 30” above the inside of the bottom of the separator. The weir is preset at the factory, but the elevation of the coolant level should be checked during the initial installation. It is not expected that it will be necessary to adjust the weir unless operations change substantially.

Adjust overflow weir by loosening bolts, sliding to desired elevation and re-tightening bolts. Be sure 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 coolant flow and oil flow out of the separator can be 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 STAINLESS NPT PIPE FITTINGS. STAINLESS CAN GALL IF OVERTIGHTENED WITH METAL FITTINGS. IT IS SUGGESTED THAT PLASTIC FITTINGS BE USED OR OTHER MEASURES TAKEN TO PREVENT GALLING.

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 coolant, separator is heavy and care should be taken in using it so as to avoid tipping and possible injury.
- Separator is not designed to be moved full of coolant. Drain before moving.
- SAFETY AND ENVIRONMENTAL PROTECTION ARE THE RESPONSIBILITY OF THE USER. MOHR SEPARATIONS RESEARCH ASSUMES NO LIABILITY FOR MISUSE OF THIS SEPARATOR OR FOR USE OUTSIDE THE PARAMETERS FOR WHICH IT IS DESIGNED.

Initial installation 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 coolant source to be purified.
- Install inlet pipe, allowing at least 10 pipe diameters of straight pipe into the separator if this is possible.

- Install outlet pipe and downstream equipment. Be careful to avoid damage to the stainless threads in the connections.
- Install valves or plugs in the drain and oil outlet connections.

Initial Check

Before putting the MSR-33 S unit in service initially or after maintenance, the following startup-check procedures should be performed.

- Ensure that the unit is installed in 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 stainless 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 provided. Save the gaskets for possible later use.
- Check to ensure that the module has not moved out of place. The module should be positioned so that it is correctly in position as shown on the drawing.
- Ensure that the corrugated plastic pressure plate / flat plate seal system is correctly installed. It is important that both of this 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 plate to get it 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 module has not shifted and that the corrugated plastic is in place. The separator should contain one large coalescing module, and the corrugated plastic sheet between the large module and the tank wall.
- Ensure that there are no obstructions in the coolant 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 coolant flow at this time.**
- Fill the separator tank with clean coolant 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 coolant for flow adjustment.
- Adjust the pump flow to _____ 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 coolant level is at least 1/8" below the oil overflow weir. Coolant should not overflow into the oil collection tank – if this happens either 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 coolant and eventually overflow into the oil collection tank.

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

Normal Operation:

Carefully maintain flow at the rate set when flow was established. The oil flow into the skimmer/oil tank, once a sufficient quantity of oil has accumulated in the separator, varies with the concentration of oil in the incoming coolant. Only oil will be removed since the skimmer has been installed above the coolant level. Some traces of coolant will exist in the oil because some 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 coolant is found, check the coolant weir adjustment. NOTE: An oil layer will always remain on the surface.

Because the coolant is continuously recirculated, some very, very small tramp oil droplets will remain in the coolant stream, but will not be expected to cause problems until they build up over a long period of time. This and degradation of the coolant chemicals cause the eventual requirement for replacement of the coolant.

Maintenance:

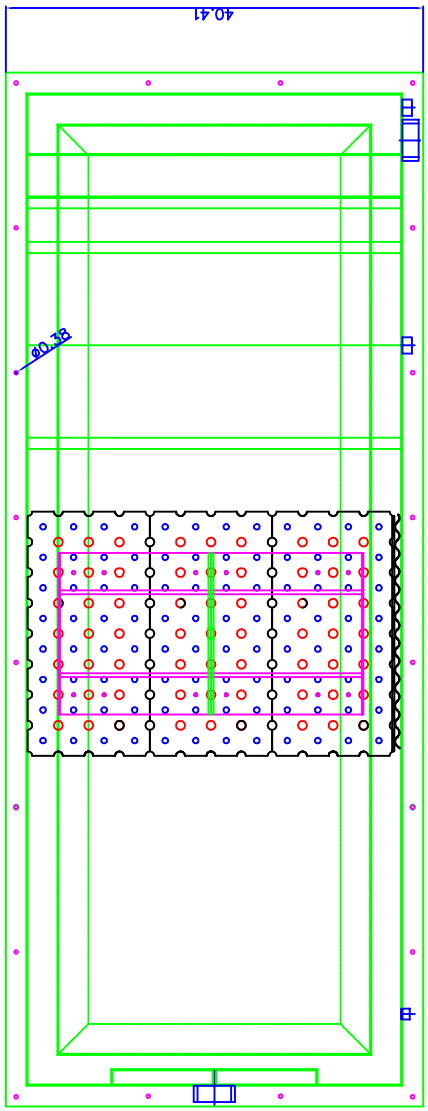
1. After approximately 250 hours of operation, the inlet area of the separator should be checked to determine if an excessive amount of solids have accumulated. If this happens, the solids may accumulate enough to plug the lower part of the module. In this case, efficiency will be reduced and hydrocarbons in the outlet coolant 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 module and clean the module. Please note the module is very heavy and mechanical lifting methods should be used. Always lift safely. The module can be cleaned using a standard garden hose at normal domestic pressure. DO NOT USE DETERGENTS OR SOAPS. DO NOT DISASSEMBLE MODULE. It is not necessary to return the module 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 module and seals. To reinstall module, use the following steps:
        i. Install module, being careful to install the module with the flat metal plate down. Move the module to the side of the module area.
        ii. Install the corrugated plastic sheet between the module and the wall.
        iii. For start-up, follow instructions listed in *Initial Start-up* 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.

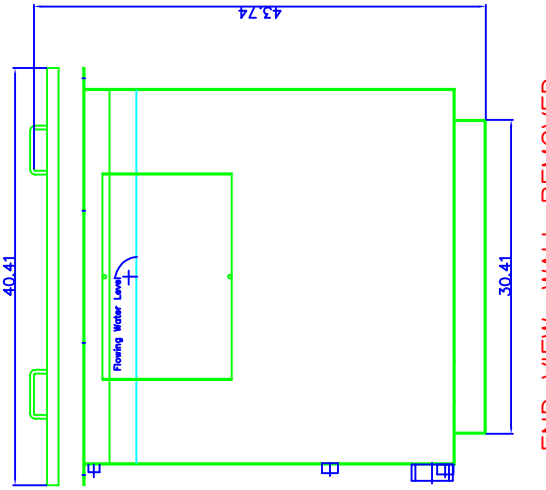
Troubleshooting:

Problem	Possible Cause	Diagnostic Technique	Corrective Action
Processed coolant effluent contains 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 great	Check flow	Adjust Flow per instructions above
For other problems or advice, please consult the factory at telephone: 918-299-9290.			
Notes: 1. For oil flow, the oil layer on top of the coolant 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. 2. Outlet line must be at least as large as outlet nozzle unless unit is operated at very low flows.			

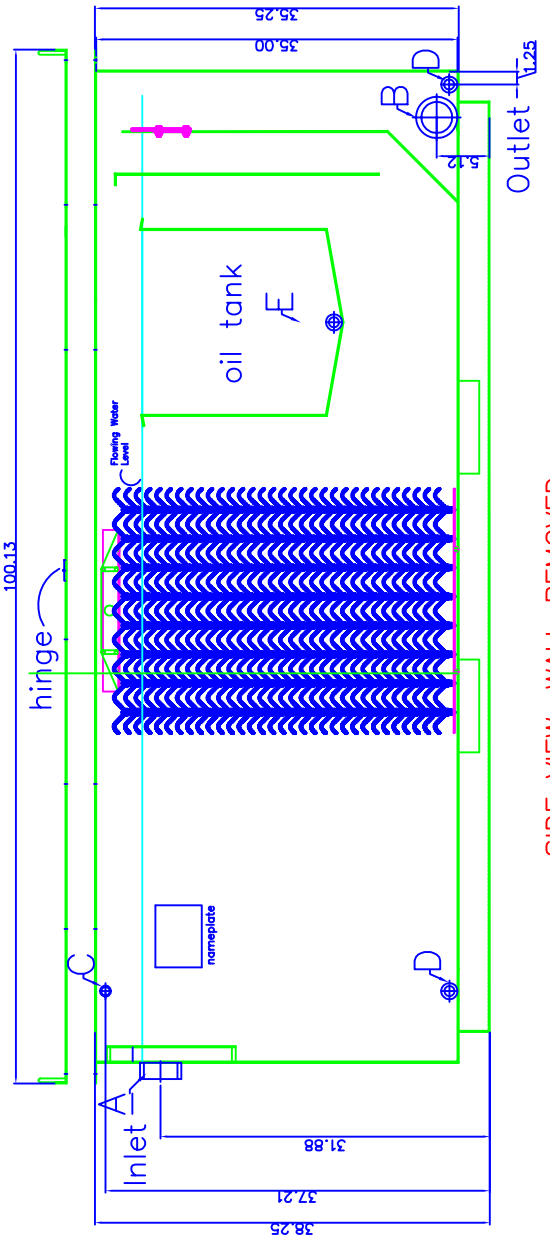
TABLE OF CONNECTIONS		
A	Inlet	3" NPT
B	Outlet	3" NPT
C	Vent	1/2" NPT IN & OUT
D	Drain	1" NPT (2 each)
E	Oil Drain	1 NPT



TOP VIEW, COVER REMOVED



END VIEW, WALL REMOVED



SIDE VIEW, WALL REMOVED

NOTES:

1. All materials are 304 SS, 10 gauge unless otherwise mentioned.
2. Cover is 14 gauge 304 SS

Sheet: 1 Of 1

Project No: Q11-1955
Drawn By: K.M.
Scale: NONE
Approved: MOHR
Issue Date: 8/10/11

Separator Drawing
Typical

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