INDUSTRIAL FILTRATION SYSTEMS

CUSTOMER:

MODEL #: CLS-141-24K H.E.-SWS

OPERATION AND MAINTENANCE MANUAL

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CUSTOMER: AHB/ ALCOA

MANUFACTURER: **EBBCO INC.**

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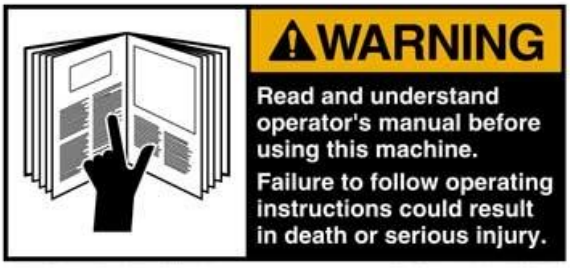


IMPORTANT!

Failure to install Ebbco Inc. brand Filter Cartridges in any Ebbco Inc. Filtration System, housings and or units requiring Filter Cartridges for necessary operation, will cause Ebbco Inc.'s standard warranty to be null and void.

Table of Contents:

Section 1: **Introduction**

1.1 Introduction

This manual provides technical instruction on the installation, and operation of the Closed Loop Filtration System manufactured by Ebbco Inc. With regular maintenance and proper operation, the Closed Loop Filtration System will reuse the overflow water from the work tank, and process it so that it meets the high-pressure pump specifications. The Closed Loop Filtration System will require some on-site assembly, which includes connecting the Closed Loop Filtration System to the water-jet cutting machines work tank overflow, connecting the make-up water line, and connecting hoses from the Closed Loop Filtration to the high-pressure pump. The Closed Loop Filtration System is manufactured using quality materials by a highly experienced production staff. The Closed Loop Filtration System is tested by Ebbco Inc. to ensure that it meets all of the specifications required by each customer. The Closed Loop Filtration System is inspected, and all test data documented prior to shipment.

1.2 Sequence of Operation

The Ebbco Inc. Closed Loop Filtration System (CLS) is designed to allow the user to shut off the drain and capture overflow water for reuse by polishing it with specialized equipment. The system operates by using the overflow water from the customer's waterjet catch tank.

Water from the customer's waterjet catch tank will overflow into a Settling Weir, preventing any large solids from entering the Closed Loop System. The Settling Weir will then overflow through the CLS 1.5" system inlet. The water flows through a Pre-Filter Bag on the inside of the CLS 1.5" inlet. This pre-filter bag will prevent any debris (150 microns and above) from settling into the dirty portion of the system tank. The dirty tank water level should be consistently around 10 – 14". The float level assembly inside of the dirty tank will open a valve and supply make-up water if the catch tank overflow supply is insufficient.

From the dirty tank water is pumped, via the system pump, through the bag vessel (vessel # 1). The water is polished by an ultra-fine bag filter (installed inside of vessel #1) polishing the fluid to 1 micron. Water is then sent through the Hurricane Filter Vessel (vessel #2), where the hurricane filter cartridge removes particles above 0.35-microns. Water leaves the hurricane vessel as clean fluid and is deposited into the clean portion of the system tank. The clean tank is constantly monitored by a TDS (Total Dissolved Solids) Meter to maintain a safe level of D.I. controlled water. Water is directed from the outlet of the Hurricane Filter Vessel (vessel # 2) into the D.I. Vessel (vessel #3) when the TDS level goes above the preset high point of the system holding tank. The D.I. vessel is filled with a waterjet resin bag, which will remove dissolved solids from the water. Water will be reintroduced into the clean tank after running through the D.I vessel. The High-Pressure Feed Pump delivers the clean, cooled TDS-controlled water from the clean tank back to the High-Pressure Waterjet Pump. Water will continuously overflow back into the CLS, continuing the filtration sequence.

The clean tank should always be continuously overflowing into the dirty tank to ensure that there is always a positive level of clean water for the CLS High-Pressure Feed Pump. This will ensure that there is always a positive level of clean water for the feed pump to draw from, which will prevent potential catastrophic feed pump damage or failure. The water that overflows into the dirty tank is again drawn up and filtered through the aforementioned process.

The CLS is fitted with an Ozone Generator, which will continuously introduce a mixture of ozone and air into the clean portion of the system tank. This action will help eliminate biological fouling agents in the entire system. Clean water is routed through a heat exchanger and a closed loop chiller, cooling the water and removing heat generated by the High-Pressure Cutting Pump, and heat generated by the cutting process itself.

Figure 1.2
Settling Weir

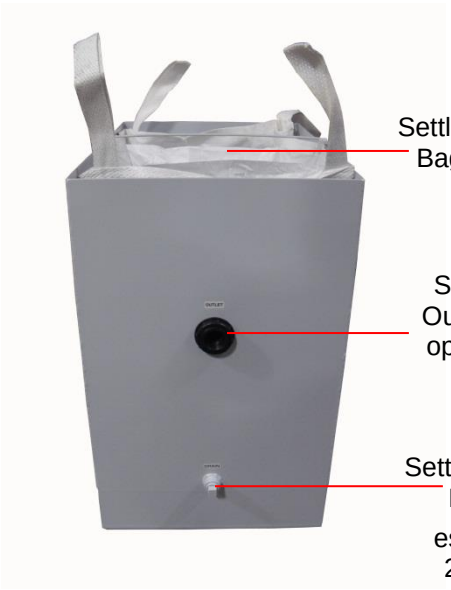


Figure 1.1
Filtration System Assembly

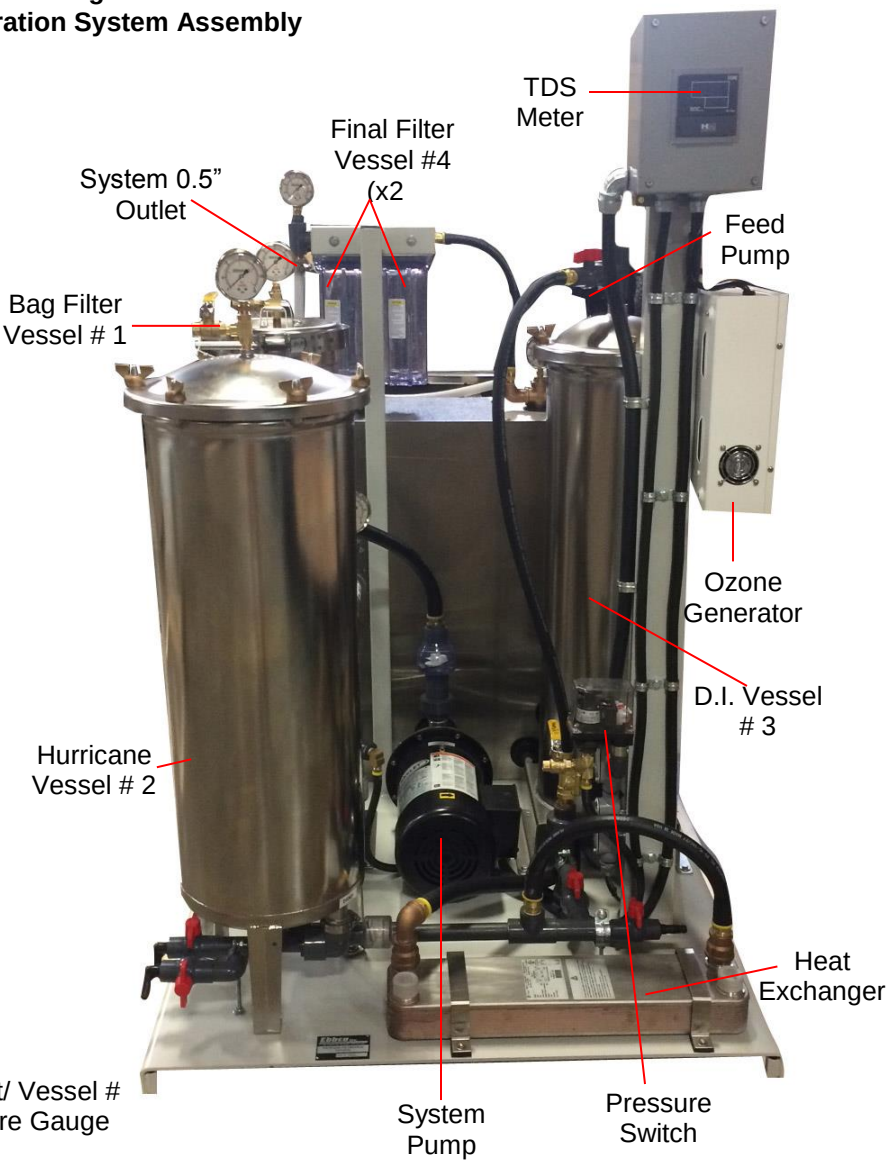
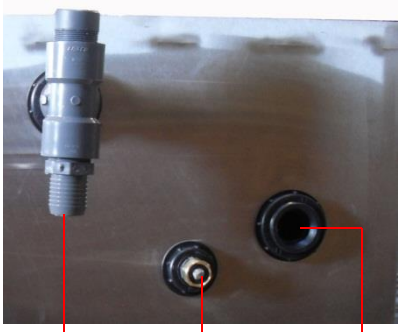


Figure 1.3
Rear System Tank Connections



Section 2: **System Specifications**

2.1 System Utilities Requirements

Electrical:	460vac/3ph/60Hz
Closed Loop System Full Load Amps:	5.0 Amps
Overall Full Load Amps for GRS and CLS:	19.0 Amps
Make-Up Water connection:	2 GPM @ 20 PSI min
Inlet connection:	1.5” BHF connection
Outlet connection:	0.5” hose barb connection
Heat Exchanger inlet/outlet connection:	0.75” hose barb connection

2.2 System Components

Tank

General Dimension:	66" l x 36" w x 62" h
Tank Dimension:	30" l x 36" w x 30" h
Clean Tank Capacity:	50 US GAL
Dirty Tank Capacity:	100 US GALLONS
Max Tank Capacity:	150 US GALLONS

Bag Vessel (Vessel #1) – SLBV-0833-BC

Construction:	304 Passivated Stainless Steel
Bag Requirement:	This unit accepts one (1) Filter Bag, extra fine extended area Pre-Filter
Rim Gasket:	Buna-nitrile
Media Requirement:	CLS-1-G2PS-EA

Hurricane Vessel (Vessel #2) – HRF-LP

Construction:	316 Passivated Stainless Steel
Recommended Flow Rate:	30 GPM
Service Height Clearance:	62”
Filter Cartridge:	This unit accepts one (1) 0.35 micron-rated Pleated Polyester-Plus™ Filter Cartridge
Rim Gasket:	E.P.D.M.
Media Requirement:	HR-930-Q.35

D.I. Vessel (Vessel #3) – DI-1

Construction:	316 Passivated Stainless Steel
Capacity:	One cubic foot of Water-jet Resin in a Poly Sateen Bag (recyclable)
Rim Gasket:	Buna-nitrile
Media Requirement:	CLSR-100-PKG

Final Filter Vessel (Vessel #4 x2) – (HSL-10-0.50-WCP)

Quantity:	2 Separate Cartridges
Construction:	Polypropylene
Flow Rate:	10 GPM
Filter Cartridge:	This unit accepts one (1) 0.35 micron-rated Pleated Filter Cartridge
Rim Gasket:	E.P.D.M.
Media Requirement:	CLS-801-Q.35 / CLS-801-0.2

Section 2: **System Specifications**

System Pump – B82418

- Closed-coupled, end suction, single-stage Centrifugal Pump.
- Pumps water from Filtration System's dirty tank through system vessels.

Motor:	460vac/3φ/60Hz
Horsepower:	1 HP
Speed:	3450 R.P.M.
Enclosure:	T.E.F.C.
Full Load Amp @ 460vac:	2.0 Amps
Temperature:	212ºf maximum operating temp
Impeller:	5"diameter AISI 316 Stainless Steel

High-Pressure Feed Pump – TC40S340

- Direct-coupled, self-priming, multi-stage Centrifugal Pump.
- Delivers water from the Filtration System's clean holding tank to customer's machine tool.

Motor:	460vac/3φ/60Hz
Horsepower:	1.15 HP
Speed:	3300 R.P.M.
Enclosure:	T.E.F.C.
Full Load Amp:	2.5 Amps
Impeller:	multistage

Electrical Panel

Custom enclosure that controls both the Garnet Removal System and the closed loop system.

System Pump starter module: PKZMO	**Thermal Overload**
Thermal overload set point @ 460vac:	2.0 (FLA of motor)

Feed Pump starter module: PKZMO	**Thermal Overload**
Thermal overload set point @ 460vac:	2.5 (FLA of motor)

Total Dissolved Solids Meter – CIC-152-4

- Digital monitor/controller.
- Dual set point is internal to discourage unauthorized adjustments. If the conductivity signal becomes greater than the conductivity set point at the solenoid valve will open allowing water to pass through the D.I. Vessel. The conductivity probe is located inside the clean tank.

Range:	0-500 PPM
Conductivity Set Point A:	40 PPM
Change Resin-Flashing Beacon:	100 PPM
Contact Rating:	SPDT 10 Amp @ 250vac, 30vdc.

Section 2: **System Specifications**

Ozone Generator – ZO-200-CD

Lamp:	Corona Discharge
Operating Temperature:	35º F to 100º F
Ozone Output:	5.0 SCFH @ 2 PSI
Cabinet:	Metal Construction
Check Valve :	1/4" Plastic Internal

Pressure Switch – MCS4FORMCDN

Material:	conforms to IEC 947, en 60-947, VDE 0660, csac2 2-2
Temperature:	-10ºf min - to 150ºf max
Max Pressure:	65 PSI (4.4 bar)
Reading:	Service Filter
Set Point:	10 PSI
Reading Pickup:	Inlet Header of Hurricane Vessel

Service Beacon – Dry contact

Bulb:	5w
Enclosure:	IP54 /UL Type 12
Triggered by:	TDS meter
Set Point:	see TDS settings/ Descending Pressure Switch
Location:	Dry Contact signal

Pressure Gauge – WJF-GA-0-60

Range:	0-60 PSI
Face Diameter:	2 1/2"
Inlet Size:	1/4" NPT
Case Material:	Stainless Steel
Wetted Parts:	Brass

Settling Weir

Dimension:	36” l x 24” h x24” w
Inlet:	1.5” BHF connection
Outlet:	1.5” BHF connection
Material of Construction:	Carbon Steel
Thickness:	10 gauge
Media Requirement (if equipped):	WJF-SWB

Heat Exchanger – 36,000 BTU

Capacity	36,000 BTU/HR
Inlet connection size:	1.0” NPT [x2]
Outlet connection size:	1.0” NPT [x2]

Section 3: System Installation and Operation Procedures

Carefully check each component against the enclosed packing list upon shipment arrival to ensure that everything has been received. A claim must be filed with the carrier immediately if any damages are found. Remove the filtration system from the wooden skidding it was shipped in using suitable materials and proper handling equipment.

3.1 Site Requirements

The Closed Loop Filtration System requires a level space as close to the customer's waterjet catch tank as possible. The system occupies an area of 66" l x 36" w, with a service clearance height of 62". It is recommended that at least three feet of additional space be allocated around the perimeter of the filtration system for operator service access, inspection, and routine system maintenance.
Electrical: 460vac/3ph/60Hz

3.2 Closed Loop Installation Procedure

1) Un-package the Ebbco Inc. Closed Loop Filtration System (CLS) and inspect for any damage that may have occurred in transit.
2) Place the CLS on a level surface within 15 ft. of the customer's waterjet catch tank.
3) Have a qualified industrial electrician connect the dedicated electrical power supply to the CLS electrical panel per the enclosed electrical drawing E-2214-071-001.
4) If a settling weir is equipped, use the provided hose to connect from the customer's waterjet catch tank overflow discharge to the 1.5" inlet port on the settling weir. Connect the provided plumbing from the settling weir 1.5" outlet port to the 1.5" catch tank overflow inlet on the CLS.
5) Connect the float ball to the float valve assembly inside of the dirty tank (if this step has not already been done prior to shipment). The float assembly has been preset at the factory to the correct height and does not require adjustment.

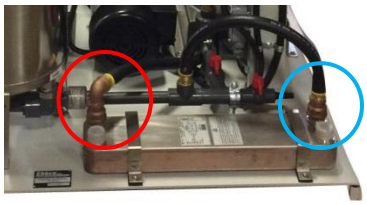
Note: The float valve assembly on the City Water Make-Up port should be set to maintain a water depth of 10 – 14" and no higher. This is used to make-up water lost from evaporation and insufficient overflow from the waterjet catch tank.

6) Connect the make-up water source to the 0.75" water make-up connection on the CLS.
7) Connect the hose from the outlet of the High-Pressure Feed Pump to the Final Filter Vessel inlet (vessel #4 2 pcs) if this was not done prior to shipment.
8) Plumb into the customer's machine tool inlet from the final filter vessel 0.5" hose barb outlet.
9) Run hose from the emergency overflow on the CLS to either a drain or into a catch bucket.
10) Ensure all unions are tight and all drains are closed

Note:

The float valve assembly on the city water make-up inlet must be set to maintain a water depth of 10 – 14"

3.3 Heat Exchanger Installation Procedure



To connect pre-existing cooling unit to heat exchanger:

1) Remove the white caps protecting the threads on the 1.0” inlet and outlet threads.
2) Connect pluming from the customer’s preexisting cooling device discharge to the 1.0” fluid inlet on the heat exchanger (red circle).
3) Connect plumbing from the heat exchanger 1.0” fluid outlet (blue circle) to the customer’s preexisting cooling device inlet.

3.4 Chiller Installation Procedure

To install a 90K in-line chiller unit:

1) Remove the ¾” hose from the chiller inlet and outlet hose barbs on the CLS (see right and below right images).
2) There are two lengths of provided hose to connect the chiller to the CLS. Connect the CLS to the in-line chiller as follows:
   a. Attach one length of hose to the 0.75” hose barb inlet located on the CLS tank (see Figure 3.1). Connect the opposite end of that hose to the 0.75” hose barb on the in-line chiller marked fluid outlet from chiller.
   b. Attach the second length of hose to the 0.75” hose barb outlet on the CLS base (see Figure 3.2). Connect the opposite end of that hose to the 0.75” hose barb on the in-line chiller marked fluid inlet to chiller.

Figure 3.1
Chiller Inlet (from chiller) Connection

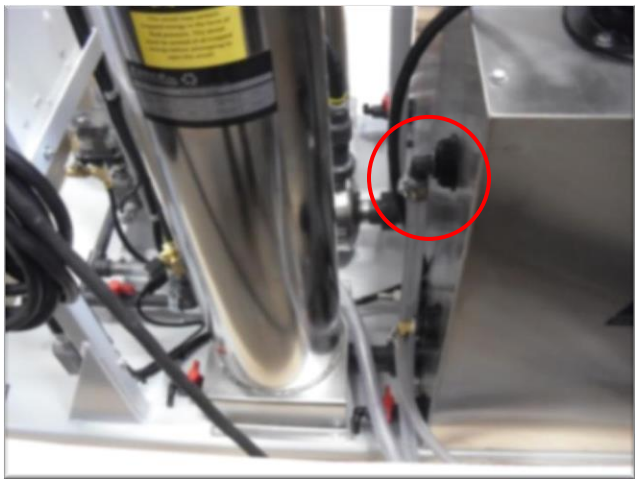
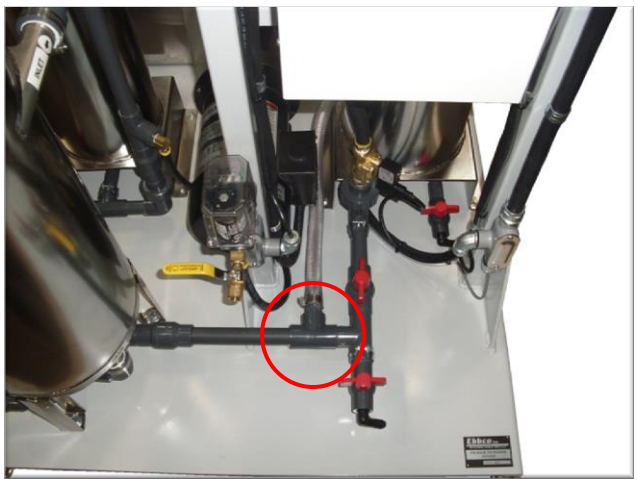


Figure 3.2
Chiller Outlet (to chiller) Connection



3.5 Start-Up Procedure

1) Fill the clean side of the system tank (smaller side) with filtered water (min 20 micron) with a TDS level no greater than 150 PPM. Fill the clean tank so it completely fills and spills over the dividing baffle into the dirty tank (larger side). Keep filling the clean tank until the water level inside of the dirty tank is just below the city water make-up port.
2) Prime the system pump by loosening the prime nut on the top of the pump housing and letting the air bleed out. Tighten the nut once water is flowing out of the port.

Note: While clockwise may typically be the normal factory set rotation, some motors do rotate counter-clockwise. Every pump leaves our facility with an arrow affixed to the motor correctly identifying the motor rotation direction. Advise said arrow for proper motor rotation direction.

3) The motor(s) have been synchronized at the factory, but if they are running in reverse have a qualified industrial electrician swap over one of the incoming power lines at the electrical panel.
4) Carefully open the bleeder valve on top of vessel # 2 to bleed out the trapped air. Close the bleeder valve once all the air is purged and fluid start to escape the valve.

Note: The inlet pressure gauge (on vessel # 1) should read approximately 38 PSI.

5) Water should be flowing from the clean tank over the dividing baffle into the dirty tank. The fluid may appear cloudy and/or have a foam layer on top after initial startup or with installation of a new filter. **This is normal and should clear itself up within due time.**
6) Ensure the ozone generator is on once the water quality clears up; bubbles should be coming out of the dispersion stone (located inside the clean tank) and rising towards the surface.
7) Let system run until the TDS meter on the electrical panel reads within the preset TDS level (40 – 100 PPM).
8) After the previous steps have been accomplished, start sending water to the customer's water-jet by turning feed pump on via the control switches on the electrical panel.

Note:

The Float Valve Assembly on the water make-up in the dirty side of the Closed Loop should be set to maintain a water depth of 10 - 12"

Section 4: **System Maintenance**

Warning:
Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

Caution:
Always follow correct lock out procedures when working on this Filtration System

The system will require the following items to be maintained on a scheduled basis:

4.1 Closed Loop System Daily Check List

1) Lift the lid on the system's clean tank and observe the water quality (the clean tank must be 100% clean at all times).
2) Start the system pump by rotating the system pump control switch on the electrical panel.
3) Check the pressure differential on bag vessel inlet and outlet pressure gauges (vessel #1).

Note: The red service beacon on top of electrical panel will flash when the outlet pressure reaches 10 PSI, signaling that the bag filter inside of vessel #1 needs to be serviced. Allow 5 – 10 minutes to elapse prior to changing the bag filter. Once the allotted time has passed perform the maintenance to the bag filter, as described in section 4.4. Observing the pressure gauge at startup will give you a good indication of how close you are to servicing the bag filter.

4) The hurricane filter cartridge typically will not get a large pressure differential. This filter should be changed on a routine maintenance schedule. Ebbco Inc. recommends changing the cartridge on the 1st of each month, or *200 hours of operation (see maintenance section in manual for cleaning procedure).

***Note: The material being cut and the abrasive being used may affect filter life.**

5) Check the TDS meter on the front of the electrical panel. The TDS Meter is preset at the pump manufacturer recommended settings. Your preset TDS level is 40.

Note:
TDS levels may spike during filter service or when make-up water is added. This is normal, however the desired TDS level should return within a few minutes (see maintenance section in this manual for Resin Bag information).

6) Open the lid to clean/dirty tank. First, the water should be overflowing from the clean tank into the dirty tank. Second, the water in the clean tank must be clean at all times. Sending dirty water to High-Pressure Feed Pump could result in catastrophic maintenance/damage.

7) Observe the water make-up float assembly. The water level in the dirty tank should maintain the present float height with city water barely trickling in or shut off.

8) Start the High-Pressure Feed Pump. Your feed pump should be running at ~80 – 90 PSI.

Note: Pressure reading is before the High-Pressure Feed Pump is turned on; the pressure will drop a couple of PSI after feed pump is turned on.
Please call the Ebbco Waterjet service department if you have any questions or comments at (800)991-4225

Warning:

Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

Caution:

Always follow correct lock out procedures when working on this Filtration System

4.2 Pump Maintenance

Inspect pump once a year: Replace any worn parts, mechanical pump seal, impeller, impeller housing, and wear plates if necessary. Ebbco Inc. recommends keeping spare system pump and feed pump seal kits in stock at all times.

4.3 Dirty Tank Pre Filter Maintenance (Filter #5)

Remove the tank lids and check the condition of the dirty tank inlet pre-filter bag. Remove and clean as necessary; replace if worn or damaged.

4.4 Bag Vessel Maintenance (vessel #1)

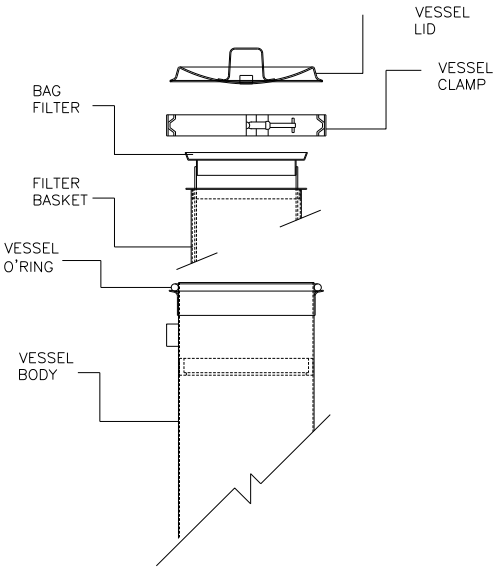
Change the bag filter when the outlet pressure gauge reads 10 PSI (or less).

Bag Filter change out procedure:

1) Shut down the filtration system by turning both the system control switch and the rotary disconnect to the off position.
2) Carefully relieve vessel pressure by opening the bleeder valve, located on top of the vessel lid.
3) Open the drain valve located near the bottom of the vessel (red valve). Wait until the pressure gauge reads 0 PSI prior to removing the lid.

Note: ***Do not forget to close the drain valve prior to restoring power to the CLS!***

Figure 4.1
Bag Vessel (exploded view)



Warning:

Do not open the lid until the pressure gauge reads 0 PSI!

4) Open the vessel by loosening the band clamp; remove the band-clamp from the vessel followed by removing the lid.
5) Remove the bag filter from the inner basket using the plastic pull tabs on the top seal.
6) Push the replacement bag filter into the vessel inner basket. Ensure that the plastic ring sits flush in the sealing area.
7) Visually inspect the lid O-ring gasket. Ensure that it is free of debris and sits flush inside of the O-ring groove. Replace the O-ring gasket if it has become worn or damaged. It is recommended that sufficient O-ring seal kits be kept in stock at all times.
8) Reapply the lid on top of the vessel. Replace the band clamp and properly tighten.
9) Verify that the drain and bleeder valves are closed before restoring power to the CLS.
10) Restore power to the CLS. Place a rag over the bleeder valve and slightly open the valve to release any trapped air inside of the vessel; close the bleeder valve once all the air is purged and fluid starts to flow out of the valve.

4.5 Hurricane Vessel Maintenance (vessel #2)

Ebbco Inc. recommends changing the filter cartridge on the 1st of each month or every 200 hours of runtime; whichever comes first.

Filter Cartridge change out procedure:

1) Shut down the filtration system by turning both the system control switch and the rotary disconnect to the off position.
2) Open the drain valve and completely drain the vessel of water.
3) Open the bleeder valve on top of the lid to purge any trapped air from the vessel.

Caution:

Failure to drain the hurricane vessel when performing a filter change out can result in a charge of unfiltered water being sent to the High-Pressure Pump

4) Open unit by removing wing nuts followed by the lid.
5) Lift out the filter cartridge assembly and place it inside a 5-gallon bucket.
6) Unscrew the cartridge retainer nut from the assembly.
7) Remove the filter cartridge from the top disk and wipe both components with a rag to remove some of the debris.
8) Apply wax (part # WJF-STW) to the top and bottom seals of the replacement filter cartridge, on the cartridge retaining nut threads, and on both sides of the top disc that come into contact with cartridge and the retaining nut.
9) Place the top disc on the replacement filter cartridge **while the assembly is still outside of the vessel**. Reapply the retainer nut and properly tighten so the top disc does not rotate or spin freely.

Note: Do not change the filter while it is inside of the vessel as the top disc WILL NOT seal properly and cause performance issues.

10) Visually inspect the lid O-ring gasket. Ensure that it is free of debris and sits flush inside of the O-ring groove. Replace the O-ring gasket if it has become worn or damaged. It is recommended that sufficient O-ring seal kits be kept in stock at all times.
11) Replace the assembly into the hurricane vessel.
12) Replace the lid and lightly tighten each of the wing nuts. Fasten down all of the wing nuts in a star-shaped pattern to evenly disperse pressure across the lid. Over-tightening can cause damage to the O-ring gasket, which may lead to an uneven leaking seal.
13) Restore power to the CLS. Place a rag over the bleeder valve and slightly open the valve to release any trapped air inside of the vessel; close the bleeder valve once all the air is purged and fluid starts to flow out of the valve.

Figure 4.2
Hurricane Filter Cartridge

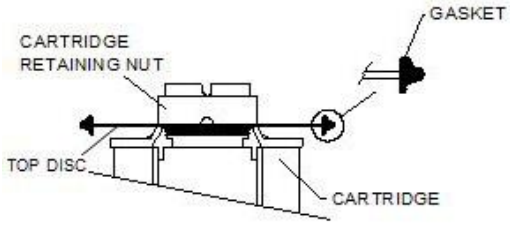
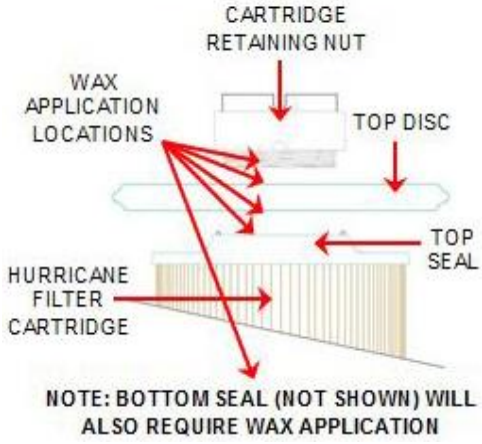


Figure 4.3
Filter Cartridge Assembly Wax Points



Note: The operator must apply wax lubricant (part # WJF-STW) to the top and bottom seals of the filter cartridge and on the top and bottom of the top disc surface that come into contact with the cartridge and retainer nut. This must be done prior to filter cartridge installation back into vessel # 2. Ensure that top disc does not rotate or spin freely once reinstalled.

4.6 D.I. Resin Vessel Maintenance (vessel #3)

Replace the waterjet resin bag and pre-filter disc when the PPM reading on the TDS Meter reading does not return to its proper range (between 40 – 100 PPM).

Resin Bag change out procedure:

1) Close the fluid inlet valve and open the bleeder valve on top of the lid to release the trapped air inside the vessel.
2) Open the drain valve to drain out any water still in the vessel. While this is not necessary in order to change the resin bag, it does make the resin bag easier to remove.
3) Remove the wing nuts from the lid and remove the lid.
4) Lift out the pre-filter disc and properly dispose of.
5) Remove the waterjet resin bag and properly dispose of.
6) Install a waterjet resin bag and a new pre-filter disc back into the top rim.
7) Visually inspect the O-ring gasket. Ensure all dirt particles are removed from the O-ring gasket, and that it is not worn or damaged. Replace the O-ring gasket if it is worn or damaged.
8) Replace the lid and properly tighten all wing nuts.
9) Close the drain valve and bleeder valve prior to restoring flow to the vessel.
10) Open the fluid inlet valve. Place a rag over the bleeder valve and slightly open the valve to release any trapped air inside of the vessel; close the bleeder valve once all the air is purged and fluid starts to flow out of the valve. Fluid should now flow through the D.I. vessel whenever the solenoid opens.

4.7 Final Filter Vessel Maintenance (vessel #4)

Change the filter cartridges inside of the two filter vessels # 4 when there is a 30 PSI pressure differential between the surrounding inlet and outlet pressure gauges.

Final Filter change out procedure:

1) Shut off the High-Pressure Feed Pump via the feed pump control switch on the electrical panel.
2) Open the unit by unscrewing the vessel housing from the mounting manifold.
3) Remove the fluid still inside of the vessel by discarding it into a drain or back into the CLS dirty tank. **NEVER** discard the fluid into the clean tank.
4) Remove the spent filter cartridge and properly dispose of.
5) Ensure that all dirt is removed from the vessel threads and the threads on the vessel mount.
6) Visually inspect the O-ring seal for dirt or particles. If the seal is worn or damaged, replace with a new lid seal. It is recommended that spare O-ring seal kits are kept in stock at all times.
7) Place the new filter cartridge inside of the vessel housing.
8) Screw the vessel housing back onto the manifold and properly tighten.
9) Return the vessel to service by turning the high-pressure feed pump back on.
10) Using a rag, relieve any trapped air from the vessel by pushing the bleeder valve down until fluid starts to come out. Release the bleed valve once all the trapped air is purged.
11) Repeat steps for second filter cartridges.

Section 4: **System Maintenance**

4.8 Service Beacon Maintenance

Service Beacon light bulb replacement:

1) Shut down the filtration system (isolate electrical power) turning both the system control switch and the rotary disconnect to the off position.
2) Turn the service beacon housing counter-clockwise to gain access to light bulb.
3) Remove the light bulb by turning counter-clockwise and pulling up.
4) Insert the new light bulb and turn clockwise to lock into place.
5) Replace the service beacon housing by lining up the arrows and turning clockwise.
6) Restore power to the filtration system.

4.9 Ozone Generator Maintenance

Checking the dispersion stone is releasing ozone: Check the dispersion regularly to be sure ozonized air is being pushed into system tank. This is done by opening the lid above the cleaning tank and looking towards the bottom of the tank. The operator should notice bubbles exiting the stone and rising towards the surface. After prolonged use, the dispersion stone may require cleaning.

Cleaning the dispersion stone: The dispersion stone may clog up with mineral deposits after prolonged use. This will reduce the amount of ozone flow through the stone. The stone will start to appear a darker color as it begins to clog. To clean the dispersion stone, remove it from the clean tank. Soak it in lemon juice or vinegar for up to 24 hours until the discoloration is gone. The dispersion stone should return to a uniform color. Rinse the dispersion stone thoroughly with fresh water. Reinstall the dispersion stone back onto the ozone line within the clean tank.
Note: Sometimes the stain will be permanent; if ozone bubbles still flow from the dispersion stone, the stain will not affect operation.

4.10 Reservoir Maintenance

Check the systems reservoir on a daily scheduled maintenance. The reservoir tank will require cleaning at regular intervals to maintain proper operating conditions. Remove the lids check for any garnet build up in the dirty tank; visually check that the Ozone Stone is bubbling and that there is a positive water overflow from the clean tank to the dirty tank. Replace the lids on the reservoir.
Note: Do not add ANY chemicals, chlorine, oils, mop water, or any other liquids to any of the water components (i.e. worktable, Closed Loop System, Settling Weir, etc.). Doing so will greatly reduce filter life and may cause catastrophic system failure. Warranty will also be null and void if any of the previously stated fluids are detected in the system's components.

4.11 Settling Weir Maintenance

- The settling weir bag should be serviced when solids have built up to approximately two to three inches below the inlet and outlet 90° PVC pipes.

Settling Weir Bag change out procedure:

1) Disconnect plumbing to and from the settling weir.
2) Remove both 90° PVC inlet and outlet pipes.
3) Remove the metal bar running across the top of the settling weir frame by removing the set-screw on each side of the weir.
4) Remove the drain plug to discharge all of the water inside of the weir to drain out. It is recommended this is done by a drain or into a catch tank/bucket.
5) Using a forklift, guide all four straps onto the forklift forks. Once secured, lift the settling weir bag out.
6) Install the replacement settling weir bag. Replace both 90° PVC inlet and outlet pipes. The inlet 90° PVC pipe should be facing downwards, and the outlet 90° PVC pipe should be facing upwards.

Note: When installing a new settling weir bag, the side that has the black inlet lettering printed on it should be installed on the inlet side of the weir. Installing the bag backwards will affect performance.

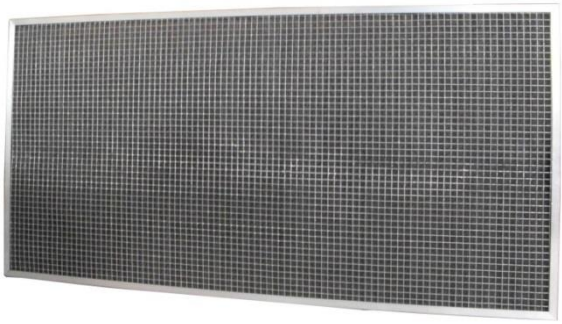
7) Reinstall metal bar across top of the weir frame followed by tightening the set-screws.
8) Reconnect the pluming to the inlet and outlet of the weir.

4.12 Chiller Maintenance

We supply our chiller units with air filters. It is imperative for the customer to establish a preventative maintenance program in order to keep the air filters clean.

- As a minimum, air filters should be visually checked once per week. Filter screens should also be removed from the chiller and cleaned at least once every three months.
- Effective rinsing of the filter screen can be accomplished with a normal garden hose connected to city water supply.
- The filter screen should be placed on a clean flat surface and sprayed from a distance of 60”.
- Check the filter screen thoroughly for any damage and replace if there any visible signs of ripped or torn media or broken frames.

Figure 4.4
Chiller Air Filter



Section 5: **System Troubleshooting Guide**

Warning:
Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

Caution:
Always follow correct lock out procedures when working on this Filtration System

5.1 System Troubleshooting

Low flow and low pressure gauge readings:

1) Check the water level in the dirty tank. The pump suction screen must be completely submerged.
2) Check that the suction screen inside the dirty tank is not plugged. The screen should be free of debris for best performance.
3) Check the electrical hookup for proper direction and power requirements. In most cases, the pump motor(s) should run clockwise looking down from the top.
4) Check the fuses in the step-down transformer. Replace as necessary.
5) Check the pump for any foreign objects.
6) Pressure gauges should read approx. 40 PSI at the inlet to the Bag Filter Vessel (vessel #1) if the reading is 10 – 15PSI less than this check pump for correct rotation (clockwise as viewed from the rear of the motor) by bumping the start/stop button on the electrical panel. All of the motors have been synchronized at the factory, if the pump motor is running in reverse have a qualified electrician swap over one of the in-coming power wires within the electrical panel.

Section 5: **Troubleshooting Guide**

Warning:
Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

Caution:
Always follow correct lock out procedures when working on this Filtration System

5.2 Ozone Troubleshooting

There are five areas to check to determine the location of any problem:

1) Ensure all cords between ozone generator and dispersion stone are kink free.
2) Ensure all cords are undamaged.
3) Ensure ozone generator is turned on.
4) Ensure electrical connection is functioning properly.
5) Ensure there is a presence of ozone bubbles inside of the clean tank.

5.3 System Pump Troubleshooting

Problem	Cause	Remedy
Failure to Pump	**Pump not properly primed**	**Make sure pump casing and suction line are full of water**
Reduced capacity and/or head	**Air pockets or leaks in suction line**	**Check suction piping**
	Clogged impeller	**Remove and clean**
Pump loses prime	**Air leaks in suction line**	**Check suction piping**
	Excessive suction lift and operating too near shut-off point	**Move pump nearer to water level**
	Water level drops while pumping, uncovering suction piping	**Check water supply and add length of pipe to suction to keep submerged end under water**
Mechanical troubles and noises	**Bent shaft and/or damaged bearing**	**Take motor to authorized motor repair shop**
	Suctions and/or discharge piping not properly supported and anchored	**See that all piping is supported to relieve strain on pump assembly**

Warning:
Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

Caution:
Always follow correct lock out procedures when working on this Filtration System

5.4 Feed Pump Troubleshooting

Problem	Cause	Remedy
Motor does not start/no motor noise	**At least two of the power supply leads have failed**	**Check fuses, terminals, and supply leads**
Motor does not start/humming noise	**One of the supply leads has failed**	**See above**
	Impellers faulty	**Replace impeller**
	Motor bearing faulty	**Replace bearing**
Pump does not pump	**Liquid level too low**	**Fill up liquid**
	Pump mechanism faulty	**Replace pump mechanism**
	Pipe blocked	**Clean pipe**
Insufficient flow and pressure	**Wrong direction of rotation of impeller**	**Switch two power supply leads**
	Pump mechanism silted up	**Clean pump mechanism**
	Worn pump mechanism	**Replace pump mechanism**
Power consumption is too high	**Lime or other deposits**	**See above**
	Mechanical friction.	**Repair pump**

WARNING:

Always disconnect power and relieve pressure from the system before performing any maintenance on this Filtration System

CAUTION:

Always follow correct lock out procedures when working on this Filtration System

5.5 Chiller Troubleshooting

***Selector switch is in the "ON" position and pump will not start:**
1) Open disconnect switch
2) Blown fuse
3) Tripped starter overloads

***Pump is rotating but no pressure is established:**
1) Improper rotation
2) No fluid in the reservoir
3) Valves not open
4) No back pressure
5) Pump suction blocked
6) Pump seal leaking

***Pump runs properly, temperature rises, but compressor does not start:**
1) Compressor is not being energized (refer to compressor symptoms).
2) Flow switch, if equipped, is not activated.

Fluid flow fault (if equipped):
1) *Pump not working (refer to pump symptoms).
2) System not completely filled.
3) Air in the system
4) Flow switch paddle stuck.

Temperature Controller is indicating a fault, or has no indication at all:
1) Faulty contacts on the relays
2) Sensor problem
3) Supply voltage missing

Thermostat (if equipped) will not call for cooling:
1) Out of calibration
2) Defective

Compressor hums, but will not start:
1) Low line voltage
2) Shorted or grounded motor windings
3) Internal compressor damage
4) Improperly wired

Compressor will not run, does not try to start (no hum):
1) Power circuit open due to blown fuse, tripped overload circuit, or open disconnect
2) Compressor motor protector open
3) Open thermostat or temperature control
4) Burned motor windings, open circuit
5) Loss of refrigerant charge

Compressor starts, but trips on overload protector:
1) Excessive suction or discharge pressure
2) Low line voltage
3) Defective overload protector
4) Tight bearings or mechanical damage in compressor
5) Shorted or grounded motor windings

Unit Short Cycles:
1) Shortage of refrigerant
2) Refrigerant liquid solenoid valve, if equipped, leakage
3) Discharge valve leaking
4) Defective expansion valve

High Refrigerant pressure fault:
1) Refrigerant overcharge
2) Dirty condenser
3) Malfunction of condenser fan (air-cooled)
4) Excessive air temperature entering condenser

Low Refrigerant pressure fault:
1) Low ambient temperatures (air-cooled)
2) Refrigerant leak
3) Lack of fluid flow through the heat exchanger
4) Liquid line solenoid valve not open, if equipped
5) Expansion Valve stuck, or lost bulbwell charge (check cap tube)

Chiller runs continuously, but fluid does not cool:
1) Filter(s) need to be serviced

Section 6: **Spare Parts Lists**

6.1 Replacement Spare Parts

QTY REQ.	DELIVERY TIME	COMPONENT DESCRIPTION	PART NUMBER
1	2-4 Weeks	Filter Pump	B82418
1	2-5 days	Filter pump mechanical seal repair kit	CLS-P-SK
2	2-4 Weeks	Feed Pump	TC40S340
4	2-5 days	Feed Pump Mechanical Seal Repair kit	ES-WJF-SK-TC01
3	2-5 days	Dirty Tank pre-filter bag (filter#5)	CLS-PFB-150
3	2-5 days	Bag Filter (Vessel #1)	CLS-1-G2PS-EA
3	2-5 days	Bag Vessel Seal Kit (#1)	CLS-0833-ORL-BC
3	2-5 days	Bag Filter Internal Stainless steel Basket #1	WJF-EAB-2E
1	2-5 days	Hurricane Filter Cartridge (vessel #2)	CLS-HR-930-Q.35
1	2-5 days	Hurricane Vessel Seal Kit (#2)	CLS-SK-2
1	2-5 days	D.I. Vessel Seal Kit (#3)	CLS-SK-3
5	2-5 days	Waterjet Resin exchange Coupon (#3)	CLS-WJR-ERC-1
2	2-5 days	High Pressure Pump Final Filter Cartridge (Vessel #4)	CLS-801-.035/ CLS-801-0.2
4	2-5 days	High Pressure Final Filter Vessel Seal Kit (#4)	CLS-801-ORL
1	2-5 days	Settling Wier Bag	WJF-SWB
1	2-5 days	Service Beacon light bulb	CLS-SL-130
3	2-5 days	0-60 PSI Pressure Gauge	WJF-GA-0-60
2	2-5 days	0-160 Pressure Gauge	WJf-GA-0-160

6.2 Recommended Spare Parts

REC. ON SITE	QTY REQ.	DELIVERY TIME	COMPONENT DESCRIPTION	PART NUMBER
3	1	2-5 days	System Pump Mechanical Seal Repair kit	ES-WF-SK-395008
3	1	2-5 days	Feed Pump Mechanical Seal Repair Kit	ES-WJF-SK-TC01
3	1	2-5 days	Bag Vessel Seal Kit (Rim Gasket) (#1)	CLS-0833-ORL-BC
3	1	2-5 days	Hurricane Vessel Seal Kit (#2)	CLS-SK-2
3	1	2-5 days	D.I. Vessel Seal Kit (#3)	CLS-SK-3
1	2	2-5 days	Service Beacon light bulb	CLS-SL-130
3	1	2-5 days	High Pressure Final Filter Vessel Seal Kit (#4)	CLS-801-ORL

6.3 Consumables

REC. ON SITE	QTY REQ.	DELIVERY TIME	COMPONENT DESCRIPTION	PART NUMBER
5	1	2-5 days	Dirty Tank pre-filter bag (filter#5)	CLS-PFB-150
25	1	2-5 days	Bag Filter (Vessel #1)	CLS-1-G2PS-EA
25	1	2-5 days	Hurricane Filter Cartridge (vessel #2)	CLS-HR-930-Q.35
25	2	2-5 days	High Pressure Pump Final Filter Cartridge (Vessel #4)	CLS-801-.035/ CLS-801-0.2
5	1	2-5 days	Settling Wier Bag	WJF-SWB
1	1	2-5 days	Hurricane Filter Cartridge Wax Stick	CLS-STW

Section 7: General Policy & Limited Warranty

It is Ebbco Inc.'s policy to ship and charge for replacement parts, upon notification of a problem. Warranty will be determined upon inspection of said part, after it is returned to Ebbco Inc., freight pre-paid. A returned goods claim form will be sent with replacement part, and must be returned with defective part. Ebbco Inc. shall not be liable for incidental, consequential losses, and damages under this expressed warranty, and any applicable implied warranty or claims for negligence.

All products manufactured and marketed by Ebbco Inc., are warranted to be free of defects in materials and workmanship, for a period up to one year from date of delivery, or 2080 hours of operation, whichever comes first.

Equipment such as Pumps, Pump Bodies, Filter-Vessels, etc. will carry one-year manufacturer warranty. Pump seals; ninety-day limited warranty. Do not run pump dry, or overheat pump by not servicing filter when required. Any overheated seals do not qualify as a warranty, as seals are subject to normal wear. It is recommended that you keep a spare vessel seal kit, and pump seal in stock at all times. This limited warranty does not cover any products, damages, or injuries resulting from misuse, neglect, normal expected wear, chemical-caused corrosion, improper installation, or operation contrary to Ebbco Inc.'s recommendations. This limited warranty also does not cover equipment which has been modified, tampered with, or altered without authorization.

No other extended liabilities are stated, or implied, and this warranty in no way covers incidental or consequential damages, injuries or cost resulting from any such defected products.

Failure to install Ebbco Inc. brand Filter Cartridges in any Ebbco Inc. Filtration System, housings, and/or units requiring Filter Cartridges for necessary operation, will cause Ebbco Inc.'s standard warranty to be null and void.

Warning:

Do not add any chemicals, chlorine, oils, mop water, or any other liquids to any of the Water-jet's components. This includes but is not limited to worktables, Closed Loop Filtration Systems, Settling Weir, etc. Doing so will greatly reduce filter life and may cause catastrophic system failure on top of voiding all warranties.

Note:

Ebbco Inc. branded Filter Cartridges, Filter Bags, and Resins must be used in order to obtain maximum performance. Performance cannot be guaranteed unless approved consumables are used.