MYCELX 107-49 Separator System

Operations and Maintenance Manual

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OPERATIONS AND MAINTENANCE MANUAL

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1. SYSTEM DESCRIPTION

The MYCELX-107™ oil water separation system includes the following basic components:

- MYCELX Oil Water Separator - fluids A&B
- Post Separator Polisher for fluid C
- Oil Content (TPH) Monitoring

1.1. Components by System

1.1.1. MYCELX Oil Water Separation System

F-101	Pre-filter Y-Strainer
CV-101	Inlet Check Valve
S-101	MYCELX Oil Separator
P-101	Main Process Pump
G-101	Vacuum Gauge
LS-101	Oil Level Switch
V-001	MYCELX Separator Vent Valve
SV-101	MYCELX Make-up Water Inlet Control Valve
MOV-101	Oil Discharge Valve
FI-101	Flow Indicator
V-002	Inner Shell Drain Valve
V-003	Flow Control Valve (manual)
V-004	Common Outer Shell Drain Valve

1.1.2. Separator MYCELX 107-49 Polisher System

G-102	Pump Discharge Pressure Gauge
F-103	Bag Filter/MYCELX Cartridge Filter
F-104	MYCELX Cartridge Filter
F-105	MYCELX Cartridge Filter
G-103	Pressure Gauge Post MYCELX Cartridge Filters
G-104	Pressure Gauge Bag for F-103
G-105	Pressure Gauge for F-104
G-106	Pressure Gauge for F-105
CV-103	Discharge Check Valve
SV-102	Discharge Water Control Valve
SV-103	Recycle Water Control Valve
V-011	Polisher Inlet Sample Valve
V-012	Polisher Outlet Sample Valve

1.1.3. Oil Content (TPH) Monitoring

V-005	TPH Clean Water Inlet Valve
V-006	TPH Sample Inlet Valve
TPH-101	TPH monitor

1.1.4. Electrical/Controls

P1 MYCELX Control Panel

1.2. Process Description

1.2.1. Process pump:

A process pump (P-101) is mounted on the outlet of the separator which pulls water from the oily water sump through the pre-filter (F-101) and separator (S-101). This placement reduces the formation of mechanical emulsions. The standard pump will pull up to 10 feet (3 meters) of negative head or vertical suction lift and still provide the design flow through the unit. The suction of the pump is continuously flooded with a positive head so there is no need to prime the pump. Depending on suction and head requirements for a given installation, the process pump is generally capable of pumping more than the designed flow through the system. A manual flow control valve is provided to adjust the flow to the designed rate.

The separation system operates in a negative pressure condition or vacuum. It is critical that ALL connections to the oil water separator are airtight and properly sized for the installation.

A high lift option is available that will pull up to 16 feet (5 meters) of negative head or vertical suction lift in the event that the inlet pressure is above 12" Hg.

1.2.2. Pre-filtration:

When the unit is turned on, the main process pump (P-101) pulls water from the sump through a pre-filter screen (Y-Strainer), F-101. This strainer will remove particulates larger than $1/20^{th}$ of an inch in any dimension. The pre-filter screen system also includes a check valve (CV-101) to prevent water from back flowing from the system when the unit is off or in the fill/oil discharge mode.

1.2.3. Oil-water separation:

The MYCELX Oil Separator (S-101) is a coalescing type gravity separator that relies on the difference in specific gravity of oil and water. The separator will not remove aqueous fluids or fluids that have a specific gravity of near 1.0 or higher. The oily water flows from the pre-filter into the bottom of the separator. The separator has an inner and outer section. The water comes up through the inner section of the separator through an oleophilic media (polyethylene or polypropylene). The media facilitates the separation of the oil from the water by providing a surface area that attracts droplets of oil and holds them until they coalesce into larger droplets, which rise rapidly to the top of the separator. As oil collects in the top of the separator it displaces the water and forces the water level in the separator downward. Any gas vapor or air that enters the separator will rise rapidly to the top of the separator where it collects with the oil. Air or vapor that collects in the separator will be discharged with the oil. A level sensor (LS-101) in

the top of the separator detects the **water** level in the separator. When the water is displaced by the collected oil to a predetermined low level, the pump, P-101, turns off, SV-102 and SV-103 close, and SV-101 and MOV-101 open. Makeup water is allowed into the separator through SV-101 raising the level of water in the separator and pushing the oil out of the separator through the oil outlet valve (MOV-101). Once the water reaches the high level, LS-101 causes SV-101 and MOV-101 to close. The main pump (P-101) turns on and SV-102 or SV-103 opens and normal operation resumes.

During normal operation, oily water entering the system flows up through the inner section of the separator and over the top of the inner section where most of the oil is separated from the water. The water then flows down through the outer section of the separator, which contains additional media. The pass through the second stage of coalescing media helps remove any residual oil and provides discharge water from the primary separator in most cases with less than 15ppm oil content. Water exiting the separator comes out the bottom of the outer section and is pumped to the **polisher** unit.

1.2.4. TPH or oil content monitor

The MYCELX 107-49 unit includes a Total Petroleum Hydrocarbon meter ("TPH", also sometimes called an Oil Content Monitor or "OCM") that has been certified to meet the MEPC 107(49) regulations. The TPH monitor has the ability to automatically return non-conforming discharge water back to the sump or bilge. The recycle solenoid valve (SV-103) and the oil in water monitor (TPH-101) control the recycle action. The TPH unit is a 15ppm oil content alarm monitor that has been tested and approved in accordance with IMO Resolution MEPC.107 (49). The TPH monitor is continually sampling the process stream and is designed to react quickly to any changes in the oil content.

1.2.5. Polisher

The primary purpose of MEPC 107(49) was to address the monitoring and removal of emulsified oil. A coalescing separator will not remove chemical emulsions and will only partially remove mechanical emulsions. Some form of post treatment is necessary.

The standard MYCELX 107-49 system includes polisher vessels designed to remove any residual oils that are not recovered by the separator vessel. This system consists of three stages of filtration to remove suspended solids and oil from the process stream. The first stage is removal of suspended solids by bag filtration. The remaining two stages removes the residual oil via MYCELX cartridge filters. The vessels are rated for 125psig pressure.

1.3. System Specifications

Specifications	0.5m^3/hr	1.0 m^3/hr	2.5 m^3/hr	5.0 m^3/hr	10.0 m^3/hr
Height (inch/cm)	50 (127)	56 (142)	69 (175)	73 (185)	75 (191)
Width (inch/cm)	27 (69)	28 (71)	36 (91)	41 (104)	55 (140)
Depth (inch/cm)	40 (102)	49 (124)	56 (142)	77 (196)	100 (254)
Dry Weight (lbs./kilogram)	450 (204)	750 (340)	1250 (567)	2600 (1080)	3550 (1610)

ALL UNITS

Specification	Value
IMO MEPC Compliance	107(49) certified by ABS, USCG, BV, CCS and MED(EC)
Vessel Metallurgy	Marine Coated Carbon Steel
Coating Specification	Epoxy/Urethane
Coalescing Media	Polypropylene / HDPE
Test Pressure	55psig (3.8barg)
Operating Pressure	15psig (1.0barg)
Operating Temp Range	40-140 F (5-60 C) except 10m^3/hr is 40-130 F (5-55 C)
Design Negative Inlet Head	10ft (3m) (max. 5 m suction lift is possible with some changes)
Positive Inlet Head Design Pressure	15psig
Max Free Oil Concentration	35%
Max Fluid "C" Oil Concentration (with Polishing)	6%
Oil in Water Discharge with TPH	<15 ppm (tested at < 5ppm)
Control Panel	NEMA 4X stainless steel panel box
TPH (Oil Content Monitor)	IMO MEPC 107(49) Certified Monitor with data logging
Max Turbidity for Accurate TPH Reading	35 NTU
Level Sensor	Conductance
Control Valves	Solenoid type
Pump	Centrifugal with SS housing
Motor	TEFC IP 55
Piping & Fittings	Marine Grade Red Brass, bronze fittings
Flow Indicator	High impact polysulfone plastic
Single Phase Power Options	110/120vac, 208vac, 220/240vac
Three Phase Power Options	208vac, 220/240vac, 380/415vac, 440/480vac, 575/600vac
DC Power Options	12 or 24
Frequency	50 or 60 Hz
Max Amperage	< 15 amps

NOTES:
Custom designs are available to vary specifications
Combinations of specs may have pricing implications
Oil Discharge Pressure equals the pressure of the makeup water inlet, but should be restricted to less than 15 lbs.

2. OPERATION

2.1. Initial procedure

Installation procedures outlined in the installation manual should be followed before this initial procedure. Verify that the clean water source has been turned on. It is recommended that the pressure of the clean water should not exceed 15 psig (the vessel design pressure). Turn the system switch to ON. The separator will automatically start to fill and the Fill & Oil Discharge light should be on. Open the separator vent valve (V-001) located at the top of the separator. Close the vent valve when water begins to discharge. When the separator is full the fill valve and the oil discharge valve (MOV-101) will close and the pump will come on. The separator is now full.

With the pump running, close the discharge and recycle isolation valves to allow the water to fill the polishers. When the pressure builds up, open the polisher vents in order. This will release air and water. To avoid spraying of water connect the vent to a hose. When there is no more release of air the system is ready to run.

IMPORTANT: If the polishers are not completely filled the TPH monitor will have problems due to air interfering with the oil ppm reading.

2.2. Normal Operation

After all of the specified testing has been completed and the system has run satisfactorily with the water flowing through the polisher, then the system can be put in normal operation. Turn the switch to ON and open the sample lines to the TPH. The unit will then monitor the outlet stream and automatically switch between discharge and recycle as needed. The system is designed to operate without operator interface except in certain conditions as described below.

2.3. Alarm and Action Conditions

The only alarm condition that requires operator action is when the polisher has reached maximum hydrocarbon saturation. This is determined by the inability of the separator and polisher to remove oil below 15ppm. At this point, the TPH monitor will not be discharging water overboard but is in a continuous recycle mode.

Cycle the TPH several times through with clean water and clean the cell glass with the brush located on the side of the panel by removing the cell plunger located on the top of the cell before it is determined that the polisher is full. If, after cleaning the cell, the TPH level is still above the 15ppm limit, it is time to change the Polishing media. Sometimes it is possible to reverse the flow through the separator and stir up the media. Sometimes this will extend the life somewhat. For systems under $1.0 m^3/hr$, it is easy to reverse the flex hoses and reverse the flow. For the other systems it is more difficult.

There is 1 alarm condition and 4 action conditions that require operator response.

2.3.1. Oil in Discharge Water Alarm—If the oil in the discharge water is greater than 15ppm the TPH monitor will alarm. A TPH alarm will cause the system to automatically go into recycle mode until the condition no longer exists. The alarm light on the TPH panel indicates that the system is in recycle and that oil greater than 15ppm has been detected in the water. There is an adjustable 0-20 second delay timer in the TPH that is met before the recycle valve is actuated.

2.3.2. Plugged pre-filter—If the pre-filter is plugged the pump will not pull the design flow of water through the system. When this happens it is time to clean the filter. It is recommended that a routine schedule be set up to clean the filter. The timing for cleaning the filter will be determined by the customer based on operating conditions.

2.3.3. Short-cycle condition—If the inlet pump is pulling air into the system from leaks in the piping, air will collect in the top of the separator and force the oil down. This will cause the level sensor to read high oil level and will cause the system to short cycle between oil discharge and normal operation. A cycle time of less than 30 minutes in most cases is an indication of this problem. If this happens there is an air leak somewhere on the inlet side of the separator. The leak will need to be located and repaired before the system can be restarted.

This is also a possible indicator that the external sump low level switch is faulty, and the system is sucking the sump dry. Check the sump level switch or adjust the system flow rate. If the inlet line is plugged, or the pre-filter is plugged, the separator will likely short cycle. Remove the restriction. If the process flow is greater than the design it can also cause a short-cycle condition.

2.3.4. Excess flow condition—The system is designed to process the oily water at a specific flow rate. The pump is capable of pumping more than the design flow rate to accommodate many possible variables with suction and discharge lift that may be encountered with each application or installation. The flow adjustment valve (V-003) must be adjusted to the designed separator flow rate for your unit. Processing more than the design flow will reduce the efficiency of the separator. An excessive flow rate could also cause other problems in the system such as a short cycle condition. When the system is initially started up, the flow rate should be adjusted to achieve the design flow, and periodically checked if there is a possibility that the position of the flow adjustment valve V-003 has been changed.

2.4. Expected Results

Operating properly the MYCELX 107-49 Separator system will reduce the oil in your discharge water to below the 15ppm limit set by the IMO MEPC regulation 107(49). In many situations the oil content will be significantly lower than the 15 ppm. You can expect the following results from the system:

2.4.1. With no emulsions present the system will generally remove any free oil and the monitor will generally read 0-1ppm.

2.4.2. The higher the volume of oil in the oily water the more oil the primary separator will discharge. For example, in most situations the primary separator will remove free oil to < 15 ppm. However, with high concentrations of oil the primary separator will pass more than 15 ppm oil. The separator will handle 100% oil for short periods of time. It will run 50% oil continuously. However, as the oil concentration goes up so will the amount of oil in the water leaving the separator. This can be helped by slowing the flow rate. In any case it is generally not a problem because the polisher will take out whatever the primary separator does not remove. The more oil in the separator discharge the faster the post polisher media will be consumed but the system will accommodate such conditions.

2.4.3. If the separator is not being used on a continuous basis or is not running full time at the designed rate, the performance can be improved by slowing down the separator. The flow control valve (V-003) can be used to restrict flow to less than the design rate. This will improve the performance of the separator and allow the coalescing separator to remove more oil, making the Polisher media last longer. This can be an effective tool for managing discharge levels of oil.

3. MAINTENANCE

The separator system may require periodic maintenance on or replacement of the components shown in the spare parts list below in section 5. The following items may require periodic maintenance at specific intervals.

3.1. Component Maintenance

3.1.1. Pump—The pump installed on the system does not require lubrication. The mechanical seal should be replaced periodically or when it fails.

3.1.2. Valves—The valves installed on the system are high quality marine grade valves and do not require lubrication. If sand particles get into the solenoid valves it can cause them to leak and they will need to be cleaned. The coils and gasket will need to be replaced periodically or when they fail. NEVER remove the solenoid cover from the valve with the power on. This will IMMEDIATELY destroy the coil and will void any warranty on the valve. If you need to service the valve, loosen the large nut at the base of the coil and remove the entire coil assembly. This will expose the plunger and allow you to replace the o-ring and disc or clean out any sand. If you need to change the coil you will need to disconnect the power before removing the cover.

3.1.3. TPH (OCM) Monitor—The TPH will need a periodic check of zero against clean water, and frequent cleaning of the glass sample cell. Anything not covered by the standard spare parts kit for the TPH will require the unit to be sent back to the factory for repair.

3.1.4. Coalescing Media—The coalescing media in the separator should last for several years. It does not require specific maintenance or replacement under normal operating conditions. If the media is damaged for some unusual reason you should do the following in order to change out the media:

1. Remove the old media. This is easier if you make a hook using a small diameter rod. Shove the rod down the side of the media. Turn 90 degrees so the hook part is under the media and use the hooked rod to pull the media up. (It is easier with 2 hooks.) For larger systems the media may have to be cut out in pieces.
2. The replacement media should come packaged with an inner section and an outer section. They will both come a little over sized.
3. It doesn't matter which section you install first. Place the media in the proper section and get it started, making sure not to damage the edge of the media trying to force it in place. The media should be tight but not too tight. The center section will compress more than the outer section and it can be a little tighter. If the outer section is too tight it will be hard to push down and could buckle. You may need to trim a small amount off the rolls—either the inside of the roll or the outside or both. To do this just cut off the excess with a utility knife. If you cut too much that is not a problem—just add some back.

If you have to add any back unroll the media bundle a little and insert the small piece and re-roll the bundle.

4. It is easier to push the media into the vessel with 2 people. Both people can help get the media started and then push it down uniformly. If there is only 1 person it is easier if a round piece of wood is placed on top of the media and pushed down uniformly. It has been determined that when the media is almost in place it gets hard to push down. In this instance a couple of short pieces of 2 x 4 are used to help push down the last little bit. On the larger systems, it works well to walk around on the media and use your weight to push it down. You should be able to jump up and down on the media to help push it down on the large units.
5. The inner section should be pushed down about 1-2 inches below the weir on 1.0m^3/hr units and below and about 4-6 inches on the larger units. The outer section should be pushed down to just below the weir.

3.1.5. Polisher Media—The polisher media will need to be changed when the oil content monitor will not go below 15ppm AND you have cleaned the cell. High oil content can be caused by using surfactants and other cleaning chemicals that make hard-to-remove chemical emulsions. It is recommended to use cleaners that do not cause emulsions.

Replacing the Media cartridges

The cartridges will need to be replaced when the system will no longer keep the oil content within acceptable limits. To remove the media unfasten the tee bolts located at the top of each MYCELX bag/cartridge filter, remove the hold down plate, and remove the cartridges by pulling up.

IMPORTANT: Prior to removing the media cartridges the system must be shutdown and the vessels depressurized and drained.

3.1.6. Control components—The control components are designed for marine application. They should be replaced when they fail. Refer to the spare parts lists for items recommended to have available.

3.1.7. Flow Indicator—The flow indicator is an industrial class, direct reading indicator that is simple to use and install. It provides an excellent way to measure the flow through the system without having to use an expensive meter. If the glass gets cloudy or breaks, the cover is easily removed and a replacement glass can be installed. The spring inside the indicator is specific to each size unit and is not interchangeable. The spring can be changed by removing the cover. The separator system will function perfectly fine without the flow indicator. The only impact is that you will not know exactly what the flow rate is. If the flow indicator fails the system can be operated normally until a replacement can be procured. In this situation the system can be operated based on its performance. If there is too much flow going through the separator, the efficiency will decrease. If the oil content in the discharge goes up slow down the flow and the efficiency will improve. As long as the separator is meeting IMO requirements it is not critical to know the exact flow rate during a temporary situation.

3.2. Draining the Separator

The separator is designed to hold water all the time. Should it become necessary to drain the separator for any reason you should cycle the system between fill and normal operation several times in succession to eject as much oil as possible from the top of the separator. To cycle the unit place the system in normal operation, close the inlet valve that is located on the inlet side of F-101 and open the vent valve (V-001). The unit will go into fill mode as soon as the fluid level in the top of the unit is pumped down to the low-level sensor. This should happen in approximately 30 – 60 seconds. The unit will cycle between fill and normal operation as long as the vent is open and the inlet is closed. Three cycles should be enough to dilute and reject as much oil as possible. Then proceed to open the drain plugs D1 & D2. This will drain both of the internal sections of the unit. Leave the vent open to facilitate the draining process. To refill the unit follow the procedure outlined in 2.4.

3.3. Annualized Recommended Maintenance Schedule

OWS Time-Based Maintenance

Maintenance Activity	Maintenance Hours	Frequency	Annualized Hours
Clean TPH monitor glass	0.05	daily or weekly	5
Purge the air in the TPH Monitor cell	0.05	daily or weekly	5
Verify normal operation of the system	0.05	daily or weekly	5
Clean the Y-strainer screen	0.15	daily or weekly	15
Test the operation of pump	0.1	monthly	1.2
Test the operation of the control valves	0.1	monthly	1.2
Verify design flow rate	0.05	monthly	0.6
Verify mechanical seal on the pump	0.05	semi annual	0.1

OWS Condition-Based Maintenance

Replace the filter cartridges when the system will not keep the oil content below 15 ppm.	.5	variable	
Replace mechanical seal and o-ring on pump and valve o-rings	.5	When they leak	.5
Replace other components as required	2	variable	2

4. TROUBLE SHOOTING

The following suggestions are provided for situations that have been encountered in the past:

4.1. System recycles into fill mode frequently

The MYCELX system is designed to go into fill mode (Cycle) when the oil water interface reaches the low level. If conditions are normal this should happen no more often than every 30 minutes. If the system is cycling more often than that, several problems may exist. The most common thing that will cause the system to recycle prematurely is when air is drawn into the system and pushes the interface level down to the low level. If the connections are not air tight, air will be pulled into the separator or if the inlet is restrictive it will cause the unit to cycle between fill and discharge in a less than 30-minute cycle. The larger the leak or greater the restriction the faster the cycle time.

4.2. System is not getting enough lift

If the vacuum gauge is reading more than the design rate you should first look for factors that could be impacting the suction lift. These may include too small inlet piping, restrictions in the line, to many fittings or too many valves. If the situation demands a high suction lift and a high discharge head and a stronger pump is needed then a higher pressure polisher may be required to accommodate the increased pressure.

4.3. Reduced flow through the system

If the flow through the system becomes reduced it could be caused by a plugged pre-filter. To unplug the filter, remove the screen, clean it and reinstall the screen.

Low flow can also be caused by a plugged post polisher. If the polisher filter units are plugged simply replace the cartridges.

4.4. Oil content reading is too high and system is in recycle

This condition indicates that the filter cartridges are full of oil and need to be replaced.

4.5. Fault Alarms and Remote Monitoring Capabilities

The TPH monitor is designed to alarm if the oil content exceeds the set limit or if the TPH system fails. If the oil content exceeds the set limit the TPH alarms internally and causes the system to go into recycle mode until the alarm condition no longer exists. The alarm will show on the TPH display and will be recorded by the TPH data logger. Under a system fault alarm the alarm will show on the TPH display. Any TPH alarm or fault condition will automatically put the system into the recycle mode. Potential causes of the TPH system fault include:

a. loose or improperly inserted data card

b. loss of communication between the display and the detector (loose cable)
c. internal board or power supply failure

(See separate TPH O&M manual for a more detailed explanation of the TPH monitor.)

The customer can connect directly to the TPH and obtain the following information at a remote location:

a. 4-20 ma signal showing the ppm oil content in the water (0-20 ppm)
b. Voltage free contact for the TPH alarm
c. Voltage free contact for the TPH system fault

The customer can connect to the main control panel and obtain the following:

a. 120 V signal showing whether the system is in normal operation mode (pump is running and either discharging water or recycling water)
b. 120 V signal showing whether the system is in fill mode (pump is not running, the system is filling and oil is being discharged)
c. The customer can remotely start or stop the system with an external voltage free contact.

4.6. Solenoid Valve not working

If a solenoid valve does not work, the most likely cause is a failure of the coil or a loose wire. You can verify the electrical continuity from the control panel. To replace the coil, turn off the power to the system, disconnect the wiring, remove the cover and replace the coil.

NEVER remove the coil with the power still connected. You will destroy the coil instantly if the coil is separated from the valve and the power somehow is either left on or gets turned on.

If the valve needs a new gasket or O-ring turn off the power and make sure there is no power to the coil. Loosen the nut just above the valve and remove the coil section. Replace the gasket/O-ring and reassemble the valve. Do not turn the power back on until the valve is fully reassembled.

4.7. System goes into fill mode but the fill valve does not open

The MOV and the fill valves should open when the system goes into fill mode. If the MOV opens but the Fill Valve does not open then it is possible that the MOV switch is faulty. If the switch does not make complete contact then the MOV will open but SOV-101 will not do anything. If this happens you have a bad switch on the MOV and need to replace the switch.

4.8. High oil content reading causing water to recycle

a. If there is turbidity in the water the TPH monitor can give a false oil content reading. If this happens a sediment filter may be needed to remove turbidity. You can either add a sand filter or cartridge filter to remove the turbidity.

b. If you are running high concentrations of oil the primary separator may pass more than 15ppm oil. The system will handle up to 100% slugs of oil and will handle 25% or more on a continuous basis. However, the water coming out of the separator will also go up in oil content. This is generally not a problem because the polisher will remove the oil. However, the cartridges will fill up faster and the media will need to be changed more often. This effect can be significantly minimized by slowing the flow rate through the system as the percentage of oil increases.

c. In most situations the cartridges will remove 100% of the free oil that goes through the polisher. As the cartridges fill up with oil the ppm of oil in the discharge will rise until the monitor goes into alarm. When this happens it is time to change the cartridges.

d. Sometimes a high TPH reading has nothing to do with the polisher and is simply caused by a dirty TPH cell. The glass in the cell should be cleaned on a regular basis. This should be the first thing checked when the monitor is in alarm mode.

5. SAFETY

5.1. Ignition Hazard Assessment

The transformer generates up to 100 watts, which is not enough to generate an ignition source. In the case of a dead short, the transformer would trip and the source of heat would cease. If the transformer gets too hot it would automatically trip and the heat would cease. The system is protected by a primary and secondary fuse. The system cannot generate sparks, shock waves, exothermic reactions, electrical arcing or adiabatic compression. There is no ignition hazard.

5.2. Electromagnetic

The system has been tested under EN Standard 61000-6-2:2005 and EN 61000-6-4:2007 for electromagnetic compatibility by an independent laboratory and was found to have no EMI or EMC interference or hazard to the operator.

5.3. 29 CFR, Part 1910

There are no moving parts on the system except the pump which is close coupled, TEFC and IP55 rated. There areno guards necessary because the pump is close coupled. The pump meets all the requirement of 29 CFR, Part 1910, as do all the other components.

The control panel has an IP 66 rating. All components in the control panel are finger safe.

The separator operates under vacuum so there are no pressure issues. Even though the separator vessel operates under vacuum it has been designed according to ASME Section VIII standards at 45psig pressure and has been tested at 65psig pressure.

The syste does not require hand rails, ladders, scaffolds or any other devices for access to the separator or polishers.

The system has its own disconnect, which must be turned off in order to open the control panel enclosure. The system is protected by fuses.

The system is not processing any hazardous chemicals.

5.4. Dangers, warning, cautions

The system comes complete with a warning label showing the electrical voltage coming to the disconnect. When the system is shut down for maintenance the power coming into the system should be turned off at the breaker with proper lock-out, tag-out procedures being followed.

5.5. Federal Protection Standards

There are no hazardous substances or chemicals used in the system. The system is designed to separate oil from water. If there are other chemicals or substances in the oily water sump they should be evaluated individually to determine the impact.

ATTACHMENT 1 – PARTS IDENTIFICATION