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ECOS SERIES OIL WATER SEPARATOR OPERATION AND MAINTENANCE MANUAL

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1.0 INTRODUCTION

Ecologix Environmental Systems, LLC (Ecologix) ECOS Series Oil Water Separators (OWS) will remove essentially all free and dispersed, non-emulsified oil, and settleable solids from the oil water mixture at a flow rate of 100 GPM at a temperature of 55° F. The design utilizes the difference in specific gravity between oil and water (buoyancy force) enhanced by the use of 36 cubic feet of HD Q-PAC coalescing plates. The separator is designed to receive oily water by gravity/pumped flow that will not mechanically emulsify the oil and will process it on a once through basis. The tank will be a single wall, rectangular unit installed above grade. It will be constructed of stainless steel. The HD Q-PAC coalescing plates are manufactured of UV-Resistant Polypropylene material.

2.0 SYSTEM DESCRIPTION AND REQUIREMENTS

2.1 **FABRICATION:** The oil water separator is a special purpose prefabricated parallel corrugated plate, rectangular, gravity displacement, type oil water separator. The separator shall be comprised of a tank containing an inlet compartment, separation chamber, sludge chamber, and clean water outlet chamber.

2.2 **TANK:** The tank shall be a single wall construction of 11 gauge stainless steel conforming to ASTM A240, type 304 stainless steel. Welding will be in accordance with AWS D1.1 to provide a watertight tank that will not warp or deform under load. Pipe connections to the exterior shall be as follows:

2.3 **PIPE CONNECTIONS:** All connections 3" and smaller are FNPT couplings. All connections 4" and larger are flat face flanges with ANSI 150 pound standard bolt circle. Use flanged piping connections that conform to ANSI B16.5.

2.4 **SEPARATOR CORROSION PROTECTION:** (For Carbon Steel Only) after shop hydrostatic test has been successfully completed, a coating system will be applied to the interior and exterior surfaces of the separator. Interior and exterior shall be sandblasted to SSPC-SP10 & SSPC-SP6; Interior lined with Tnemec Series 61 liner to 9 mils MDFT; Exterior coated with polyamide epoxy to 6 mils MDFT.

2.5 **LIFTING LUGS:** The tank shall be provided with properly sized lifting lugs for handling and installation.

2.6 **COVERS:** The tank will be provided with vapor tight covers for vapor control. Gas vents and suitable access openings to each compartment will be provided. The covers shall be constructed of the same material as the tank and will be fastened in place. A gasket shall be provided for vapor tightness. 304 SS Latches will be provided for cover attachment.

2.7 INLET COMPARTMENT: The inlet chamber shall be comprised of a non-clog diffuser to distribute the flow across the width of the separation chamber. The inlet compartment shall be of sufficient volume to effectively reduce influent suspended solids, dissipate energy and begin separation. The media will sit elevated on top of a sludge baffle. The sludge baffle will be provided to retain settleable solids and sediment from entering the separation chamber.

2.8 SEPARATION CHAMBER: The oil separation chamber shall contain HD Q-PAC Coalescing Media containing a minimum of 132 square feet per cubic foot of effective coalescing surface area. The medias needle like elements (plates) shall be at 90 degrees to the horizontal or longitudinal axis of the separator. Spacing between these elements shall be spaced 3/16" apart for the removal of a minimum of 99.9% of free droplets 20 micron in size or greater. The elements are positioned to create an angle of repose of 90 degrees to facilitate the removal of solids that may tend to build up on the coalescing surfaces, which would increase velocities to the point of discharging an unacceptable effluent. Laminar flow with a Reynolds Number of less than 500 at a maximum designed flow rate shall be maintained throughout the separator packed bed including entrance and exit so as to prevent re-entrainment of oils with water. Flow through the polypropylene coalescing media shall be crossflow perpendicular to the vertical media elements such that all 132 square feet/cubic foot of coalescing media is available for contact with the coalescing surfaces. None of the coalescing media surfaces shall be pointing upward so as not to be available for contact with the crossflowing oily water. The media shall have a minimum of 87% void volume to facilitate sludge and dirt particles as they fall off the vertical elements and settle in the sludge compartment. The media when installed in crossflow OWS shall meet US EPA Method 413.2 and also European Standard 858-1.

2.9 BAFFLES: An oil retention & underflow weir, and overflow weir. Position underflow weir to prevent resuspension of settled solids.

2.10 SLUDGE CHAMBER: The sludge chamber shall be located prior to the coalescing compartment for the settling of any solids. It shall also prevent any solids from entering the clean water chamber.

2.11 OIL SKIMMER: The oil separation chamber will be provided with a rotatable pipe skimmer for gravity decanting of the separated oil to a product storage tank.

2.12 CLEAN WATER CHAMBER: The tank will be provided with a 240-gallon clean water chamber which allows the water to leave the separator by pumped flow through the clean water outlet port.

2.13 VENTS: 2" vents will be provided with vent piping to atmosphere.

3.0 SAFETY AND ENVIRONMENTAL CONSIDERATIONS

3.1 All normal safety precautions should be taken with this equipment to prevent accidents and fires.

3.2 Normal fire prevention measures must be taken to prevent fire danger from separated oil.

3.3 Care should be taken to keep the area around the separator clean to prevent accidents.

3.4 Disposal of the separated oil and solids, which may contain hazardous material, must comply with the regulations of the authority having jurisdiction.

3.5 Safety and environmental protection are the responsibility of the user. ECOLOGIX assumes no liability for misuse of this separator or for use outside the purpose for which it is designed.

4.0 INSPECTION AND OFFLOADING

4.1 **INSPECTION:** Inspect the oil water separator upon delivery for any damage, which may have occurred in shipment. Areas most susceptible to damage are connections and cover openings. If the separator is damaged, ECOLOGIX should be notified immediately. The off loading personnel should note the extent of damage and sign and date the bill of lading. A claim should be filed with the delivering carrier.

4.2 **OFFLOADING:** The separator must be carefully removed from the truck so the unit is not damaged. Components for the separator are often supplied in a separate carton. Proper rigging practices should be observed at all times. Hoisting equipment operators should attach a guide line to prevent the separator from swinging out of control. Do not drop the separator or allow it to fall hard in the process of inverting, turning, or moving. Do not slide the separator.

4.3 **COATINGS:** All damaged coatings should be touched up immediately! Please contact the factory if more specific information is required. Under no conditions should chains or cables be put around the separator. Use spreader bars, and the lifting eyes on the unit.

4.4 **STORAGE:** If the equipment is not to be installed at the time of delivery, it should be stored in an area away from traffic. The ground should be level and free sharp objects that might damage the coatings. All equipment should be stored off the ground on timbers. All factory packing should remain intact until the unit is ready for installation. Equipment should be stored indoors. If not, care should be taken that tanks do not fill up with water and debris. Covering all of the equipment with a tarp is strongly recommended.

5.0 SYSTEM INSTALLATION

When placing the separator for system operation, be sure it is installed in a concrete foundation, which provides adequate support under full load operating conditions. Even if a mounting skid is used, a concrete pad or other properly designed structure must be installed as a foundation. The length and width of this pad are dependent upon the footprint of the unit. Thickness of the concrete pad depends on local soil and frost conditions. A local qualified civil engineer should be contacted to determine these dimensions.

5.1 FOR EQUIPMENT SUBJECT TO TRAFFIC LOADS

5.1.1 A concrete slab must be installed around the equipment if the separator is going to be subject to traffic loads. It should be designed to carry the load and transmit the load into adjacent, undisturbed soil, not onto the tank side walls!

5.1.2 If a concrete pad is not installed and the equipment is subject to traffic loads, deformation or in some cases total collapse of the equipment may occur. ECOLOGIX cannot be held responsible for equipment subjected to such loads!

5.2 LEVELING

5.2.1 At this point the equipment should be set exactly in place and the anchor bolts should be installed.

5.2.2 Remove any lids.

5.2.3 The tankage should now be made as level as possible. The absolute minimum requirements being, within +/- 1/16" per foot from inlet to outlet end of tank and +/- 1/16" per foot from side to side, maximum of +/- 1/4" total. Shim the tank, if necessary, until these parameters are met. We recommend the use of stainless steel shim stock. When installing shims, make sure to locate them under all vertical tank supports.

NOTE: We cannot stress enough the leveling process. It is better to invest a little time at this point than to try to correct an improperly leveled tank later. A level installation functions better, has a better appearance and will give you fewer problems in the future.

The next step toward system start involves the plumbing and electrical connections. Any valves and/or piping should be adequately supported and accepted piping and valve practices must be followed for proper system operation. Any pump or level probe wiring and conduit connections should be made at this time. If the unit includes internal level detection, insert the level detection level indicated on the drawing.

5.3 PLUMBING

5.3.1 When making connections to the equipment do not use the equipment as a pipe support. All plumbing should stand on its own if disconnected from equipment. ECOLOGIX cannot be held responsible for damage caused by using this equipment to support your plumbing.

5.3.2 Connections do not have to be made in the order listed below. Review your situation and make the connections in the most convenient order for your particular application.

5.3.3 Connect the outlet plumbing. The effluent plumbing must be the same size or larger than the nozzle size of the equipment. Do not reduce the size of the effluent piping as this might cause hydraulic overloading of the equipment. Also, try to run the discharge piping through as few changes as possible, as short a distance as possible and at a pitch of not less than 1/16" per foot. On gravity flow units it may be necessary to vent exterior piping to prevent air locks in discharge pipe.

5.3.4 Connect the inlet plumbing. The influent must be the same size or smaller than the nozzle size on the equipment. Do not increase the size of the influent piping as this might cause hydraulic overloading of the equipment. Also, the pitch of the pipe should not exceed 1/16" per foot.

5.3.5 On most units, vents will have been provided. These vents have been supplied to prevent air locks during surge conditions. For both indoor and outdoor applications the vents should be run to a location where noxious and sometimes volatile gas would pose no hazard. Follow all applicable fire codes with regards to size of vent pipe.

*****Warning: Do not plug or otherwise obstruct air flow through the vents. Obstructing air flow through the vents could damage the unit and/or create a hazardous condition*****

6.0 SEPARATOR SET UP AND START UP PROCEDURES

6.1 SEPARATOR SET UP PROCEDURES:

The inlet flow to the separator must be by gravity or a positive displacement pump upstream. Centrifugal pumps greatly agitate the oil and water and tend to make a stable emulsion that is very difficult, if not impossible, to separate by gravity settling.

Separator flow should be controlled upstream to ensure even, steady flow, and stable conditions in the separator. Unstable flows tend to reduce efficiency and may cause high oil concentration at the outlet.

(6.1 *SEPARATOR SET UP PROCEDURES* continued)

6.1.1 The separator tank is atmospheric in design and must be vented to the atmosphere. Consult the OWS drawing for location of all vents.

6.1.2 To achieve the desired flow, excessive throttling of the input must be avoided as this will also cause emulsification of the oil, adversely effecting separator performance. Especially avoid the use of globe type or other valves with high-pressure drops.

6.1.3 It is recommended that the effluent water flows by gravity flow from the separator. The pressure loss for the water effluent pipe shall not exceed the drop elevation of the customer lines. External piping should be separately supported. The separator is not designed to support piping.

6.1.4 To install the separator, follow these steps:
(Please refer to attached installation drawing)

1. Ensure that the source of the water to be treated is properly regulated and not provided with a centrifugal pump or other device, which will cause emulsification such as a high-pressure drop valve.
2. Ensure that the separator is securely installed per installation drawing.

6.2 *SEPARATOR START-UP PROCEDURES:*

6.2.1 Initial start-up. This procedure is to be followed after the installation of the separator or after the separator has been drained for maintenance and is ready to be restarted.

6.2.1.1 Ensure that the owner supplied upstream influent flow r
egulating valve is closed.

6.2.1.2 Before starting the flow to the unit, remove the coalescer access cover and ensure that the HD Q-PAC packs have not shifted and are securely fastened. The separator should contain plate packs, polishing pack and adjustable oil skimmer pipe tube. (Slot of skimmer to be turned upward away from water)

6.2.1.3 Ensure that there are not obstructions in the water outlet piping.

6.2.1.4 With the coalescer access cover off, fill the tank with clean water, establishing flow from the effluent opening. Check for leaks.

6.2.1.5 Allow the influent oil water mixture into the OWS tank.

6.2.1.6 Replace the coalescer access cover and bolt down liquid tight.

6.2.2 Normal operation:

Carefully maintain flow at the rate set when flow was established. Once a sufficient quantity of oil has accumulated in the separator, turn the slot of the skimmer into the oil layer (The oil will then be decanted into an integral oil storage compartment or to a separate tank outside of the separator). Disposal of the oil must comply with regulations of the authority having jurisdiction.

7.0 QUALITY ASSURANCE

7.1 INSPECTION: Examine each component of the separator for compliance with requirements indicated in Section 2 - System Description & Requirements. This element of inspection shall encompass visual examination.

7.2 PRETEST PROCEDURES: After separator has been leveled, hydrostatically test unit for (4) hours by filling full with potable water, provided by customer, with means of getting it from the nearest source by the installer. Acceptance criteria for this test is no leakage after four (4) hours.

7.3 TESTS: After hydrostatic test has been successfully completed and unit has been properly connected to influent and effluent piping, allow influent oil water mixture of 100 ppm, to flow into separator filled with potable water. After injection, operate unit for a minimum of ten tank volume changes prior to testing for contaminant removal.

7.4 TEST FOR CONTAMINANTS: The installer shall test the effluent to ensure that it meets oil concentration levels described in Section 2 - System Description & Requirements. Test shall be performed by an independent certified testing laboratory.

7.5 ANALYTICAL METHODS: Test and sample preservation methods for test contaminants shall be in accordance with the latest revision of EPA Methods for Chemical Analysis of Water and Wastes. Effluent oil concentration shall be measured by gravimetric, Separatory Funnel Extraction Method API 413.1.

8.0 MAINTENANCE

8.1 The separator should be checked periodically to determine if excessive amounts of solids and debris have accumulated. If this happens the solids may accumulate enough to plug the lower part of the HD Q-PAC plates. In this case, efficiency will be reduced and oil in the outlet water may exceed specified effluent limits.

8.2 After the first 6 months of operation, the inlet area should be inspected and cleaned as follows:

1. Stop the flow of influent to the separator.
2. Remove separator cover.
3. Dispose of separated oil per regulatory procedures.
4. Remove water from separator through drain or hose.

8.3 Measure and record the depth of the solids. Use this measurement as the timing basis for the next solids inspection and clean out. Consult OWS drawing for depth of sludge baffle. Solids should not exceed this depth.

8.4 The HD Q-PAC plates can be either cleaned in place or removed and cleaned .

1. For cleaning in place, connect a pressure water hose (1-15 psig) and insert in plate spacing on top of the plate packs. As the water flushes the dirt out of the plate packs it should be removed by the vacuum hose.
2. For removing plate packs outside of separator. Flush with garden hose (10-15 psig) over an area to prevent discharge of flushed water into groundwater. It is only necessary to remove all sludge from between the plates and any very heavy oil coating.

8.5 Examine tank interior for damage and repair any damage to internal coating.

8.6 To restart separator, reinstall HD Q-PAC plate packs and polishing pack in original position. Make sure that both are securely in place so that they do not float when unit is operational.

8.7 For start up, repeat steps in section 6 of these instructions.

9.0 TROUBLESHOOTING

Regularly monitor the quality of the effluent leaving the separator. If any loss in effluent quality is observed, steps should be taken to correct the problem immediately. Some things to check if effluent quality has deteriorated are:

1. Have you exceeded the separators rated flow ? If so, return the flow rate to the design flow rate.
2. Have you allowed the sludge to accumulate to a point where it has started to affect the performance of the separator? If so, take steps to have the sludge removed immediately. If it cannot be pumped out, you will have to drain the separator and remove the accumulated sludge.
3. Check the influent for surfactants or chemical emulsifiers. If any are present, you may need additional treatment in order to meet discharge requirements.
4. Are you pumping into the separator? If so, you may be mechanically emulsifying the influent oil. Sample the oil water from both before and after the pump. There should be no differences between the two samples. If you are mechanically emulsifying the oil you may have to change your influent pump to a low RPM positive displacement pump or similar pump that will cut down on shearing.
5. Check to make sure that the oil depth in the separator is not too great, a deep layer of product will reduce the efficiency of the separator. Free product should be removed and the separator put back in service.

TROUBLESHOOTING GUIDELINE

PROBLEM	POSSIBLE CAUSE	DIAGNOSTIC TECHNIQUE	CORRECTIVE ACTION
EFFLUENT	Oil Concentration too Great for Design	Sample Influent	Decrease the Flow Rate
CONCENTRATION	Flow Too Great For Design	Check Flow	Decrease the Flow Rate
TOO	Plates Blocked	Inspect, Remove Plates if Necessary	Clean Per Par. 8.4 Instructions and Reinstall.
HIGH	Solids have Accumulated Into Coalescer Plates	Check Depth of Solids In Coalescer Compartment	Remove Solids From Compartment See Par. 8.3.
TANK IS OVERFLOWING	Output Line Restricted	Check Flow	Remove Restriction

Note: For proper operation, outlet line should be as large as outlet nozzle unless unit is to be operated at very large flows

LIMITED WARRANTY

Ecologix equipment is warranted as to workmanship, material and performance when properly installed, used, and cared for, and provided that the original design criteria represent actual field data at the time of operation. Should any parts or parts prove defective within twenty-four (24) months from the date of purchase, it will be replaced F.O.B. destination without charge, provided the part (or parts) is returned transportation charges prepaid.

No allowance will be made for labor, transportation, or other charges incurred in the replacement or repair of defective parts by the customer. This warranty does not apply when damage is caused by conditions such as sand or abrasive materials pumped with the fluids, lightning, improper voltage supply, careless handling, improper installation, stray electrical interference, or due to substances or factors that were unknown to Ecologix at the time of purchase. Buyer shall have no claim, and no product or part shall be deemed defective, by reason of failure to resist erosive or corrosive action, nor for problems resulting from buildup of material within the equipment.

This warranty applies only to seller's equipment, under use and service in accordance with the seller's written instructions, recommendations and ratings for installation, operating and maintenance, and service. All claims for defective products, parts, or work under this warranty must be made in writing immediately upon discovery and, in any event, within one year of purchase.

This warranty is a *Limited Warranty*, anything in the warranty notwithstanding. Implied warranties for particular purpose and merchantability shall be limited to the duration of express warranty. The manufacturer expressly disclaims and excludes any liability of consequential or incidental damages for breach of any express or implied warranty.