

Sustainable Solutions



744 Gordon Baker Road Toronto ON | M2H 3B4

Tel: 416-490-7848 Fax: 416-490-0974

www.filterinnovations.com

Wastewater | Groundwater | Process Water | Air Treatment

5 GPM WATER TREATMENT SYSTEM

OPERATION AND MAINTENANCE MANUAL

PREPARED FOR: **Department of National Defence Project #10649**

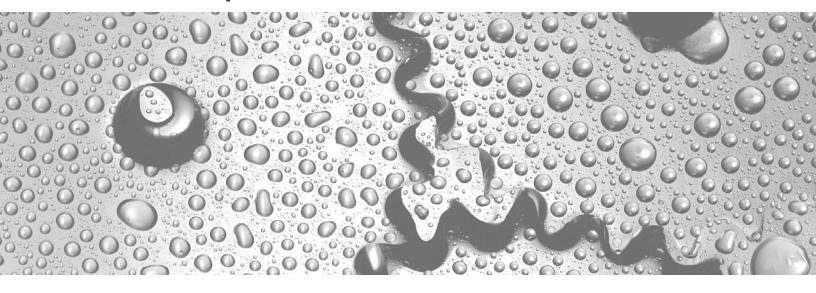
MANUAL NUMBER: M09-954 R.3

AUGUST 2009

5 GPM WATER TREATMENT SYSTEM

OPERATION AND MAINTENANCE MANUAL

PREPARED FOR: **Department of National Defence**



Filter Innovations Inc.

744 Gordon Baker Road

Toronto ON M2H 3B4

Phone: (416)-490-7848

Fax: (416)-490-0974

www.filterinnovations.com

MANUAL NUMBER: M09-954 R.3



INTRODUCTION





1.0 Introduction

An understanding of the information contained within this manual is vital to ensuring the proper functioning of your 5 GPM WATER TREATMENT SYSTEM. We strongly recommend that all operators read this manual carefully and become thoroughly acquainted with its contents. This manual includes a description of the system, start-up instructions, and operation/ maintenance instructions.

This system should be routinely checked for any signs of operational problems. Such problems could include, but are not necessarily limited to: improper water flow into the filter inlet, defective flow valves, defective air release valves as well as increase in pressure.

Any process parameter changes and/or repairs should be documented. This can be done simply and conveniently by recording details in an equipment operating logbook. Information typically recorded includes: results of inlet and outlet water analysis, results of routine pH and suspended solids monitoring of inlet and outlet of system, bag filter installation date and backflush date. This information is helpful for monitoring system operation and performance.

IMPORTANT NOTICES

This 5GPM Water Treatment System is designed with disposable FII filter products of the type and model specified in the operation instruction manual and drawings. Safe operation and performance is guaranteed with the specified FII filters. We will not guarantee the performance and function of this system with other makes, models or types of components. Any accidents or damages caused by using incorrect, non-specified filters or media are the full responsibility of the operator or user.

All required/ appropriate personal protection equipment should be worn when performing system maintenance and media change outs.

GENERAL INFORMATION





2.0 General Information

5 GPM WATER TREATMENT SYSTEM

This 5GPM Water Treatment System has been designed for the removal of particulates down to 1 micron (Nominal) in size, organics, as well as oil/ grease from the contaminated water stream.

This system consists of the following components:

- One (1) oil-water separator module (Model FII-OWS-2)
- One (1) bag filter
- One (1) drum filled with TM-100 media (modified organoclay media)
- Two (2) drums filled with Granular Activated Carbon (GAC)

Contaminated water enters the oil-water separator; separated oil is directed into a collection drum, while the separated [treated] water (oil concentration in treated water will have been reduced to 15 ppm or 25 micron oil droplets) is pumped into the next stages of the treatment system for further polishing.

From the oil-water separator the water stream is pumped through a bag filter housing which contains a 1-micron filter bag (model *PE1 P2P*). The filter bag can be filled with *spaghetti* (shredded meltblown media) for additional oil removal (optional). The purpose of the bag filters is removal of large particulate matter (particles greater than 1 micron in diameter).

Following particulate filtration, the water stream continues on through a (3) three-drum train. The train consists of one (1) TM-100 organoclay drum and two (2) granular activated carbon drums. The TM-100 (modified organoclay media) drum is used to remove the remaining oil and organic compounds which have a low solubility, high molecular weight from the contaminated water. The activated carbon drums are used to remove the smaller organic molecules and to polish the water stream prior to discharge.

SYSTEM DESCRIPTION (OVERVIEW)

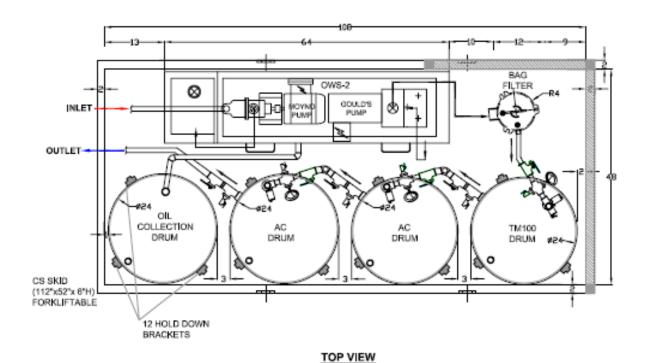




3.0 System Description (Overview)

This 5 GPM Water Treatment System consists of the following:

- Oil-water separator module to remove free floating product (down to 10-15 ppm)
- **Filtration module** consisting of a single (1) treatment train; includes a bag filter for particulate filtration followed by a series of media contactor vessels (TM-100, and Activated Carbon) for removal of organic contaminants from the water stream.
- Control Panel to allow for simple operation of the 5 GPM Water Treatment System



General Layout of 5 GPM Water Treatment System



3.1 Oil-water separator (OWS) module

Oil-water separator module consisting of:

- Inlet suction pump unit
- FII-OWS-2 oil-water separator
- Transfer pump unit
- Oil product collection tank



5 GPM Water Treatment System



Process Description

Contaminated water travels to the oil-water separator from the influent tank via an inlet suction pump (Model Moyno 344 Progressive cavity pump). As a result of the forces of gravity, coalescence and buoyancy, oil and water become separated from each other within the OWS. The OWS is fitted with an oleophilic media that draws in oil particles from the water and collects/consolidates them. Additional droplets continue to collect and coalesce (join) with the previous droplets and in doing so rise to the surface of the separator. At the water surface an adjustable pipe (product skimmer) collects oil and transfers it to the external oil-collection drum.

Using a centrifugal transfer pump (Goulds NPE Model), treated water is sent on to a bag filter for particulate filtration.

During the oil-water separation process, solids accumulate within the separator and settle, passing through the spacing of the media pack matrix. They are collected in a hopper-bottomed sludge chamber located below the coalescence media pack. Settled solids are stored in this location prior to discharge/ disposal through the sludge drain.

Inlet Suction Pump Unit Includes:

- Pump Control
- Moyno Model 344 progressive cavity pump
 - o 10 gpm at 90' TDH
 - o 1 HP 110V/1P motor (E-XP)
 - o Pressure gauge
 - Sample port
 - o Check Valve
 - PVC piping



Moyno Model 344
Progressive Cavity Pump

Oil/Water Separator Model (FII OWS-2)

Filter Innovations's series oil/water separator with its coalescence principle of operation offers the user a number of advantages

- Capable of removing oil droplets down to and below 20 micron
- Solids settling removal capabilities for wastewater flow with multiple contaminates
- Compact design conserves valuable floor space
- Low maintenance/operating costs



Inlet Flow
Damping

Oleophilic
Media

Outlet
holding
chamber

Schematic Oil/Water Separation Process

Operating Principles

The operation of the coalescence type separator is based on the use of relatively close tolerance surface areas which reduce the distance that an oil droplet must travel before it reaches a collection surface. The coalescence media is constructed of materials which are hydrophobic (water repelling) and oleophilic (oil attracting). When the oil droplets come in contact with the plate they reach a zone of zero velocity and adhere to its surface. These coalescence surfaces multiply the effectiveness of the natural separation that occurs between oil and water.



FII OWS-2 Internal

As the media becomes coated with continuously agglomerating oil, the oil begins to form droplets. These droplets then coalesce and migrate upward. The oil coating the media surface accumulates at the top edge of the media where it detaches as a droplet and floats to the



surface of the separation chamber. There are now two zones of liquid in the separator – **oil and water.**

The oil which has collected on the water surface flows into a collection chamber for subsequent removal into the oil-collection drum. Separated water flows beneath the oil and is pumped by the Goulds transfer pump from the oil-water separator on a continuous basis to the bag filters.

Coalescing Media

A coalescing media pack material, Model CFS-1200, Accu Pac of PVC construction is used in the system. Coalescence media can withstand flows with temperatures of up to 140 degrees F *continuously* and 160 degrees F *intermittently*. The media is enclosed in a framework for easy accessibility.

Transfer Pump module

Gould's NPE model 1ST Centrifugal transfer pump with 1 HP 120V/1Ph motor:

- Motor: EXPPump Control
- Performance: 10 GPM at 100' TDH
 - Pressure gauge
 - Sample port
 - Gate valve
 - Check valve
 - PVC piping



Gould's Centrifugal Transfer Pump



3.2 Filtration Module

The filtration module consists of one (1) treatment train containing a particulate bag filter and a series of media drums piped in series (TM-100 and Activated Carbon) to remove organic contaminants.

The Particulate (Bag) Filter Unit

The Particulate Filter is a pre-filter for removing any dirt and dust particles which would prematurely plug the absorbing media.

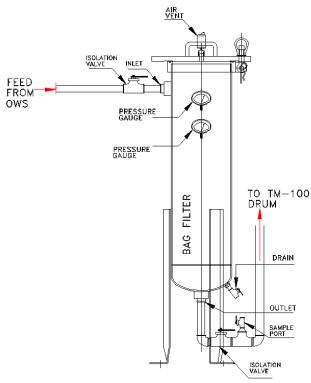
The bag filter system consists of a pressure vessel, a micron rated disposable filter bag and a restrainer basket (to support the filter bag).

The water from the OWS passes through a micron-rated filter media, leaving solids and trace amounts of oil products trapped within the bag, allowing disposal of filter bags.

The disposable filter bag has a micron rating of 1 micron. It can hold from 1-5 pounds of dry solids before becoming plugged. Rapid access to the filter bag ensures a quick and easy clean-up of the vessel, since filtered contaminants are trapped within the bag.

For particulate filtration 1 micron disposable filter bags are used in the system:





Model PE1 P2P (1 micron)

Polyester needle felt features a three dimensional structure of high porosity. This results in a much higher solids loading capacity over the equivalent area of mesh fabric. The outlet surfaces on all bags have been heat treated to give a glazed finish to help reduce fibre migration.



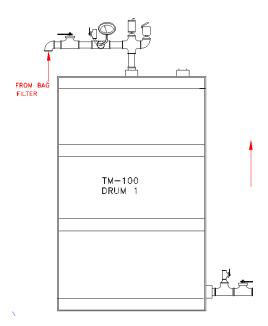
Adsorption Media Filtration Unit

The adsorption media filtration unit consists of TM-100 and Activated Carbon drums piped in series to remove organic contaminants.

TM-100 Modified Organophilic Clay is a mixture of 30% active sorbent and 70% anthracite filter media, which allows for maximum utilization by the large sorption capacity of TM-100 without excessive pressure build-up in the column.

Model FII55WAT-CSI-TM100 carbon steel water-phase pollution control barrel with internal PVC Distributors:

- Nominal capacity of 55 U.S. gallons (44 imperials gallons)
- 2" FNT top inlet/bottom outlet connections
- Dimensions: 24" diameter x 35" height
- Media weight: 300 lbs
- Total shipping weight: 360 lbs
 Maximum flow rate: 10 USgpm
 Recommended flow: 5 USgpm
 Maximum pressure: 10 psig
 Maximum temperature: 140F
- Drum interior has a 2 part epoxy coating
- Drum exterior coated with enamel paint
- Includes 50 lbs of Anthracite covering bottom lateral



One (1) TM-100 drum filled with modified organophilic clay meant for adsoption of trace amounts of oil and greases, and other high molecular weight low solubility organics from water.



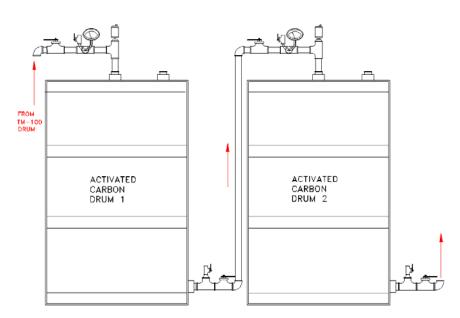
GC 12x40S – Granular Activated Carbon made from selected grades of coconut shell. It is ideal for liquid –phase4 applications including organics removal from water stream.

The **primary carbon adsorption drum** removes all low molecular weight organics. This unit will hold 165 lbs. of granular activated carbon and comes complete with an inlet and outlet header.

The **secondary carbon adsorption drum** polishes any contaminants, which may escape from the first carbon drum. During monitoring when the firs drum becomes saturated, the second drum is to be placed in the location of the first carbon drum location; a replacement drum can then be put in the polishing position.

Model FII55WAT-CSI-1240S carbon steel water-phase pollution control barrel with internal PVC Distributors:

- Nominal capacity of 55 U.S. gallons (44 imperial gallons)
- 2" FNPT top inlet/ bottom outlet connections
- Dimensions: 24" diameter x 35" height
- Carbon weight: 165 lbs.
- Total shipping weight: 225 lbs.
- Maximum flow rate: 10 USgpm
- Recommended flow: 5 USgpm
- Maximum pressure: 10 psig
- Maximum temperature: 140 °F
- Drum interior has a phenolic coating
- Drum exterior coated with enamel paint



Two (2) drums of activated carbon in series filled with model GC 12x40S coconut-phase carbon.

SYSTEM INSTALLATION AND MAINTENANCE





4.0 System Installation and Maintenance

10 GPM WATER TREATMENT SYSTEM

4.1 System Installation

Installation of the Oil/Water Separator

- 1. Attach piping to the inlet coupling
- 2. Attach piping to the [water] outlet coupling
- 3. Attach piping to the [oil] outlet coupling.
- 4. Fill the oil-water separator with clean water. Fill from the inlet end until some water spills over the weir into the outlet tank.
- 5. Adjust the product skimmer inside the unit so that the intake is about ½" above the water level. This will ensure that no water escapes down the pipe into the oil storage tank. Do not try to skim the product down to sheen.

To start up the pump

- 1. Ensure all valves are open.
- 2. Turn on the inlet Moyno pump to fill the OWS.

Note: Once tank is full Moyno pump should cease operation due to Hi level switch. Also, low level switch in process tank will crease operation of the Moyno pump.

- 3. Turn on outlet Goulds pump to start water treatment process. The presence of a low level switch in OWS the Goulds pump will cease operation.
- 4. Check the power draw on all legs.
- 5. Check the flow rate of water.
- 6. Regulate the flow rate of water with the upstream gate valve. This flow should not exceed the design capability (5GPM).
- 7. Check for water leakage around the pump and fittings.



Installation of Bag Filter

1. Remove the unit from the skid, being careful not to damage any of the system components.

Note: Be sure to correctly identify the inlet and outlet connections of the unit to avoid piping the unit backwards. The bag filter will not perform if the connections are reversed.

- 2. Proceed with the required piping by referring to the drawings.
- 3. Tighten all bolts evenly and securely. **Note**: Check to make sure that the bag filter has been installed in the filter vessel before tightening the end cover bolts.
- 4. Install all pressure gauges, air eliminators and pressure relief valves.
- 5. Ensure that the drain piping is led well away from the unit. The water drain lines can be connected to a common drain system.
- 6. After all connections have been made and all bolts have been tightened securely, the unit is ready for operation.

Installation of remaining system components

1. Remove the unit from the skid, being careful not to damage any of the system components.

Note: Be sure to correctly identify the inlet and outlet connections of the unit to avoid piping the unit backwards. The OWS will not perform if the connections are reversed.

- 2. Proceed with the required piping by referring to the drawings
- 3. Check all drains for plugs and valves.
- 4. Remove top lid and inspect all media, floats, and weir.
- 5. Open all main valves to bag filter, TM-100, and Carbon drums.
- 6. Turn on inlet and outlet pumps and check for leaks.
- 7. Turn system off to repair any leaks.
- 8. Turn system on and remove all air from bag filter and drums with vent and sample port valves.
- 9. Check the flow. If it is greater than 5 GPM, immediately adjust it with the control valve.
- 10. System should be less than 5 psig across drums.
- 11. Allow water to completely fill the system. This will purge any air trapped in the filters.
- 12. Check the flow and ensure that it is still less than 5 GPM.



744 Gordon Baker Road Toronto, Ontario M2H 3B4 Tel: (416) 490-7848 Fax: (416) 490-0974 www.filterinnovations.com

13. All water to flow approximately 5-10 minutes to ensure all trapped air, TM-fines and carbon fines are removed from the system.

Warning: If the flow is greater than 5 GPM, the quality of the treated water will be severely compromised due to reduced contact time between the water and the media. If excessive flow or pressure is allowed, damage to the drums or leakage will occur.

Warning: The unit should only be drained when changing filter elements or when it is no longer in service. The oil-absorbing media must remain immersed in water to eliminate air pockets that can compromise its oil-absorbing capabilities.

- 14. Observe the pressure gauges and record differential pressure readings for future reference.
- 15. Samples of incoming water may be taken from sampling drain valves and samples of discharge water after filtration may be taken from sample drains.
- 16. The system is now ready to treat your wastewater.

Monitoring System Pressure

The filter system requires minimal attention after the initial installation. However, regular attention should be paid to the pressure readings within the system.

4.2 System Maintenance

Oil-water separator

- Check the control panel for running status
- Check for leaks around the separator
- Check and record flow rates, vacuums, pressure, temperature, pH
- Check to ensure there is no excessive moisture inside the control panels or transducer wiring boxes
- Drain and clean the separator on a yearly or bi-annual basis as required.
- Remove the coalescing media and clean or replace if required.
- Check the tank anode (if present) and replace if necessary.
- Check height of oil skimmer and re-adjust if necessary.

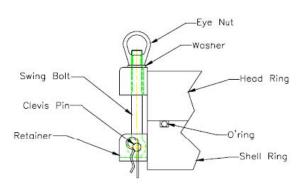


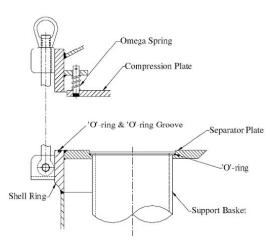
Changing filter bags

Filter bags should be replaced when the operator notices an increase in the recorded pressure. To check the pressure of the bag filter housing please refer to the two pressure gauges that

have been installed on the side of the vessel. If the differential pressure reaches/ exceeds 15psi then the bag filter should be changed. Please follow the instructions below.

- Check pressure gauges to confirm that either the filter bag is plugged or the replacement is mandated by daily changeout requirements.
- Shut the 5GPM Water Treatment System off.
- Close the bag filter isolation valves (2), to ensure wastewater will not continue to flow into the bag filter.
- 4. Open the bag filter sample port valve, at the base of the bag filter housing to relieve any internal pressure. Open top vent valve to allow product to drain from the filter bag housing. Contaminated wastewater may be in the housing and should be piped or collected accordingly.





Note: Ensure that hands and face are protected and clear of filter vessel while venting.

Caution: Do not at any time remove or loosen closure bolts before draining. Failure to open drain vent can result in pressurized fluid being trapped in the vessel. Fluid may spray out when bolts are loosened causing personal injury or damage to equipment.

- 5. Relief all pressures prior to loosening cover nuts.
- 6. Once the cover has been removed, remove filter hold down bracket.
- 7. Remove the filter bag by grasping the loop and lifting the bag upwards. Once removed, the filter bag can be discarded.





- 8. Remove the support basket from the vessel. Clean support basket and inspect for damage
- Clean and inspect filter interior and all components. Also clean and inspect O-Ring and O-Ring groove
- 10. Re-install the support basket to the opening, ensuring that it is seated firmly on the separator plate.
- 11. Install a new filter bag to replace the used one (ensure bottom of filter bag fits tightly on top of bottom of restrainer basket).
- 12. Ensure that the filter bag is spread out in such a way that when the hold down bracket is set on top of the bag, the bag will be firmly in place.
- 13. Close cover carefully. Do not drop. Tighten bar knobs evenly and securely.
- 14. Close the drain valve on the bag filter housing.
- 15. Re-open valves slowly.
- 16. The unit is ready to operate. Restart the system. Upon restart, ensure that the flow is less than 5 GPM. If the flow is greater than 5 GPM, adjust the flow control valve.
- 17. In the logbook, record the time, date and number of gallons processed for the bag filter change.

Changing TM-100 (oil absorbing) media drums

The TM-100 (oil absorbing) media is contained epoxy-coated steel in removable drums that are both chemical- and abrasion-resistant. The TM media absorbs oil and grease through a partitioning phenomenon. The unique characteristics of the media result in a slight swelling of the bed as it removes the hydrocarbon from the contaminated liquid. At the maximum pressure allowance of **8 PSI**, pumping action through the system will be stopped due to saturation of the media. The flow of unfiltered liquid through and out of the system will be automatically prohibited until the TM Media is replaced.

- Check pressure gauge to confirm that the TM-100 (oil-absorbing) drum is plugged and requires a change-out
- 2. Shut down the 5GPM Water Treatment System.
- 3. Close the isolation valve prior to inlet connection on TM-100 drum.
- 4. Open the drain valves to relieve internal pressure, along with sample port valve and remove any water which may remain in the drum. Wait 10 minutes to allow all drainwater to escape.
- 5. Undo the inlet and the outlet of the drum, if required.





Note: The saturated weight of the drums and media is approximately 500 pounds. The drums must be handled with proper equipment when removing them from the skid.

- 6. Remove spent TM-100 drum.
- 7. Replace with a new TM-100 drum. Replace and retighten the inlet and outlet connections of the TM-100 drum.
- 8. Close drain valve and open isolation valve.
- 9. Unit is ready to operate. Restart the system. On restart, ensure that the flow is less than 10 GPM. If the flow is greater than 5GPM, adjust the flow control valve, if required
- 10. Record in the logbook the time, date and gallons processed for the TM-100 change

Changing Activated Carbon Drums

Both carbon absorption drums contain GC 12x40, a virgin activated carbon that is granular in form. Made from the finest grades of bituminous coal, it is ideal for many liquid phase applications including the removal of organics from water stream and the purification of potable water

The *Primary* carbon absorption drum removes all low molecular weight organics. This unit can hold 165 pounds of granular, activated carbon. The *Secondary* carbon absorption drum polishes any contaminants that may flow from the primary carbon drum. When the primary drum becomes saturated, it should be replaced with secondary drum. A new drum should be placed in the secondary position.

- 1. Check water samples from sample port valves. If water quality is the same, then the carbon drum is saturated and must be replaced.
- 2. Shut off the 5GPM Water Treatment System.
- 3. Close the isolation valve prior to inlet and outlet connections on drum.
- 4. Open the drain valves to relieve internal pressure, along with sample port valve and remove any water which may remain in the drum. Wait 10 minutes to allow all drainwater to escape.
- 5. Undo the inlet and outlet of the drum, if required.
- 6. Remove the drum.
- 7. Replace and retighten the inlet and outlet of the drum
- 8. Close drain valves and open isolation valve.
- 9. Unit is ready to operate. Restart the system. On restart, ensure that the flow is less than 5GPM. If flow is greater than 5GPM, adjust flow control valve.
- 10. Record in the log book the time, date and gallons processed for the activated carbon change.

10649 OWS Canadian Forces

STARTUP PROCEDURE

- If the system is being started for the first time then work your way through the commissioning checklist in the installation guide or system manual before starting the system.
- Walk through process piping and check the position of all process valves.
- Check that there are no obstructions over any moving parts, (for example a jacket laying on a belt drive).
- Turn the main disconnect is on.
- If an alarm occurred on startup, then review the alarm descriptions and troubleshooting guide in the installation guide or manual for guidance on how to troubleshoot the problem. Fix the alarm condition and restart the system with the above procedure.

	106	49 - C	OWS C	anadia	ın Foi	rces		
Engineer: Joshua Ha	ale	Control:	RELAY			Tester #1:	Steven Po	oole
g					l		Matthew S	
Mechanical Team:	Electrical T	eam:	Panel Team:		ı			
						Start Date:	7/14	/2009
						Otari Date.	1/17	72003
						End Date:	7/14	/2009
					ı			
SECTION A - PRE-TE	ST FLOW F	RATES AND	D POWER DE	TAILS			√/NA	INITIALS
Receive Mechanical S	-	-	-	Record Syste	em Flow Ra	ates	V	
Check That Walk Thro	ough Issues	Have Beer	n Resolved				V	
P-VLS				B-STRIP				
B-SVE				P-STRIP				
P-OWS		GPM @ 90	ערדים	C-SPRG				
OTHER:		<u>GPM @ 90</u> GPM @ 90		OTHER:				
OTTLK.	<u>10</u>	Grivi @ 90	וטוו	OTTILK.				
Record System Certifi	cations	Panel	Approvals	System A	pprovals	Ī		
Building #1			. 698A	N/				
Building #2			L 508	N/			V	
Notify Electrical Office	of pending	CSA or ES	SA certification	าร			N/A	
Review Electrical Che	cklists and I	Record Site	Power Requi	irements				
	Voltage:		Vac	1-Phase	, 2-Wire			•
	Amperage:	20 / 15	Amps					
Notes								
Notes:								
SECTION B - WALK	AROUND						√/NA	INITIALS
							171471	
Lay Down Electrical S	afety Mat a	nd Set Up 1	Testing Cart				V	
Check That Test Powe	er Is Connec	cted	_				V	
Ensure That Testing T			That Hoses Ar	re Secure				
Ensure That Carbon V		• •					N/A	
Verify That Exhaust M					•	Air)	N/A	
Make Sure That Build	ing Fan and	Louvre Sh	ipping Braces	Have Been	Removed		N/A	
SECTION C. WALKS	TUDOUGU						a / NIA	INITIAL
SECTION C - WALK	IHROUGH						√/NA	INITIALS
Inspect Valves and Pr	ncass Linas						V	
Check Transmitter / M			w Lying Snots	: Where Mois	ture can Co	allect	N/A	
Check That Floor Ven				WITCH WOR	itaro dari Ot	Siloot	N/A	
Record Process Equip							1071	
Record Motor Namep							V	
Notify Project Manage			of Any Outsta	inding Issues	;		N/A	
			•	·				
* This includes motors	s, blowers, c	ompressors	s, oxygen/ozoi	ne generator	s, pumps, e	etc.		

SECTION D - PANEL OFF INSPI	ECTION				√/NA	INITIALS
Check for Dielectric Test Label					N/A	
Check for Auto Re-Start Label, Ch		und, L1, L2, I	_3 and High	Leg Labels	V	
Verify "Star" Ground Connections	√ ./					
Check for IS Wiring Warning Stick Ensure Neutral Wire is Connected	N/A					
Inspect 24Vdc and 120Vac Relay	IV/A √					
Check That Spare IS Input Wires	N/A					
Cross Check Fuses, Circuit Break	√ V					
Determine Service Factor Amps a	V					
	_					
SECTION E - PANEL ON INSPE	CTION				√/NA	INITIALS
Record Test Supply Voltages	L1/L2	L2/L3	L3/L1	1		
literal rest Capp., remages	,			Vac		
	L1/N	L2/N	L3/N			
	115			Vac		
_					ļ -	+
Record 24Vdc Supply Voltage		Vdc			N/A	
Test GFI and non GFI Outlets Check "Push To Test" Panel Indic	-1				N/A N/A	
Check Push to test Panel Indic	alors				N/A	
SECTION F - INITIAL SYSTEM S	ETUP AND	TESTING			√/NA	INITIALS
Check E-mail Configuration Throu		Card on PLC			N/A	
Record H0-ECOM100 Firmware F		v.			N/A	
Record Cell Modem Firmware Re		v.			N/A	
Update PLC Firmware and Record		V.			N/A	
Initialize Scratch Pad of Automatic Upload PLC Program	on Direct PL	Cs			N/A N/A	
Set PLC Clock and Calendar					N/A	
Check Functionality of All Discrete	e Inputs				$\frac{1}{}$	
Check Functionality of All Discrete						
Check Functionality of All Analog	Inputs and	Dutputs			N/A	
					N/A	
Switch System Outputs to AUTO I	vioue				IN/A	
Switch System Outputs to AUTO I					IN/A	
Switch System Outputs to AUTO I Set and Record All Setpoints:		vice	Value	Units		
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1		vice	Value	Units	N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2		vice	Value	Units	N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3		vice	Value	Units	N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3 SP4		vice	Value	Units	N/A N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3		vice	Value	Units	N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3 SP4 SP5 SP6 SP7		vice	Value	Units	N/A N/A N/A N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3 SP4 SP5 SP6 SP7 SP8		vice	Value	Units	N/A N/A N/A N/A N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3 SP4 SP5 SP6 SP7 SP8 SP9		vice	Value	Units	N/A N/A N/A N/A N/A N/A N/A N/A	
Switch System Outputs to AUTO I Set and Record All Setpoints: SP1 SP2 SP3 SP4 SP5 SP6 SP7 SP8		vice	Value	Units	N/A N/A N/A N/A N/A N/A N/A	

SECTION G - OPERATOR INTER	FACE (PANEL DOOR /	TOUCHSCREEN)		√/NA	INITIALS
	•	,			
Type of Operator Interface:		ct One-		NI/A	
Update Display Screen Firmware, Upload Panel Program	Record Revision V.		<u> </u>	N/A N/A	
Test Panel Menu Hierarchy				N/A	
Check PLC to Panel Communicat	ion Pomovo Ground III	mnor if Nococcany		N/A	-
Verify Value, Scale, Significant Di				N/A	
Check Functionality of All Discrete		N/A			
Check Functionality of All Discrete				N/A	
Test All User-Adjustable Setpoints	_	N/A			
Verify Correct Hourmeter Values,		(ent		N/A	
verify derived recumerer values,	Endure i reper rime io i	Юрг	<u> </u>	14//	1
SECTION H - VFD / SOFT START	DEVICES			√/NA	INITIALS
Drive Type and Application:	N/A	N/A			
Set Local / Remote Mode				N/A	
Verify Integrity of RS-485 Commu	nications			N/A	
Verify Drive Parameter Settings				N/A	
Test Frequency Control				N/A	
Check VFD Noise on Analog Sign	als / Adjust Carrier Freq	uency Accordingly		N/A	
Save VFD Set-up Variables From	PowerSuite / Record VF	D Settings		N/A	
BAUD: N/A PARITY:	N/A STOP BITS:	N/A CARRIER:	N/A		
SECTION I - ANALOG SIGNALS					INITIALS
PLC Card Slot #1: N/A - Not I					
PLC Card Slot #2: N/A - Not I					
PLC Card Slot #3: N/A - Not I					
PLC Card Slot #4: N/A - Not I	nstalled				
Check mA Signals at Different Op	erating Points for Device	Hystorisis and Calibratio	n	N/A	
Check Conversion Math and Squa			'' 	N/A	
Check Conversion Math and Squa	are Root i diletions iii i L	o Logic		IV/A	
SECTION J - SYSTEM OPERATION	NC			√/NA	INITIALS
Check Building Fan(s) Operation				N/A	i
Check Building Heater(s) Operation	nn.		<u> </u>	N/A	
Test All Kill Buttons	лі			N/A	
Bump Motors and Check For Exce	ssive or Ahnormal Curre	ant Draw	<u> </u>	1 V /A	
Ensure that LSL Switches are Abo		Sit Braw	<u> </u>	V	
Set and Test Pressure and Vacuu		na to P&ID	<u> </u>	N/A	
Thoroughly Test Control Logic	in itolior valvoo itooorai	ing to rail	<u> </u>		
Check Functionality of Oxidizer In	terlocks			N/A	
Run System In Full Automatic	ionioono			√ √	
Simulate All Alarms, Check That N		lot Shut Down System			
	Non-Critical Alarms Do N		ı		1
Check Magnehelic Gauges for Ac		iot Chat Down Cyclom		N/A	
Check Magnehelic Gauges for Ac Verify Air Flows Using Hot Wire A	curacy	ot ondt bown byotom		N/A N/A	
Verify Air Flows Using Hot Wire A	curacy nemometer	·			
Verify Air Flows Using Hot Wire A Verify Logic and Flow For All Sole	curacy nemometer noid Valves, Including A	·		N/A	
Verify Air Flows Using Hot Wire A	curacy nemometer noid Valves, Including A nd Monitor Ventilation	uto-Oilers		N/A N/A	
Verify Air Flows Using Hot Wire A Verify Logic and Flow For All Sole Run System With Doors Closed a	curacy nemometer noid Valves, Including A nd Monitor Ventilation of Whole System (Includi	uto-Oilers		N/A N/A N/A	

CECTION IV. DI C FINAL CHECV	.// NIA	INITIAL
SECTION K - PLC FINAL CHECK	√/NA	INITIALS
Check Hour Meter Variable Memory Locations and Minute Counters	N/A	
Force Datalogging	N/A	
Update PLC Program Revision(and Operator Interface if Applicable)	N/A	
Final Program Revision #: v. 1.0	IN/A	
Tillai Fiogram Revision # . v. 1.0		
SECTION L - TELEMETRY	√/NA	INITIALS
	1,710,71	
Select Communication Type:		
Confirm Remote Access, Record Method	N/A	
Check Modem Auto-Reboot Feature	N/A	
Test System Operation Using Offsite Package	N/A	
Configure Autodialer (Set Sensaphone Passwords to "2000" and "s2000")	N/A	
Test Autodialer Alarm Dial-out and Report	N/A	
Send IT Dept. an email to setup Eserver User: Password:	N/A	
Send IT Dept. an email to setup EAlarm email address	N/A	
Send Emonitor Operator email for setup	N/A	
Ensure 1K ohm End of Line Resistors are Used for ea. Input on Mission Autodialers	N/A	
SECTION M - FINAL	√/NA	INITIALS
	ft. N/A	
Record Motor Voltages, Currents and Operating Conditions	V	
Adjust Oil Water Separator Skimmer Tube	V	
Add Flow Charts and Directional Stickers, Oxygen / Ozone Generator Labels	V	
Pump Water Out Of System	V	
Turn Off All Breakers and HOA Switches	V	
Take System Pictures	V	
Return Mechanical Shop Aid To Project Manager	<u>√</u>	
Update Project Software Folder	N/A	
Email Project Manager and Production Staff	V	
SECTION N - ELECTRICAL AS-BUILTS	√/NA	INITIALS
SECTION IN - ELECTRICAL AS-BOILTS	V/ NA	INTIALS
Update System Approval Data Plates, Fuse Schedule and Startup Procedure	V	
Attach System Approval Stickers, Fuse Schedule and Startup Procedure	$\sqrt{}$	
Take Panel Pictures and Transfer All Pictures to Project Folder	- ·	
Check Off "Testing" as Being Complete in APES	V	
Update Electrical CAD Drawings and Electrical Bill of Materials	V	
Update Input, Output, Setpoint and Alarm Database, add EOS Tags to I/O Tables	V	
Print DWG, PDF and Bill of Materials Files	V	
Add Panel Revision Sheet and Test Notes to Electrical Quality Binder		
	<u></u>	_
Copy PDFs to Project "Manuals Directory"		
Copy Completed Test Sheets to Electrical As-Builts Directory with DWG Files and B	ill of Materials	
Give Receptionist Hard Copies Of Test Documents and Electrical CAD Drawings		
Give Project Manager Copy of Test Documents		
Check Off "As-Builts" Box in APES		

		M	ECHANICAL .	TEST RECO	RD			
Device Name	: P-5501			Ma	anufacturer:	Moyno IN	C	
Device Model #	: <mark>34401391</mark>	3440100		Device Serial #: 11/08				
Motor Manufacturer	Baldor							
Motor Model #	: BY418073	3		Мо	tor Serial #:	F0811034	082	
HP	: 1.00	Voltage:		Frame:	143T	RPM:	1725	
Phase	: 1	Current:	12.80	SF:	1.00	ENCL.:	EXPF	
Factory Test	: Running				Field Test:			
L1 L2	L3			L1	L2	L3		
8.2		Amps					Amps	
L1/L2 L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
110		Vac					Vac	
Device Name					anufacturer:			
Device Model #		EOD4		Devi	ce Serial #:	E0912057		
Motor Manufacturer								
Motor Model #					tor Serial #:			
	1.00	Voltage:		Frame:		RPM:		
Phase		Current:	11.40	SF:	1.00	ENCL.:		
Factory Test					Field Test:	1.0		
L1 L2	L3	0		L1	L2	L3	Δ	
10.3	1.0/1.4	Amps		1.4/1.0	1.0/1.0	1.0/1.4	Amps	
L1/L2 L2/L3	L3/L1	\		L1/L2	L2/L3	L3/L1	N/	
107		Vac					Vac	
Device Name				Ms	anufacturer:			
Device Model #					ce Serial #:			
Motor Manufacturer				Devi	ce dellai #.			
Motor Model #				Mo	tor Serial #:			
HP		Voltage:		Frame:	tor Ochai #.	RPM:		
Phase		Current:		SF:		ENCL.:		
Factory Test		Carrona		0	Field Test:	21102		
L1 L2	L3			L1	L2	L3		
		Amps					Amps	
L1/L2 L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
		Vac					Vac	
Device Name	:			Ma	anufacturer:			
Device Model #	:				ce Serial #:			
Motor Manufacturer	:							
Motor Model #	:			Мо	tor Serial #:			
HP	:	Voltage:		Frame:		RPM:		
Phase	:	Current:		SF:		ENCL.:		
Factory Test					Field Test:			
L1 L2	L3			L1	L2	L3		
		Amps					Amps	
L1/L2 L2/L3	L3/L1			L1/L2	L2/L3	L3/L1		
		Vac					Vac	

COMMISSIONING CHECKLIST

The following document is a guide to follow when filling out the system field test records included in your manual. The following things should be completed before turning on the power.

IF THE UNIT IS IN A BUILDING:

Level the building. Check the door openings to see if additional leveling is necessary. If a building sump switch is present ensure that the building is positioned so the spill will collect in the end with the building sump switch. If an Oil Water Separator is included with your system it is particularly critical that the building is close to level to ensure that the oil skimmer will work properly.

FOR ALL UNITS:

 Tighten all terminals where wires are terminated. These terminal strips and wiring terminals are tightened before shipping but may loosen during shipping.

Steps 2, 3, and 4 may be omitted if no field wiring is necessary

- 2. Remove IS Barriers from bases if present.
- Check to ensure that both the Hazardous and Non Hazardous sides of the IS Barriers are properly grounded directly back to the main ground or to a grounding stake as per the codes of the local authorities.
- 4. If you have a PLC, check to ensure the PLC is in "run". This can be detected with the run light on the PLC. Locate the position of the run light. It should be green. If no light is present, use the toggle switch on the top of the PLC to switch the unit from "term" to "run" then back to "term".

Step 5 is only required if you have Intrinsically Safe barriers protecting your inputs for operation in hazardous areas.

5. Test each input going in to the Hazardous side of the IS barrier for proper operation. Check to ensure that the correct inputs are wired into the correct IS Barrier Locations. This can be done by using an electrical meter and checking for continuity to ground. Have one person hold the meter while another person lifts and drops the switch. Ensure that the switches are field wired as normally closed or normally open as required on the electrical drawings.

- Check the alignment of all motors. They have all been factory aligned but may come out of alignment during shipping or installation.
- 7. Manually rotate motors to ensure they are not seized before starting up.
- 8. Disconnect all fuses in fuse holders.
- Check the voltage on each phase of power to ground for even voltage distribution and voltage distribution between phases of the incoming power.
- 10. Check to ensure there is only one source of neutral. If we have a 120V control transformer in our panel then we ground the neutral and no neutral should be brought into the panel.
- 11. Check to ensure the panel is properly grounded and there is only one main source of ground.

Ensure all necessary electrical approvals are in place before proceeding. Energize the main disconnect to the system allowing the power to flow to the main fuses.

The following list can be completed once the power is on to the system and should be done after all the items listed above have been completed.

- 1. Check the power on the hot side of the main fuses.
- 2. Install fuses to the AC transformers if present and check the power on the primary and secondary sides of the AC transformers.
- 3. Install fuses to the DC transformers if present and check the power to the primary and secondary sides of the DC transformers.
- 4. Close the remaining fuse holders and check for power on the bottom of each fuse holder to ensure that no fuses are blown. If a fuse is blown, there may be a short somewhere. Check for resistance between the bottom of that fuse holder and the ground. If there is a short then there will be little resistance. Ie 0-1 Ohms. If a short is detected follow the line out of the bottom of the fuse holder and continue to check for lack of resistance until you locate the short.
- 5. If there is power to the bottom of all the fuses, you can start testing the inputs. Check for voltage to the Non Hazardous Side of the IS barriers. There should be either 24V or 5V here depending on which type of PLC you are using or if you are using relay logic. If you have any other voltage, the IS barriers should not be installed because they could become damaged by higher voltages. Find the source of stray voltage and fix the problem. When allowable voltages are detected on the Non Hazardous side of the IS barriers, you can install the barriers.
- 6. Test the inputs a second time. This time check to ensure that the correct input light on the PLC is turned on or the correct relay (for

- relay logic systems) is activated when the input is closed. If the wrong lights or relays are being activated, check the input wiring diagram to ensure that the correct input is going to the correct IS barrier terminal on the hazardous side.
- 7. Test all shutdown alarms to ensure they are operating properly.
- 8. Install the fuses for motors and bump the motors to check for proper direction of rotation. Most three phase motors can have the direction of rotation switched by changing two wires. This is indicated on the wiring diagram on the motor or in the termination box for the motor. If a single-phase motor is rotating the wrong way, check the wiring in the motor termination box to ensure that it is wired correctly.
- 9. Progressive Cavity pumps (Moyno or Liberty Pumps) should not run in reverse. If these pumps run in reverse the shaft will unscrew requiring the pump to be disassembled and reassembled. All process systems that are shipped as a complete unit with a prewired panel are tested in our facility and set up so that each motor runs in the correct direction. When the power is connected on site, all the pumps could run in the wrong direction if the three phases of power are connected differently. Always test a motor that will not be damaged by rotating backwards and then switch two phases of the main power coming into the system. This will ensure that all other motors are operating in the correct direction.
- 10. Always refer to specified documentation for each motor and pump to ensure that they are tested for rotation properly. Some motors cannot be run dry and some pumps and compressors cannot be run in reverse in which case the rotation check should be done with the motor disconnected from the device.
- 11. Remove motor fuses and test the operation of the logic without the motors actually running. You can jumper inputs with jumper wires.
- 12. Plug in Fuses for motors and check for valves in the system to ensure that all required valves are open and ready to process water. Check to ensure that no pumps will be deadheaded or starved of water.
- 13. Prime equipment with clean water.
- 14. Start the system.

System Field Test Checklist

This purpose of this report is to test the functionality of electrical, control, and mechanical components to ensure the system operates as originally designed. This testing is then documented so it can be referenced at a later date if needed.

The following field test records must be completed by the startup technician on site before operating the process system. This is the last quality check ensuring the process equipment is ready for continuous operation.

FII highly recommends that the system is started by a FII factory trained startup technician to ensure the long term success of your project. We understand that this may not always be feasible in which case we would require a highly skilled technician capable of troubleshooting both mechanical and electrical aspects of a process treatment system and be familiar with our manual, equipment and capable of training the operator on operating and maintenance requirements of the treatment system.

This checklist must be sent back to Product Support department at FII to validate your equipment warranty, which begins on the date of shipment from the factory. It can be sent back in one of the following methods:

Email: inquiries@filterinnovations.com

Straight Edge for Aligning couplings and belts

Fax:

Att: Product Support

(416) 490-0974

If you choose to fax the document then, please follow up with an email explaining that a fax was sent so we can ensure that we received the fax and properly validate the equipment warranty.

Project number:Project name:	
Tested By:	
Company:	
Date Tested:	
Minimum Tools Required:	
Clamp style amp meter	Socket Set
Multi meter for AC/DC Volts and ma signals	Wire Cutters
Instrumentation Screw Driver	Wire Strippers
Screw Driver Set	Channel Locks
Wrench Set	Pipe Wrenches

		Initial	Date
Verify site power per system design criteria			
Verify building process flow and instrumentation			
matches P +ID drawing, check off drawing			
components against actual (preferably with the			
customer present)			
Ensure all unions are tight, as some are loosened to			
prevent stress in shipping.			
Site voltage measured:			
L1/L2L2/L3L3/L1			
L1/GRD L2/GRD L3/GRD			
Check field wiring and piping as per drawings			
Check panel for lose wiring			
Tighten all terminals where wires are terminated			
Check alignment of motors			
Check all motor belt tensions	· · · · · · · · · · · · · · · · · · ·		
Check to ensure all piping unions are tight			
Check voltage on AC step down transformer			
Check voltage on DC transformer			
Check I.S. barrier is grounded as per input drawing			
3.6			
Check voltage + amperage + name plate info against			
FII mechanical test record on all motors			
Manually test inputs as per input table			
Manually test control logic for each output			
Manually test all shut down alarms			
Manually test that non-critical alarms do not shut			
down SVE			,
Run through complete logic and alarm sequence			
with customer and make allowable changes.			
Note name of individual and company with whom			
logic was reviewed:			
Test that incoming power has correct phase			
sequence. Bump a safe 3 phase motor to test			
rotation.			
Check rotation of all motors that were field wired.			
Check that PLC Run light is on and the			
stop/term/run switch is in term			
Check connections of all field wiring to ensure it			
was completed per the electrical drawings and per			
the NEC.			

System Field Test Record

Testing Checklist	Ck	Initial	Date
Fill out mechanical test record on each motor and			
check amperage and voltage. Document amperage			
on the System test records in the operating manual			
in the Field test load section.			
Check overload settings for all motors			
Test analogue inputs			
Check/Install filter bag in bag filters			
Install louver hoods on system			
Wet test all control inputs and outputs			
Wet test all shut down alarms			
Check systems for leaks (liquid and vapor)			
Test operation of building exhaust fan			
Test operation of building heater			
Test position of ball float switches for proper			
start/stop level			
Test vacuum and pressure relief valve			
Test air stripper and discharge pump operating			
sequence			
Check flow rate on all pulse meters such that digital			
and analogue reading increment at the same rate			
Test phone line and record phone number			
Site Number:	ļ		
Test remote access			
Test operation of Auto dialer and program if			
necessary.			
Run system in full automatic			
Check flow rate discharging from VLS, should			
maximize flow to prevent a high level shutdown. If			
you have a centrifugal pump ensure flow rate is low			
enough to prevent cavitation on the inlet under			
vacuum.			
Check the skimmer on the oil water separator,			
should be ½" above water level when water is			
flowing at full speed. Adjust if necessary.			
Check water flow rate into stripper, should be set to			

minimum flow to keep up with incoming water to maximize contact time in the air stripper. Adjust flow rate if necessary.		
Check flow rate exiting the air stripper, if there is no carbon filters down stream then allow pump to discharge at maximum flow rate. If carbon vessels		
are installed, then set pump flow rate to the		

.

Customer Training Record

Customer Training Checklist		
Review the operating manual with the customer		
explaining the various components of the manual		
and sources of information.		
Review content of the system CD.		
Review the startup and shutdown procedure with		
operator.		
Review operation of treatment system and describe		
the maintenance required for each piece of		
equipment.		
Describe operation of panel and panel components.		
Train customer to troubleshoot alarms based on		
input conditions to the PLC or relays in the panel.		
Discuss the operating logic with the customer so		
they understand how the system is configured to		
work.		

Operating Data and Records

The following table is a guideline to document the operating conditions of the system when running in automatic mode. The startup technician should document the operating conditions at all the locations in the system. This information can be used at a later date to troubleshoot problems that can arise.

Location of Record Description	Recorded Value
Air Vacuum readings:	
Air Pressure Readings	
Water Pressure Readings	
water Tressure readings	
Water Flow Rates	
Air Flow Rates	
O T	
Operating Temperatures:	

Site Contractor Information: It is important that we capture the site contractor's information who was involved in the mechanical and electrical installation of equipment on site. We may be required to contact these companies during the project life to provide services at a later date.

Electrical Contracto	or: Mecl	Mechanical Contractor:	
Company Name:	Сотра	ny Name:	
Contact:	Contac	et:	
Phone Number:	Phone	Number:	
to list any problems, deficier	ncies or quality issues th	tup: The intension in this section is nat were identified during startup. If ate. If FII is required to follow up	
Issue 1. Identified:			
Check box that applies: Fl Issue 2. Identified:	• •	Sorted out on Startup	
Check box that applies: Fl Issue 3. Identified:		Sorted out on Startup	
Check box that applies: Fill Issue 4. Identified:	II Follow up Required	Sorted out on Startup	
Check box that applies: F	II Follow up Required	Sorted out on Startup	
(Please use back of sheet if r	necessary for remaining	issues)	

Project Maintenance Document

16-Jul-09

Department of National Defence - 5 to 10 GPM Water Treatment System

Warning: This document does not replace the manufacturer's recommended maintenance schedules as referenced in the OM manual provided by the equipment manufacturer. It is provided as a quick guide to required OM activities for this project.

Section1: General Maintenance Activities

Section2: Cross Reference Maintenance Code to Parts

Section3: Maintenance Schedule by Hours

General Maintenance Activities

Daily

- Check the control panel for running status.
- Contact the system remotely to check system operation for:
 - Alarms
 - Operating Conditions

Weekly

- Check for Leaks.
- Check the volume of consumables. i.e. Chemicals, oil etc
- Check for excessive noise of various components.
- Check for Alarms.
- Check and record Flow Rates, Vacuums, Pressures, Temperatures, pH.
- Check for excessive moisture inside the control panels and transducer wiring boxes
- Check for corrosion and grease the moving parts if required to reduce corrosion.

Monthly

- Test critical inputs for proper shutdown capacity.
- Test the operation of the overloads.
- Test building sump switch if it is present.

Yearly

- Test each input.
- Test alarm conditions.
- Test the operation of each output device.

Maintenance: 10649 Page 1 of 6 16-Jul-09

Parts Listing per Maintenance Code

Gauge, Pı	essure			
	Part		Qty	Module
PI-4901	16203	Gauge,Pressure,0-60psi, Indumart,P16T2-FG-60	1	Oil/Water Separator
Oil Water	Separa	tor		
	Part		Qty	Module
OWS-4901	11569	Oil/ Water Separator,OWS-2	1	Oil/Water Separator
Pump, Di	scharge			
	Part		Qty	Module
P-4901	11074	Pump,Discharge,1ST1E0D4,Goulds	1	Oil/Water Separator
P-5501	M1253	Pump,Discharge,Moyno,34401	1	Inlet Tank
Switch, L	evel			
	Part		Qty	Module
LSH-4901	m1108	Switch,Level,Mech Float,Wide Angle,N.O.,Red	1	Oil/Water Separator
LSLL-5501,55	M1343	Switch,Level,Mech Float,Narrow Angle,N.O.,Blue	2	Inlet Tank
LSHH-4901	m1343	Switch,Level,Mech Float,Narrow Angle,N.O.,Blue	1	Oil/Water Separator
Tank And	odes			
	Part		Qty	Module
4900	m1405	Tank Anodes,18" long, ICCC-2-1.05	1	Oil/Water Separator

Maintenance: **10649** Page 2 of 6 16-Jul-09

10649

EVERY 200 OPERATING HOURS

Tank Anodes

Inspect the integrity of the anode. When the anode has completely dissolve drain the tank and replace it.

Maintenance: **10649** Page 3 of 6 16-Jul-09

EVERY 800 OPERATING HOURS

Pump, Discharge

Close-Coupled Unit

Ball bearings are located in and are part of the motor. They are permanently lubricated. No greasing required.

10649

Frame-Mounted Units

Regrease frame with a #2 sodium or lithium based grease. Fill until grease comes out of relief fittings, or lip seal. Then wipe off excess. Follow motor and coupling manufacturers' lubrication instructions.

Note: Alignment must be rechecked after any maintenance work involving any disturbance of the unit.

Switch, Level

- 1) Test the operation of the switch.
- 2) Remove the switch and check for debris buildup that can potentially cause a failure of normal operation.

Maintenance: **10649** Page 4 of 6 16-Jul-09

EVERY 4000 OPERATING HOURS

Gauge, Pressure

- 1) Check accuracy of gauges.
- 2) Zero gauge if required.

Oil Water Separator

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

10649

- 1) Stop the flow of influent to the separator.
- 2) Remove separator cover.
- 3) Dispose of separated oil per regular procedures.
- 4) Remove water from separator through drain or hose. Measure and record the depth of the solids. Use this measurement as the timing basis for the next solids inspection and clear out. Consult OWS drawing for depth of sludge baffle. Solids should not exceed this depth.
- 5) The HD Q-PAC plates can be either cleaned in place or removed and cleaned.
- 6) Examine the tank interior for damage and repair any damage to internal coating.
- 7) To restart separator, install 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.

Maintenance: **10649** Page 5 of 6 16-Jul-09

10649

EVERY 15000 OPERATING HOURS

Pump, Discharge

To lubricate tapered roller bearings:

- 1) Remove the drive shaft assembly and the bearings.
- 2) Clean bearing cups and cones and the shaft assembly to remove all old grease.
- 3) Use a good grade of EP (Extreme Pressure) Lithium soap-based grease to lubricate bearings.
- 4) Reassemble.

Maintenance: 10649 Page 6 of 6 16-Jul-09

Troubleshooting Chart

Symptom	Potential Cause	Possible Solution
Electrical Motor		1
Motor will not start and there is no noise.	Motor may not be receiving the proper power.	Check fuses and power distribution between power lines to motor.
	Overload is tripped.	Reset overload.
	Main power may be off.	Check main power.
	Contactor may not be closing because motor is in manual position.	Switch motor to Auto position.
	Contactor may not be closing because PLC is not telling output to be on.	Check PLC operating sequence to determine if a start requirement is not met.
Motor will not start but makes a humming noise.	One of the phases of power is not getting to the Motor as a result of a blown fuse.	Change fuse.
	One of the phases of power is not getting to the Motor as a result of a poor wire connection.	Check wiring for a loose wire or a poor connection.
	The driven component (i.e. pump) will not spin and could be seized up.	Disassemble driven component, check clearances and clean internal components and replace any damaged components.
	Bearing on drive shaft of motor or driven component may be seized up.	Replace bearings.
Overloads trip immediately after startup.	Check for short circuit in motor windings.	Re-wind motor.
	One of the phases of power is not getting to the motor as a result of a blown fuse.	Change fuse.
	Motor power wires may be shorting out to ground.	Search for wiring short and replace wiring if required.
	Motor may have too much load or backpressure as a result of operating the driven component outside of its operating capabilities.	Check operating capabilities of driven component. I.e. Ensure positive displacement pump is not over pressured or that centrifugal pump is not operating at too high a flow rate.
Motors amps are above the allowable value on the nameplate.	Motor may be designed to operate on the upper limit.	Calculate maximum allowable amps. Name plate amps x safety factor.
	Driven component may have scale build up inside.	Clean internal components of driven component.
	Driven component may be rotating in the wrong direction.	Check direction of rotation and switch rotation of motor if it is incorrect.
	Check voltage of power. Low voltage results in high amps.	Adjust overloads for higher amps if the difference is only slight, otherwise change power or motor.
Centrifugal Pumps		
Pump does not produce sufficient pressure/vacuum.	Pump is not primed.	Prime pump.
pressure/vacuum.	Pump is rotating in wrong direction.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to an obstruction located between the pump and gauge.	Check for flow restrictions and clean strainers or piping if required.
	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.
	i .	1

	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter	Replace filter and clean line.
Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Liquid Ring Pump		
Pump does not produce enough vacuum.	Pump is not primed.	Prime pump and start under vacuum.
	Service fluid is to low in seal oil tank.	Add seal oil.
	No restriction on inlet of pump.	Close valves to create suction.
	Dilution valve is open.	Close dilution valve.
	Service fluid is not flowing into the pump.	Check for flow restrictions in service fluid lines. Check strainer.
	Pump is rotating in the wrong direction.	Check and change direction if required.
	Vacuum gauge is not working correctly.	Replace vacuum gauge.
	Pump seals may be allowing air into the pump.	Check for leaking and replace seals if required.
	Pump is too small for application.	Replace pump.
	Vacuum relief valve is set too low.	Replace or reset vacuum relief valve.
	Air may be leaking into vapor lines.	Check for air leaks in vapor lines.
	Pump internal components are damaged.	Disassemble pump and replace components if required.
Pump is making a growling noise.	Cavitation is occurring.	Decrease the vacuum.
	Insufficient seal fluid flow or excessive seal fluid flow.	Increase/decrease seal fluid flow rate.
Pump is leaking.	Gaskets are faulty.	Replace gaskets.
	Mechanical seal has been overheated or is faulty.	Replace mechanical seal.
	Oil may be leaking from 1/8" vacuum relief valves in pump housing.	Remove valves and install plugs.
Pump is running too hot.	Seal fluid strainer is plugged restricting seal fluid.	Clean out strainer.
	LRP is not providing enough suction to draw sufficient seal fluid.	Increase seal oil suction. Pipe seal fluid into a higher vacuum port of pump.
	Seal fluid flow rate is too low.	Open seal fluid control valve to allow more seal fluid to enter the pump.
	Seal fluid heat exchanger is not working properly.	Check heat exchanger.
Excessive discharge pressure built up in seal oil tank.	Demister filter is plugged and requires replacement.	Replace demister.

	1	T
	Seal oil is not being drawn out of demister filter through scavenger line.	Increase vacuum of LRP to allow oil to be sucked through scavenger line. Ensure that scavenger line has sufficient vacuum to draw oil out of the demister filter.
Seal Oil Low Level Alarm	Seal oil temperature may be operating too high causing the oil to evaporate.	Check seal oil operating temperature and increase seal oil flow.
	Seal oil suction line may be plugged causing seal oil to collect in bottom of demister filter.	Check for plugging of seal oil return line and clean or replace if required.
Oil Water Separator		
Water is in the oil outlet.	Skimmer opening is below the oil/water interface.	Adjust skimmer alignment to allow more oil to collect before skimming.
Oil is making its way to the outlet.	Water flow rate is too high.	Reduce flow rate through system.
	Filter media is plugged.	Replace or clean media.
	Oil discharge is plugged backing up OWS.	Drain oil down stream of skimmer.
Air to Air and Air to Fluid Heat Exchang	ers	
Heat exchanger fan is drawing too many	See troubleshooting for motors.	
amps.	Fan blade pitch and diameter may be wrong.	Change fan blade.
	Motor may be operating at wrong RPM for fan blade.	Replace motor or fan blade.
	Check clearance of fan blade.	Make adjustments if blade is making contact.
Phase Separator		
Water will not pump out of phase separator.	Base of separator may be plugged with sand.	Flush sand and debris out of separator.
Electric Solenoid Valve		
Valve will not completely shut.	May have dirt or rocks preventing it from shutting properly.	Disassemble and clean out internal components.
Valve will not open	Check for power to solenoid.	Trace power lines and determine why power is not going to valve.
	PLC may not be telling it to open.	Check start requirements in manual.
	Coil may be damaged or faulty.	Replace coil.
Level Switches		
Level switch is staying closed when water in tank drops below switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.
	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick up.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed closed regardless of the switch position.	Replace switch.
	Wiring to level switch may be shorting out to ground causing the switch to appear closed at all times.	Disconnect switch from system wiring and separate system wires so they are not in contact with each other or any metal. If the input is still on, the input wiring is being grounded somewhere. Find short and replace or fix wiring.
	IS barrier is shorted out internally.	Switch IS barrier with working barrier and if problem goes away then the barrier may be faulty and should be changed.
	Input wiring is loose in terminal strip.	Tighten terminal strip where field wiring is brought into panel.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.

Level switch stays open when water in tank is above the switch.	Level switch is upside down or on its side.	Check orientation of level switch. Level switch may be designed as normally closed and therefore will be upside down.
	Sight glass is plugged giving a false level in the tank.	Clean sight glass.
	Level switch has dirt or film causing it to stick down.	Remove level switch, clean and test for normal operation using a millimeter.
	Level switch may be damaged or faulty and failed open regardless of the switch position.	Replace switch.
	IS barrier is blown preventing the level switch signal from crossing the barrier.	Switch IS barrier with working barrier and if problem goes away then the barrier may be blown. If barrier is blown, the input wire on the right side of the barrier will have 24 V DC and the wire on the opposite side will have 0V DC.
	Level switch is wired incorrectly.	Consult input wiring diagram and inspect wiring of level switch. Change if required.
Regenerative Blowers		
Blower does not produce sufficient	Blower is not turned on.	Turn on blower.
pressure/vacuum.	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Blower is not operating at required RPM.	Check and replace motor if required.
	Blower has wrong sized impeller.	Check impeller and replace if required.
	Pressure or vacuum is lost due to obstruction located between blower and gauge.	Check for flow restrictions and clean strainers or piping if required.
Blower is leaking.	Fittings are leaking on or around blower.	Tighten fittings.
Blower flow rate is too low.	Backpressure is too high for blower.	Reduce backpressure.
	Blower may not be sized correctly for process.	Replace blower.
	Blower impeller is too small.	Change blower impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Air Stripper		
Stripper leaks.	Gaskets are leaking.	Apply silicon grease to gaskets and close up stripper. If they cannot be fixed the gaskets may need to be replaced.
Pressure or vacuum is building up in stripper.	Stripper is being fouled by mineral precipitates.	Clean stripper with acid to dissolve precipitates.
	Airflow rate through stripper has risen or is above the design value.	Decrease airflow rate.
Stripper is not cleaning contaminants sufficiently.	Inlet concentrations are higher than the design values.	Decrease water flow rate to obtain required stripping capacity.
	Flow rate of water through stripper is too high.	Decrease flow rate allowing longer residence time in stripper.
	Water temperature is lower than the design (below 60 deg F).	Increase water temperature or slow down water flow rate or increase airflow rate.
	Airflow rate is not high enough.	Increase airflow rate or decrease water flow rate.
	Products that are not easily strippable may be in higher concentrations than originally planned.	Consult manufacturer with test results of discharge contaminants.
	Stripper may have been shut down manually causing the contaminated water in the trays to fall into the sump without being cleaned.	Allow stripper to go through proper shutdown cycle when stopping the unit.

	Stripper may be setup wrong allowing the water to bypass trays.	Check orientation of trays to ensure water will flow through each tray properly.
	Some contaminants may be present that are affecting the ability to strip other contaminants.	Consult manufacturer with test results of intake and discharge contaminants.
	Increase in pressure causes a decrease in airflow resulting in a decrease of contaminant concentrations.	See pressure rise in stripper troubleshooting above.
Water is collecting in discharge piping of stripper.	Air leaving the stripper is very humid and will condense some water in the pipelines.	Install a knockout drum in discharge line before air is piped to another section of the process.
	The stripper causes foaming of the water which results in water collecting in the discharge lines.	Test for foaming contaminants such as soaps and install antifoaming dosing system to prevent foaming.
	Airflow rate is higher than the design value causing water to be carried over into the discharge lines.	Decrease flow rate to within design range.
Stripper often shuts down on a high stripper sump alarm.	Transfer pump is flowing faster than the discharge pump.	Slow transfer pump or speed up discharge pump.
	Discharge pump is not working properly.	Troubleshoot discharge pump.
Moyno Pumps		
Pump does not produce sufficient	Pump is not primed.	Prime pump.
pressure/vacuum.	Wrong direction of rotation.	Check and change rotation if required.
	Vacuum or pressure gauge is faulty.	Replace gauge.
	Pump is not operating at required RPM.	Check and replace motor if required.
	Pump has wrong sized impeller.	Check impeller and replace if required.
	Pump pressure or vacuum is lost due to obstruction located between pump and gauge.	Check for flow restrictions and clean strainers or piping if required.
	Pump is not turned on.	Turn pump on.
	Coupling between pump and motor is no longer connected preventing the pump from rotating with the motor.	Reconnect and realign motor and pump.
Pump is leaking.	Gaskets are worn or faulty.	Replace gaskets.
	Mechanical seal has been overheated. This is often a result of operating the pump without any water.	Replace mechanical seal.
	Fittings are leaking on or around pump.	Tighten fittings.
	Water may be coming from another location.	Check for leaks around pump.
	Pump was run in reverse allowing the rotor to spin off of the pump shaft.	Disassemble pump and screw rotor back onto shaft (See manufacturer's manual).
Pump flow rate is too low.	Backpressure is too high for pump.	Reduce backpressure.
	Pump may not be sized correctly for process.	Replace pump.
	Pump impeller is too small.	Change pump impeller but watch power consumption on motor.
	Flow control valve is closed.	Open flow control valve.
	May have blocked line or filter.	Replace filter and clean line.
Pump is making excessive noise during operation.	Manually rotate pump impeller and listen for clearance problems.	Disassemble pump and fix clearance problems.
	Alignment of pump may be off causing the flexible coupling to degrade.	Check alignment and reset alignment if needed. Replace flexible coupling if it is degraded.
Pressure Switch/Vacuum Switch		
Switch is not reacting at desired set point.	Switch is out of adjustment.	Change set point to desired value.
	<u> </u>	L

Switch is not working.	Switch may be faulty.	Remove input wires and test switch at desired pressure. If it does not trigger, it should be replaced.
Flow meter		
Flow meter is not rotating.	Dirt could have caused meter internals to jam up.	Disassemble flow meter and clean internal components.
Flow meter is rotating but pulse input is not working.	Switch on meter may be faulty.	Remove wiring and test contacts on meter to ensure that they are opening and closing. If not meter head needs to be replaced.
	Input wiring may be grounding out preventing the signal from opening and closing.	Test input wiring by isolating input wires and checking if input is on. If so you have a grounded input wire.
	Input to PLC is not working.	Simulate rotating meter by contacting input wires together and check for a detected flow rate and change in totalized flow.
Belt Driven Assemblies		
Squealing noise occurs on startup.	Belt is too loose.	Check tension of belt and tighten if required.
Excessive wear on bearings.	Belt is too tight.	Loosen belt tension.
Belt is wearing excessively.	Check orientation of blower and motor.	Adjust orientation if required.
Carbon Vessel		
Vessel is operating over pressure.	Silt may have collected in water phase vessel.	Remove lid and check for silt. Remove top layer of silt or replace vessel.
Vessel is breaking through earlier than expected.	Flow rate through vessel may be too high. Check design specifications.	Decrease flow rate.
	Air contaminant concentrations are higher than expected.	Test inlet concentrations.
	Check piping orientation to ensure that water is going in the top of water phase vessels and air is going in the bottom of air phase vessels.	Repipe vessel if piping is wrong.
	Ensure that there is not a large trapped air gap in the top of the water phase carbon vessel allowing the water to bypass a portion of the carbon.	Release air gap if present.
Bag Filter		
Vessel is operating over pressure.	Bag filter may be full of dirt and silt.	Remove cover and check for dirt buildup in the bag. Replace filter element if required.
	Equipment down stream of bag filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure.	Check pressure output of pump with pump curve. Replace pump if needed.
Filters are plugging too fast	Filter element micron size may be too low.	Install larger micron filter element.
	Filter pressure switch setpoint may be too low.	Increase high pressure shutdown setpoint.
Oil Water Separator		
Water is collecting in product tank	Oil water separator may not be level causing water to spill into the skimmer tube.	Check level of oil water separator and adjust if necessary.
	Skimmer tube is not adjusted properly.	Check position of skimmer tube ensure that tube is rotated so the skimming slot allows at least 1-2" of oil to collect before spilling over into the oil tank.
	Skimmer tube is cracked or leaking.	Check that skimmer tube is not cracked, replace if necessary.
	Separator can be full of sludge on the bottom restricting water flow through to the clean water reservour.	Check for dirt buildup in bottom. Drain and clean separator if necessary.

Oil is collecting on the clean water side	Oil water separator may be operating outside of design parameters.	Check that specific gravity of product and flow rate of separator match site-specific design print out for oil water separator. This can be found in the oil water separator section of your MLEE manual or submittal package.
	Oil water separator was not primed with clean water on startup and large amounts of product were initially pumped into separator contaminating the clean water sections.	Drain separator, clean separator and media, and fill with clean water before proceeding.
	Silt can build up in the bottom of the separator restricting volume capacity and flow through media.	Inspect bottom of separator and inside of media. Drain and clean separator and clean or replace media if plugged or restricted.
	Inlet side of separator can have excessive amounts of oil on the top layer. This will reduce effective capacity of oil water separator.	Check level of oil collected in inlet side of separator. Adjust skimmer if required. Reprime separator so only 1-2" of product remains on the top of the separator.
	Biological bacteria is suspending product in high-density mucus like collections that are passing through the separator.	Check for signs of bacteria in the inlet side of the separator. Contact MLEE to discuss solutions to eliminating biological suspension.
	Product may be made up of two different components. The component breaking through may have a different density from what the separator was designed for.	Collect a sample of what is breaking through and confirm that it has the same properties as the product collecting on the inlet side.
	Oil storage tank may be fill and high-level alarm not working properly. This will back the product up and fill the inlet side of the separator with product until the product passes under the lower weir and collects in the clean-water side.	Check product storage tank and ensure that level switch is working properly and that tank has not overfilled.
Oil and water is building up on inlet side but is not passing through separator and collecting in the clean water side.	Sludge and dirt may have built up on floor of separator preventing the water from passing by the lower weir.	Check for dirt buildup on bottom of separator. Drain and clean if necessary.
	Oil Water interface may be too low indicating that the separator has insufficient water to properly separate.	Fill the separator with clean water allowing water to collect in the inlet side forcing the oil water interface level to rise up too about 1-2" below the skimmer level.
	Only product is being pumped into inlet of separator.	If water is not present in sample entering the separator then it will not collect in the clean water side.
Sand Filter		
Vessel is operating over pressure.	Sand filter may be full of dirt and silt.	Remove cover and check for dirt buildup on top of filter. Backwash filter.
	Equipment down stream of sand filter may be plugging.	Check for pressure buildup down stream of filter and fix pressure buildup downstream if found.
Water will not flow through filter fast enough.	Pump may not be able to supply enough pressure	Check pressure output of pump with pump curve. Replace pump if required.
Filters are plugging too fast.	Filter was not backwashed properly.	Backwash filter vessel as per manufacturer's instructions.
	Filter pressure switch setpoint may be too low.	Increase high-pressure shutdown setpoint.
	Filter sand has solidified with calcification.	Replace sand in filter.
	Process water flow rate is operating above the design flow rate for the sand filter.	Check process flow rate and compare with design flow rate listed on manufacturer's literature or on the component sheet of the sand filter section of your Maple Leaf System Manual.
Rotary Screw Compressor Package	1	System Francia.

Compressor not starting.	Motor Overload.	Reset overload. Check compressor output pressure. Oil separator may be dirty, replace if needed. Check supply voltage.
	Stopped by compressed air temperature relay.	Oil level is too low. Not enough cooling air flow. Wrong compressor oil. Ambient temperature too high. Cooler dirty.
Insufficient air output.	Clogged intake filter.	Check condition of the filter and replace if needed.
	Clogged oil separator element.	Check condition of the oil separator element and replace if needed.
	Pressure switch not working.	Check pressure switch adjustment. Repair or replace if switch is faulty.
	Receiver blow down valve open.	Disassemble and clean out internal components.
	Too high air consumption.	Check network for leaks and air powered devices.
	Drive belt slipping.	Check tension of belt and tighten if required. Replace belt if worn.
Compressor overheating.	Insufficient amount of oil.	Add more oil.
	Clogged oil filter.	Check condition of the filter and replace if needed.
	Cooler dirty.	Clean.
	Ambient temperature too high.	Check temperature and air circulation.
High oil consumption.	Oil return tube or its orifice is blocked.	Open and clean all internal components.
	Oil separator or sealing damaged or loosened.	Check seals and repair if needed.
	Oil separator dirty.	Replace.
	Wrong compressor oil.	Change oil. Use the correct oil as specified in the manufacturer's instructions.
	Output air temperature too high.	Check output temperature correct if it is too high.
	Faulty non-return valve of oil return pipe.	Check operation and replace valve if needed.
	Too much oil.	Drain extra oil out.
Network pressure rises over set valve.	Pressure switch not working or damaged.	Check operation of switch.
	Output valve leaking.	Replace seal.
	Loose wire connections.	Check for loose wires and correct as needed.
Compressor doesn't restart automatically.	Pressure switch damaged.	Replace pressure switch.
	Output valve leaks.	Replace seals of output valve.
	Loose wires.	Check for loose wires and correct as needed.
Compressor doesn't stop automatically.	Output valve leaks.	Replace seals of output valve.
	Pressure Switch Damaged.	Replace pressure switch.
Refrigerated Dryer		
Water down stream of dryer.	Residual air in piping.	Blow out system with dry air.
	Air bypass system is open.	Check bypass valve position.
	Inlet and Outlet conditions are reversed.	Check for correct connection.
	Air temperature on outlet of dryer may be	Heat trace piping.

Automatic drain mechanism is not working.	Replace drain mechanism.
Dryer overloaded.	Check flow rate and inlet temperature.
Inlet air strainer clogged.	Clean inlet air strainer.
Excessive air flow.	Check flow rate and reduce if needed.
Separator filter clogged.	Replace filter sleeve.
Freezing of moisture in evaporator.	
Dryer overloaded resulting in high air outlet temperature.	Check operating conditions.
High outlet air temperature.	Correct high temperature.
Thermostat switch is malfunctioning or not securely mounted.	Replace thermostat switch.
Power failure.	Check power.
Line disconnect switch open.	Check disconnect.
Fuses blown, breaker blown.	Check fuses or breaker.
Loose or faulty wiring.	Check wiring.
High or low ambient conditions.	Check min/max temperature ranges.
Air filter clogged.	Clean filter.
Condenser fins clogged.	Clean fins.
Fan motor or control switch not working.	Replace fan motor or switch.
There may be water in the air sampling lines that is throwing off the readings.	Drain any moisture out of the air sampling lines.
Transmitter may be out of calibration.	Refer to transmitter specification sheets on how to calibrate the transmitter. Note if transmitter is more than 10-25% out of calibration it will likely require factory recalibration.
Transmitter may not be wired properly or one or more wire connections may be loose.	Check wiring with device specification sheet and MLEE drawing. Check wiring for loose connections.
Transmitter may be damaged or not working properly.	If you have a similar transmitter installed in another location on the system, switch them around to determine if the faulty transmitter works in another location. If the transmitter works you know the transmitter is not the problem. If the transmitter does not work in the other location then it is likely the transmitter. If the good transmitter does not work in the faulty location the problem is likely the wiring at that location or the input into the PLC.
Transmitter is likely damaged.	Send back to manufacturer for re- calibration.
	1
	I
PLC may not be in run mode. If the power has been off to the panel for an extended period of time, the PLC will switch out of run mode and stop running the logic.	Use external switch on PLC to switch from "term" to "run" then back to "term". This will force the PLC back into run mode. The run light should now indicate that the PLC is in run mode.
	working. Dryer overloaded. Inlet air strainer clogged. Excessive air flow. Separator filter clogged. Freezing of moisture in evaporator. Dryer overloaded resulting in high air outlet temperature. High outlet air temperature. Thermostat switch is malfunctioning or not securely mounted. Power failure. Line disconnect switch open. Fuses blown, breaker blown. Loose or faulty wiring. High or low ambient conditions. Air filter clogged. Condenser fins clogged. Fan motor or control switch not working. There may be water in the air sampling lines that is throwing off the readings. Transmitter may be out of calibration. Transmitter may be damaged or not working properly. Transmitter may be damaged or not working properly.

16-Jul-09

10649

OWS Canadian Forces

System Site Specifications System Electrical Specifications

Elevation: 100 ft Voltage: 115V-1ph Max Temp: 100 deg F Main Disconnect By Others

Min Temp: 30 deg F Panel Approval: UL508A (GP) Class: GP
Noise Target: No System Approval: NONE Class: CL1DIV2

Gas Required: None Panel Type: NONE Water Required: None Telemetry: None Telephone Reqd: None Autodialer: None

Building: None EMonitor: NotReq Server: NotReq

System SVE (First Blower) System SVE (Second Blower)

@

Blower Disch Temp: deg F Blower Disch Temp: deg F

Inlet Legs:

Disch Press:

in wc

Disch Press:

in wc

Water Flowrate:

gpm

Water Flowrate:

ggm

Water Flowrate:

ggm

Water Flowrate: gpm Water Flowrate: gpm Heat xchg Disch: deg F Heat xchg Disch: deg F

Air Sparge Other Specifications

@ psi Other Inlet Liquid Flow: gpm

Sparge Disch Temp: deg F Disch Flow: 10 gpm @ 40 psi

Disch Legs: AirTreatment: None
Heat xchg Disch: deg F Water_Treatment: None

Stripper Airflow: cfm
Stripper Dsn Flow: gpm
OWS_Dsn_Flow: 10 gpm

Other Information May be Presented Below

Connection Info:

Panels to be Nema 4 for outside.

Shipping Information

Contaminants

Ontario

Canada

Oil/Water Separator

Module Code:	4900
mount couc.	1000

Manual, System, Hard Copy	Part:	17149
Maridal, dystern, raid dopy	Qty:	1
	Mfg:	•
	Mfg Part:	
	g	
900		
Coalescing Media, HD Q-PAC	Part:	13959
0.25" spacing, 132 sqft/cuft	Qty:	2
	Mfg:	
None	Mfg Part:	HD Q-PAC
Strain Relief Connector, PVC, 1/2"	Part:	16884
TSRC10	Qty:	2
	Mfg:	
None	Mfg Part:	TSRC10
Oil Water Separator, Assembly, OWS-2	Part:	17530
	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Miscellaneous Part for parts not included in purchasing	Part:	9998
	Qty:	1
	Mfg:	
Product Drain Pipe, to include: - 8 ft length of 2 in galvanized steel pipe - One end is male thread - One end is 1/2 of a union	Mfg Part:	
Tank Anodes,18" long, ICCC-2-1.05	Part:	m1405
Magnesium	Qty:	1
	Mfg:	
None	Mfg Part:	ICCC-2-1.05
Valve,Brass,Ball,2",150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve,Brass,Ball,2",150#	Part:	p1065
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-2
Valve,Brass,Ball,1", 150#	Part:	p1067
NPT, Teflon seats, 600 PSI WOG	Qty:	3
	Mfg:	Kitz
-	Mfg Part:	601-1
 Union, Galv, 2"	Part:	P1093
1	Qty:	1
	Mfg:	
	Mfg Part:	2GZU

4900-Piping

Valve,Check,Brass,Swing, 1"	Part:	10035
	Qty:	1
News	Mfg:	504705
None	Mfg Part:	521T05
Valve,Check,Brass,Swing, 1"	Part:	10035
	Qty:	1
	Mfg:	
None	Mfg Part:	521T05
Camlock Fitting,1", Part "F",Aluminum	Part:	10402
Male Adapter x Male Thread Cam Lock Fitting	Qty:	2
	Mfg:	Bayco Industries
None	Mfg Part:	BAL-100F
Camlock Fitting,1", Part "C",Aluminum	Part:	10403
Female Coupler x Hose Shank Cam Lock Fitting	Qty:	2
	Mfg:	Bayco Industries
None	Mfg Part:	BAL-100C
Camlock Fitting,1-1/2", Part "C",Aluminum	Part:	10490
Female Coupler x Hose Shank Cam Lock Fitting	Qty:	1
	Mfg:	Bayco Industries
None	Mfg Part:	BAL-150C
Camlock Fitting,1-1/2", Part "A",Aluminum	Part:	10859
Male Adapter x Female Thread Cam Lock Fitting	Qty:	1
	Mfg:	Bayco Industries
None	Mfg Part:	-
Nipple, Plated, KC, 1", IPM	Part:	11210
	Qty:	1
	Mfg:	
None	Mfg Part:	CNP-100
Nipple, Plated, KC, 1-1/2", IPM	Part:	11347
	Qty:	1
	Mfg:	
None	Mfg Part:	CNP-150
Hose,PVC,Suction,Green,1",J100	Part:	12090
Tigerflex,,85psi@70F,60psi@100F	Qty:	4
PVC,150F (min 100ft order)	Mfg:	Kuriyama
None	Mfg Part:	J100
Hose,PVC,Suction,Green,1-1/2",J150	Part:	12091
TigerFlex only,70psi@70F,50psi@100F	Qty:	2
PVC,150F (min 100ft order)	Mfg:	Kuriyama
None	Mfg Part:	J150
Pump Piping, Centrifugal, 1.5"x1", 10gpm	Part:	17261
. 1	Qty:	1
	Mfg:	Maple Leaf Environmental Equipment
-	Mfg Part:	-
Valve,Brass,Ball,1-1/2",150#	Part:	P1066
NPT, Teflon seats, 600 PSI WOG	Qty:	1
,,	Mfg:	Kitz
-	Mfg Part:	601-1-1/2
	J "	

Valve,Brass,Gate, 1"	Part:	P1216
	Qty:	1
	Mfg:	
None	Mfg Part:	514T05
4900-Sample Por		
Valve,Brass,Ball,1/4",150#	Part:	10047
NPT, Teflon seats, 600 PSI WOG	Qty:	1
	Mfg:	Kitz
None	Mfg Part:	601-1/4
4900-Siphon		
Valve,Check,Brass,Spring, 1/2"	Part:	20746
	Qty:	1
	Mfg:	
	Mfg Part:	
LSH-4901		
Switch,Level,Mech Float,Wide Angle,N.O.,Red	Part:	m1108
Tilt Float Level Switch 90deg (min. order 20)	Qty:	1
13A, SPST, N/O	Mfg:	Warrick Controls
-	Mfg Part:	GR20W4000
LSHH-4901		
Switch,Level,Mech Float,Narrow Angle,N.O.,Blue	Part:	m1343
Tilt Float Level Switch	Qty:	1
25deg 13 amp NO	Mfg:	Warrick Controls
None	Mfg Part:	PB20W4000
OWS-4901		
Oil/ Water Separator, OWS-2	Part:	11569
2 cubic feet of packing	Qty:	1
Note: Build up price from Price Sheet	Mfg:	Maple Leaf Environmental Equipment
****OWS Simpsons Fabricated****	Mfg Part:	OWS-2
Temperature: 65 degF		
sg. Oil: 0.85 Micron Removal Size: 25		
Safety Factor: 1.25		
Maximum Distance Between Plates: 0.25"		
Surface Area: 132 ft^2/ft^3		
Rated Flow: 10 gpm Standard Features:		
- Vent Coupling		
- Sump High Level Switch Coupling		
- Sump level Switch Coupling - Product Discharge		
- Anode Coupling		
- Inlet and Outlet Couplings		
Options:		
- Sandblasted Interior - Stand: Specify Height if Different from 24"		
 Custom Modifications: Skimmer discharge on opposite side front. Front side includes drain 		
valve and lid opening.		

P-4901

Pump, Discharge, 1ST1E0D4, Goulds

1hp,1ph,230V,XPF,3600rpm

Centrifugal

******Discharge Pump******

Model: 1ST

Flow Requirement: 10 GPM @ 90 ft TDH

Hosepower:1 HP Voltage: 120V 1Ph Motor Type: EXP Approval: UL/CSA RPM: 3600 Impeller: D

Part: 11074 Qty: 1 Mfg: Goulds 1ST1E0D4 Mfg Part:

PI-4901

Gauge, Pressure, 0-60 psi, Indumart, P16T2-FG-60 Part: 16203 1

SS, brass internals, Glyc. Filled, bottom mount Qty:

> Mfg: Indumart

None Mfg Part:

AS BUILT: 10649 Page 5 of 8 16-Jul-09

Inlet Tank

Module Code: 5500

Switch, Level, Mech Float, Narrow Angle, N.O., Blue Part: dty. M1343 Tilt Float Level Switch Qty: 2 2 25deg 13 amp NO Mig: Warrick Controls	LSLL-5501,5502		
25deg 13 amp NO Mfg: Part: PB20W4000 P-5501 Coupling, Insert, L075N Part: Part: PB20W4000 None Mg: Browning None Mg Part: -00516344 Coupling, Motor, L075x.875° Part: 12027 1 Mg: Browning None Mfg Part: -00515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: Mfg: Mg Part: L075x.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: Mg Part: L075x.625 Base, Pump, 10 x 24 Part: 15855 Guard- Moyno Pump Part: 15855 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 None Mfg: Maple Leaf Environmental Equipment Mfg: Mg: Maple Leaf Environmental Equipment Mfg: Baldor Mfg: Mg: Baldor Mfg: Baldor Mfg: Baldor Mfg: Baldor Mfg: Baldor Mfg: Mg: Baldor Mfg: Mg: Baldor Mfg: Mg: Moyno Mfg: Moyno Mf	Switch,Level,Mech Float,Narrow Angle,N.O.,Blue	Part:	M1343
	Tilt Float Level Switch	Qty:	2
P-5501 Coupling, Insert, L075N Part: 11105 (Qty: 1 Mig: Browning Mrg Part: -00516344 None Mfg Part: -00516344 Coupling, Motor, L075x.875¹ Part: 12027 1 (Qty: 1 Mrg: Browning Mrg Part: -00515662 None Mfg Part: -00515662 Coupling, Pump, L075x.625 Part: 12028 (Qty: 1 Mrg: L075x.625 Part: 15855 (Qty: 1 Mrg: Mrg: Maple Leaf Environmental Equipment Mrg: Name Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg:	25deg 13 amp NO	-	Warrick Controls
Part: 11105 Qty: 1 Mfg: Browning None Mfg Part: -00516344		Mfg Part:	PB20W4000
None Qty: Mfg: Browning Mrg Part: -00516344 Coupling, Motor, L075x.875° Part: 12027 1 Qty: 1 Mfg: Browning Mrg: Browning Mrg: D0515662 None Mfg Part: D0515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: Mrg: L075x.625 Base, Pump, 10 x 24 Part: L075x.625 Base, Pump, 10 x 24 Part: Mfg: Maple Leaf Environmental Equipment Mfg: Mrg: Baldor Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 Mrg: Baldor Mrg: Baldor Mrg: Baldor Mrg: Baldor Mrg: Baldor Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg:	P-5501		
None Mfg: Mfg Part:	Coupling, Insert, L075N	Part:	11105
None Mfg Part: -00516344 Coupling, Motor, L075x.875' Part: 12027 1 Afg: Browning None Mfg Part: -00515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: - Mfg Part: L075x.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: - Mfg Part: 15855 Guard-Moyno Pump Part: 15856 33301 or 34401 Qty: 1 None Mfg: Maple Leaf Environmental Equipment None Mfg: Maple Leaf Environmental Equipment Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 1800rpm, 115/230V/1ph, UL/CSA, w/base Qty: 1 Mfg: Baldor Mfg: Boldor Mfg: Moyno Mfg: Moyno Mfg: Moyno </td <td></td> <td></td> <td></td>			
Coupling, Motor, L075x.875" Part: 12027 1 Qty: 1 Mg: Browning None Mfg Part: -00515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: - Mfg Part: L075x.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: Maple Leaf Environmental Equipment - Mfg Part: 15856 Guard-Moyno Pump Part: 15856 33301 or 34401 Qty: 1 None Mfg: Maple Leaf Environmental Equipment Motor,Baldor,1hp,L5023T,XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg: Baldor Woyno 34401 Assembly Part: 16777 12gpm@25psig Qty: 1 1800 rpm Mfg: Moyno Mfg: Moyno Pump,Discharge,Moyno,34401 Part: Mfg: Mfg: 19mg: Spsi			
None Oty: Mfg: Browning Browning Mfg: Parts: -00515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: L075x.625 Base, Pump, 10 x 24 Part: L075x.625 Base, Pump, 10 x 24 Part: Mfg: Maple Leaf Environmental Equipment Mfg: Mfg Part: 15855 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 Mfg Part: Mfg Part: 15856 Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 1800rpm, 115/230V/1ph, UL/CSA, w/base Qty: 1 Mfg: Baldor Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 Mgyno 1800 rpm Mfg Part: Mfg: Moyno Pump, Discharge, Moyno, 34401 Part: Mfg: Moyno Pump, Discharge, Moyno, 34401 Part: Mfg: Mfg: Moyno Pump, Discharge, Moyno, 34401 Part: Mfg: Moyno Pump, Discharge, Moyno, 34401 Part: Mfg: Moyno Pump, Discharge, Moyno, 34401 Part: Mfg: Moyno Mfg: Moyno	None	Mfg Part:	-00516344
None Mfg: Mfg Part:	Coupling, Motor, L075x.875"		12027
None Mfg Part: -00515662 Coupling, Pump, L075x.625 Part: 12028 Qty: 1 Mfg: L075x.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: Maple Leaf Environmental Equipment - Mfg Part: 15855 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 More, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 1800rpm, 115/230V/1ph, UL/CSA, w/base Qty: 1 Mg: Baldor Mfg: Baldor Woyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno Moyno </td <td>1</td> <td>Qty:</td> <td>1</td>	1	Qty:	1
Coupling, Pump, L075x.625 Part: Qty: 1 (Mrg: L075x.625) - Mfg Part: L075x.625 Base, Pump, 10 x 24 Part: 15855 (Qty: 1 (Mrg: Maple Leaf Environmental Equipment Mrg: Mrg Part: 15855) Guard- Moyno Pump (Guard- Moyno Pump (Mrg: Maple Leaf Environmental Equipment Mrg: Mrg: Maple Leaf Environmental Equipment Mrg: Mrg: Maple Leaf Environmental Equipment Mrg: Mrg Part: 16237 Motor, Baldor, 1hp, L5023T, XPF, 143T (Mrg: Mrg: Baldor Mrg Part: Mrg: Baldor Mrg Part: 16237 Part: 16237 Moyno 34401 Assembly (Mrg: Mrg: Baldor Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg: Mrg			Browning
Qty: Mfg Part: Mfg: Mfg Part: L075X.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: Maple Leaf Environmental Equipment Mfg Part: 15855 Guard- Moyno Pump Part: 15856 Part: 15856 33301 or 34401 Qty: 1 Mfg: Maple Leaf Environmental Equipment Mfg Part: Mfg: Maple Leaf Environmental Equipment Mfg Part: 16237 Motor,Baldor,1hp,L5023T,.XPF,143T Part: 16237 Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: 16777 Part: 16777 12gpm @ 25psig Qty: 1 Mfg: Moyno Part: 16777 1800 rpm Mfg: Moyno,34401 Part: Mfg: Moyno Part: Mfg: Moyno Pump,Discharge,Moyno,34401 Part: Mfg: Moyno Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: Mfg: Moyno Mfg: Moyno	None	Mfg Part:	-00515662
- Mfg:	Coupling, Pump, L075x.625	Part:	12028
Mfg Part: L075X.625 Base, Pump, 10 x 24 Part: 15855 Qty: 1 Mfg: Maple Leaf Environmental Equipment Mfg Part: 15856 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 Mfg: Maple Leaf Environmental Equipment Mfg: Baldor Mfg: Baldor Mfg: Baldor Mfg: Baldor Mfg: Mfg: Mfg: Moyno Mfg Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno		Qty:	1
Base, Pump, 10 x 24		Mfg:	
Qty: 1 Mfg: Maple Leaf Environmental Equipment Mfg Part: 15855 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 None Mfg: Maple Leaf Environmental Equipment Mone Mfg Part: 16237 Motor,Baldor,1hp,L5023T,.XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	-	Mfg Part:	L075X.625
Mfg: Maple Leaf Environmental Equipment Mfg Part: 15855	Base, Pump, 10 x 24	Part:	15855
- Mfg Part: 15855 Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1		Qty:	1
Guard- Moyno Pump Part: 15856 33301 or 34401 Qty: 1 More Mfg: Maple Leaf Environmental Equipment Motor, Baldor, 1hp, L5023T, XPF, 143T Part: 16237 1800rpm, 115/230V/1ph, UL/CSA, w/base Qty: 1 Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump, Discharge, Moyno, 34401 Part: M1253 12gpm @ 25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno		Mfg:	Maple Leaf Environmental Equipment
33301 or 34401 Qty: Mfg: Maple Leaf Environmental Equipment None Mfg Part: Motor,Baldor,1hp,L5023T,XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm @ 25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno Mfg: Moyno	-	Mfg Part:	15855
None Mfg: Mfg: Maple Leaf Environmental Equipment Motor,Baldor,1hp,L5023T,.XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 Moyno 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	Guard- Moyno Pump	Part:	15856
None Mfg Part: Motor,Baldor,1hp,L5023T,.XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	33301 or 34401	Qty:	1
Motor,Baldor,1hp,L5023T,.XPF,143T Part: 16237 1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno		Mfg:	Maple Leaf Environmental Equipment
1800rpm,115/230V/1ph,UL/CSA,w/base Qty: 1 Mfg: Baldor Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	None	Mfg Part:	
Mfg: Baldor Mfg Part: Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump, Discharge, Moyno, 34401 Part: M1253 12gpm @ 25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	Motor,Baldor,1hp,L5023T,.XPF,143T	Part:	16237
Mfg Part: Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump, Discharge, Moyno, 34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	1800rpm,115/230V/1ph,UL/CSA,w/base	Qty:	1
Moyno 34401 Assembly Part: 16777 12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump, Discharge, Moyno, 34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno		Mfg:	Baldor
12gpm @ 25psig Qty: 1 1800 rpm Mfg: Moyno - Mfg Part: - Pump, Discharge, Moyno, 34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno		Mfg Part:	
1800 rpm Mfg: Moyno - Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	Moyno 34401 Assembly	Part:	16777
- Mfg Part: - Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	12gpm @ 25psig	Qty:	1
Pump,Discharge,Moyno,34401 Part: M1253 12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	1800 rpm	Mfg:	Moyno
12gpm@25psi, 1800rpm, NPSH: less than 5 feet Qty: 1 Mfg: Moyno	-	Mfg Part:	-
Mfg: Moyno	Pump,Discharge,Moyno,34401	Part:	M1253
	12gpm@25psi, 1800rpm, NPSH: less than 5 feet	Qty:	1
- Mfg Part: 34401		Mfg:	Moyno
	-	Mfg Part:	34401

AS BUILT: **10649** Page 6 of 8 16-Jul-09

Main Control Panel

Module Code: 8200

8200		
Miscellaneous Part for parts not included in purchasing	Part:	9998
	Qty:	2
	Mfg:	
Panel, for pump control.	Mfg Part:	
PNL		
Contactor,SQD LC1D1810G6	Part:	10254
(SQD LC1D18G7)	Qty:	2
	Mfg:	
-	Mfg Part:	SQD LC1D18G7
Barriers,IS,D1031Q	Part:	12475
Must be marked with UL Approval	Qty:	1
	Mfg:	GM International
-	Mfg Part:	D1031Q
Overload,SQD LRD21	Part:	12681
	Qty:	2
	Mfg:	
-	Mfg Part:	SQD LRD21
Panel, Hoff, Nema 4, CSD16166	Part:	18422
16"x16"x6"	Qty:	1
	Mfg:	
- 	Mfg Part:	CSD16166
Panel, Backplate, Hoff, CP1616	Part:	18423
For 16"x16"	Qty:	1
14.2"x14.2"	Mfg:	
	Mfg Part:	CP1616
Fuse Holder,Pheonix 3004171	Part:	19077
Fused Terminal Block	Qty:	4
	Mfg:	
-	Mfg Part:	
Relay, HY41PN24DC	Part:	19143
IMO, 24DC 5A 4PCo Led.	Qty:	4
	Mfg:	IMO
-	Mfg Part:	IMO HY41PN24D
Relay, SRN4-C	Part:	19145
Relay base	Qty:	4
	Mfg:	WO 000W 0
-	Mfg Part:	IMO SRN4-C
Elect_PromisE_Download	Part:	19885
	Qty:	1
	Mfg:	
-	Mfg Part:	-
Power supply, Telemecanique ABL7 RM24025	Part:	20780
In 100-240VAC Out 24VDC 2.5A	Qty:	1
	Mfg:	
-	Mfg Part:	ABL7 RM24025

Fuse,GLD ATDR5	Part:	E1121
midget time delay 600V 5A	Qty:	2
	Mfg:	
-	Mfg Part:	GLD ATDR5
Fuse,GLD GDL1	Part:	E1185
Miniature Fuse 1A, 1/4"x1-1/4" time delay	Qty:	1
	Mfg:	
-	Mfg Part:	GLD GDL1
Fuse,GLD GDL2	Part:	E1186
Miniature Fuse 2A,1/4"x1-1/4" time delay	Qty:	1
	Mfg:	
-	Mfg Part:	GLD GDL2

AS BUILT: **10649** Page 8 of 8 16-Jul-09

Bill of Material

Project 10649

Description OWS CANADIAN FORCES

Ordernumber 10649

Drawing Number

MLE EQUIPMENT INC. 1325 CALIFORNIA AVE. ONTARIO, K6V 5Y6 CANADA

Installation

No. Device Id	Location	Page Line N	Numbunction Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
1 CR227		2.27	LSHH-4901	1	19143	Relay, HY41PN24DC	Relay, HY41PN24DC, IMO, 24DC 5A 4PCo Led.	
2 CR227		2.27	LSHH-4901	1	19145	Relay, SRN4-C	Relay, SRN4-C, Relay base	
3 CR230		2.30	LSH-4901	1	19143	Relay, HY41PN24DC	Relay, HY41PN24DC, IMO, 24DC 5A 4PCo Led.	
4 CR230		2.30	LSH-4901	1	19145	Relay, SRN4-C	Relay, SRN4-C, Relay base	
5 CR233		2.33	LSLL-5501	1	19143	Relay, HY41PN24DC	Relay, HY41PN24DC, IMO, 24DC 5A 4PCo Led.	
6 CR233		2.33	LSLL-5501	1	19145	Relay, SRN4-C	Relay, SRN4-C, Relay base	
7 CR236		2.36	LSLL-5502	1	19143	Relay, HY41PN24DC	Relay, HY41PN24DC, IMO, 24DC 5A 4PCo Led.	
8 CR236		2.36	LSLL-5502	1	19145	Relay, SRN4-C	Relay, SRN4-C, Relay base	
9 FU215		2.15		1	E1121	Fuse,GLD ATDR5	Fuse,GLD ATDR5, midget time delay 600V 5A	Gould
10 FU215		2.15		1	19077	Fuse Holder,Pheonix	Fuse Holder, Pheonix 3004171, Fused Terminal Block	
11 FU219		2.19		1	E1186	Fuse,GLD GDL2	Fuse,GLD GDL2 , Miniature Fuse 2A,1/4"x1-1/4" time delay	Gould
12 FU219		2.19		1	19077	Fuse Holder,Pheonix	Fuse Holder,Pheonix 3004171 , Fused Terminal Block	
13 FU220		2.20		1	E1185	Fuse,GLD GDL1	Fuse,GLD GDL1 , Miniature Fuse 1A, 1/4"x1-1/4" time delay	Gould
14 FU220		2.20		1	19077	Fuse Holder,Pheonix	Fuse Holder,Pheonix 3004171 , Fused Terminal Block	
15 FU258		2.58		1	E1121	Fuse,GLD ATDR5	Fuse,GLD ATDR5, midget time delay 600V 5A	Gould
16 FU258		2.58		1	19077	Fuse Holder,Pheonix	Fuse Holder,Pheonix 3004171 , Fused Terminal Block	
17 IS228		2.28		1	12475	Barriers,IS,D1031Q	Barriers,IS,D1031Q, Must be marked with UL Approval	
18 M208		2.08	P-5501	1	10254	Contactor,SQD LC1D18	Contactor,SQD LC1D1810G6 , (SQD LC1D18G7)	SQD
19 M251		2.51	P-4901	1	10254	Contactor,SQD LC1D18	Contactor,SQD LC1D1810G6 , (SQD LC1D18G7)	SQD
20 OL209		2.09	P-5501	1	12681	Overload,SQD LRD21	Overload,SQD LRD21 ,	SQD
21 OL252		2.52	P-4901	1	12681	Overload,SQD LRD21	Overload,SQD LRD21 ,	SQD
14/07/2009		Project	10649	In	stallati	Bill of M	aterial Page 1 from	n 2 Pages

Installation

No. Device Id	Location	Page Line Nur Function Text	Quantity	Partnumber	Description	Technical Des	Manufacturer
22 PS220		2.20	1	20780	Power supply, Teleme	Power supply, Telemecanique ABL7 RM24025, In 100-240VAC Out 24VDC 2.5A	

14/07/2009 Project 10649 Installati **Bill of Material** Page 2 from 2 Pages

PRODUCT TECHNICAL SPECIFICATIONS



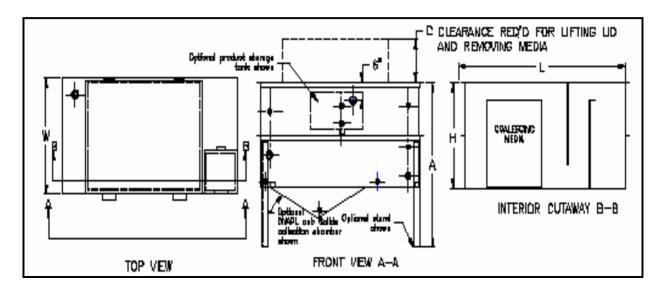


PRODUCT DATA SHEET FII OIL WATER SEPARATOR (ML-OWS)

Filter Innovations supplies ML-Series Oil water Separators available to reduce free oil in water to below 15 ppm. ML OWS works with flow rates ranging from 1 to 100 gpm.

ML OWS operates on the coalescing principles: as the oil/water mixture is passed through the ML OWS, larger oil droplets migrate to the surface to be collected and skimmed of the water. The media coalesces (collects) the smaller droplets until they are large and buoyant enough to float to the surface.





Dimensions:

Part	Width	Standard	Standard	Length with	Height with	Req'd	Standard	Extended	Elevated	Product
Number	(in)	Height	Overall	Extended	Elevated	Overhead	Pumpout	Pumpout	Pumpout	Tank
	"W"	(in) "H"	Length (in)	Pumpout (in)	Pumpout (in) "A"	Clearance (in) "C"	Volume (US Gal)	Volume (US Gal)	Volume (US Gal)	Volume (US Gal)
ML OWS-2	16	30	64	76	n/a	14	23	41	n/a	8.1
ML OWS-4	28	30	64	76	n/a	26	46	81	n/a	8.1
ML OWS-8	28	30	76	88	n/a	26	46	81	n/a	8.1
ML OWS-12	40	30	76	88	n/a	38	70	122	n/a	8.1
ML OWS-18	40	30	88	n/a	60	24	70	n/a	130	12.2
ML OWS-24	52	30	88	n/a	60	24	93	n/a	173	12.2
ML OWS-36	52	42	88	n/a	72	24	133	n/a	212	17.8
ML OWS-45	64	42	88	n/a	72	24	166	n/a	265	17.8
ML OWS-75	100	42	88	n/a	72	24	266	n/a	425	17.8





744 Gordon Baker Road North York, Ontario M2H 3B4 Tel: (416) 490-7848 Fax: (416) 490-0974 www.filterinnovations.com



SIGNIFICANT FEATURES

- Unique Multi-Stage design:
- Easy removal of coalescing media for cleaning
- Reduce free oil in water to below 15 ppm
- Solution temperatures to 200 ⁰F
- Epoxy coated steel or stainless steel construction
- DNAPL separator or combined LNAPL/DNAPL available
- Available as complete systems with controls, pump and water treatment

Rated US GPM (Based on 25 micron particles at 65° F and design safety factor of 1.25)

Part Number	1/2"	Packing	3/4"	Packing	1 1/4"	Packing	Slant	Plate
	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)	Oil (0.9)	Gas (0.72)
ML OWS-2	5	14.1	3.5	9.8	2.3	6.3	0.9	2.5
ML OWS-4	10.1	28.2	7	19.7	4.5	12.7	1.8	4.9
ML OWS-8	20.2	56.5	14	39.3	9.1	25.4	3.5	9.8
ML OWS-12	30.3	84.7	21.1	59	13.6	38.1	5.3	14.7
ML OWS-18	45.4	127.1	31.6	88.4	20.4	57.1	7.9	22.1
ML OWS-24	60.5	169.5	42.1	117.9	27.2	76.1	10.5	29.5
ML OWS-36	68.1	190.7	47.4	132.6	30.6	85.7	11.8	33.2
ML OWS-45	85.1	238.4	59.2	165.8	38.2	107.1	14.8	41.5

NOTES: Larger spaced packing will not plug as quickly as closely spaced packing allowing longer intervals between maintenance requirements. The slant plate coalescer should be used in applications with heavy sludge loads because it does not foul quickly.

<u>Construction</u>: The standard ML Series Oil/Water Separator is fabricated from carbon steel. For corrosion resistance, the interior is epoxy coated and the exterior is painted. Optional stainless steel construction is also available. A large lid allows access to the coalescing media and oil skimmer while a small lid allows access to the pumpout tank.



744 Gordon Baker Road North York, Ontario M2H 3B4 Tel: (416) 490-7848 Fax: (416) 490-0974

www.filterinnovations.com

PRODUCT DATA SHEET EB-SERIES BAG FILTER HOUSING

FII EB-series single bag non-code industrial housings are a cost effective solution for low and high flow rates in variety of applications. Their compact space saving design allows for easy installation, and quick bag changeover.

Features:

- Housing rated for 150 psig (10.3 bar) @ 250° F (121.1°C)
- Vessels available in carbon or stainless steel 304 and 316
- · Accepts single & double length baskets
- Swing bolt & V-band closures available
- Threaded connection standard
- SS 316L perforated basket & omega spring standard with all housings

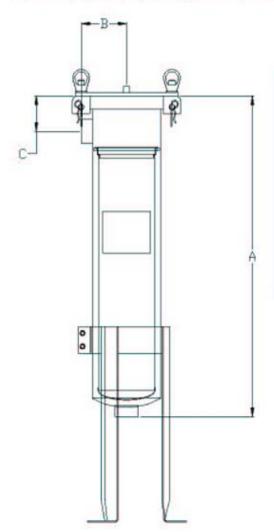


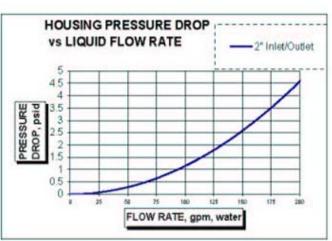
Tel: (416) 490-7848 Fax: (416) 490-0974 www.filterinnovations.com

Dimensional Data

Model	Flow Rate (gpm)	Shipping Weight (lbs)	A (Cover to Outlet)	B (Center to Inlet)	C (Cover to Inlet)
EB111-2P	100	60	26 3/4"	4 7/8"	4"
EB111-2F	100	65	29 1/8"	7 1/2*	4"
S4EB111-2P	100	60	26 3/4"	4 7/8"	4"
S4EB111-2F	100	65	29 1/8"	7 1/2*	4"
S6EB111-2P	100	60	26 3/4"	4 7/8"	4"
S6EB111-2F	100	65	29 1/8"	71/2*	4"
EB112-2P	200	70	38"	4 7/8"	4"
EB112-2F	200	75	40 5/8"	71/2"	4"
S4EB112-2P	200	70	38*	4 7/8*	4"
S4EB112-2F	200	75	40 5/8"	71/2*	4"
S6EB112-2P	200	70	38"	4 7/8"	4"
S6EB112-2F	200	75	40.5/8**	7 1/2*	4"

^{***}Dimensions given are typical only. For critical requirements contact F.I.I. for a certified drawing.





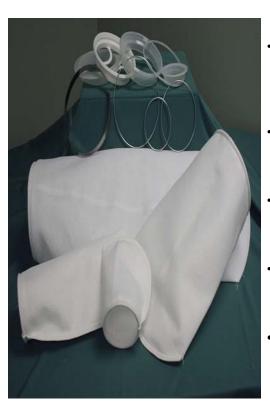
NOTE: Actual flow rate is dependent on fluid viscosity, micron rating, contaminant and type of media.

FII FILTER BAGS

Filter Innovations Inc. is a leading supplier of filter bags, filter cartridges, filter housing, and media filters designed to meet the requirements of all types of liquid filtration applications.

FEATURES

- · High Solids collection Capacity
- Solids are contained in the bag for easy disposal
- Interior of vessel remains clean after bag removal, thus Reducing cleanup time
- Longer operating cycles
- Lower operating coast.
- Multi-layer filtering capabilities for higher dirt holding capacities
- · Wide array of media fibers to meet needed temperature and micron specifications
- Broad range of proprietary media provides excellent filtration performance and greater consistency
- Offered with plastic and metal rings for wide temperature compatibility
- · Weld or sewn construction
- Silicone free to prevent craters to provide better surface results.



STYLES OF FILTER BAG MEDIA

- FELT: Available in polyester and polypropylene, felt is generally used when particle retention of 1-200 microns is required. Felt media provides three dimensional depth filtration, resulting in a much higher solids loading capacity over the equivalent area of mesh fabric.
- MESH: NYLON MONOFILAMENT- A woven fabric with evenly spaced holes. Suitable for surface filtration only, monofilament consists of single untwisted thread. Bags are available in 25-800 microns.
- POLYESTER MULTIFILAMENT- Also suitable for surface filtration, this low cost, disposable fabric consists of many smaller diameter threads twisted together. Available in 100-800 microns.
- OIL REMOVAL- Filter bags: designed to remove trace amounts of petroleum based products from paints, coatings, and other industrial fluids.
- MAXIMUM OPERATING TEMPERATURES: Polypropylene: 200-220 degrees Fahrenheit Polyester: 275-325 degrees Fahrenheit Nylon: 275-300 degrees Fahrenheit

Covered filter bags are also available. The cover contains any fibers that may separate from felt bag. Available in nylon mesh, polyester mesh, and cerex.

Fiber	Organic Solvents	Animal Vegetable & Petro Oils	Micro- Organisms	Alkalies	Organic Acids	Oxidizing Agents	Mineral Acids	Temperature Limitations (max. deg. F)
Polyester	Excellent	Excellent	Excellent	Good	Good	Good	Good	325
Polypropylene	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good	225
Nylon	Excellent	Excellent	Excellent	Good	Fair	Poor	Poor	325

^{*} Chart is to be used as a guide. User should make test with specific media to assure compatibility

Filter Bag Data

Bag size	Length	Diameter	Surface Area	Bag Volume
	(inches)	(inches)	(sq. ft.)	(gallons)
1	16.5	7.06	2.0	2.1
2	32	7.06	4.4	4.6
3	8	4.12	0.5	0.5
4	14	4.12	1.0	1.0
7	15	5.62	1.3	1.3
8	21	5.62	2.0	1.5
9	32	5.62	3.4	2.8
12	32	8.37	5.6	6.0

Standard Filter bags



Diameter- 7 inches Length- 17 inches

Size 1



Diameter- 7 inches Length- 32 inches



Size 3

Diameter -4 inches Length- 8 inches



Diameter 4 inches Length- 15 inches

Size 4

Industry Applications

The liquid filter bags (and housings) supplied by Filter Innovations Inc. are used in a wide number of industries such as the paper, food, and petroleum industries, and for a variety of applications such as removing undispersed solids, filtering condensate, and removing plastic fines from water. A more thorough list of applications and industries is displayed below.

Applications for Liquid Bag Housings

Filter Recirculating	Clean Electrolytic Solutions	Protect Chiller and Air conditioners
Keep Spray Nozzles Open	Remove Oversize Particles from Slurries	Protect Reverse Osmosis Systems
Protect Catalyst Beds	Filter Condensate	Filter Broiler Feed Water
Protect Instruments	Filter Bottle and Can Wash Water	Filter Pump Seal Water
Remove DE Filter Carryover	Filter Poultry and Meat Wash Water	Protect Glue Applicators
Remove Precipitated Solids	Remove Char Particles	Filter Scrubber Water
Remove Undispersed Solids	Filter Cooling Tower Water	Remove Plastic Fines From Water
Remove Particles from Coatings	Filter Waste Oil for Reuse	Remove Pulp from Juices

Industries

Paper	Food	Petroleum	Chemical	Misc.
Clay Slurry	Peanut Butter	Amine	Acetic Acid	Adhesives
Pigmented Coatings	Corn Syrup	Reduced Crude's	Brine	Solvents
Fresh Water	Lard	Feedstock's	Calcium Carbonate	Resins
White Water	Dextrose	Pump Seal Water	Cooling Tower	Liquors
Decker	Chocolates	Naptha	Ethylene Glycol	Paints
Shower Water	Jelly	Fuel Oil	Herbicides	Shampoo
Size	Juices	Motor Oil	Hydrochloric Acid	Dyes
Starch	Milk Sugar	Hydraulic Oil	Latices	Beer
Tio2 Slurry	Edible Oils	Synthetic Lubricants	Pellitizer Water	Beverages
Mill Water	Soybean Concentrate	Completion Fluids	Polymers	Pharmaceutical
Wet End Additives	City and Well Water	Injection Fluids	Resins	Toothpaste
Cooling Water	Tea Liqor	Cooling Tower Water	r Sulphuric Acid	
Dyes	Extracts			
Pump Seal Water				

HOW TO ORDER FILTER BAGS

PEF 25 MATERIAL / MICRON

PE,PEF,PEA = Felt Polyester

Microns: 1,5,10,15,25,50,75,100,200

PO, POF, POA, = Felt Polypropylene

Microns: 1,3,5,10,25,50,100

PEMU = Mesh, Polyester Multifilament

Microns: 100,150,200,250,300,400,600,800

NMO = Mesh, Nylon Monofilament

Microns: 25,50,75,100,150,200,300,400,600,800,

FOS = Oil Removal Material

POXL = Extended life

BAG FINISH OR COVER

P= None or Glazed

C= Cerex Cover

PEM= Polyester Multifilament Cover

NMO= Nylon Monofilament Cover

WELDED SIDE SEAM

W = welded side WW= welded side and bottom

HANDLE

H = Handle

RING OR FLANGE

SS = Stainless steel

P or N = Poly or Nylon Flange

RP = Ronnigen-Peter

S = Carbon Steel Ring

R = Tie On

DS= Drawstring DST= Drawstrap

C= Commercial ring

BAG SIZE

SP= 7" plastic internal ring

 $1 = 7 \frac{1}{16}$ " X $16 \frac{1}{2}$ " (P1S)

2 = 7 1/16" X 32" (P2S)

3 = 4 1/8" X 8" (LFB-1, P3S)

4 = 4 1/8" X 15"(LFB-2, P4S)

7 = 5.5/8" X 15" (P7S)

8 = 5 5/8" X 21" (P8S)

9 = 55/8" X 32" (P9S)

 $12 = 8 \frac{1}{4}$ " X 32" (P12S)



PRODUCT DATA SHEET

POLYESTER FILTER BAGS

PE P1P(S) / PE P2P(S) PE LFB1 / PE LFB2

Polyester needle felt features a three dimensional structure of high porosity. This results in a much higher solids loading capacity over the equivalent area of mesh fabric. The outer surfaces on all filter bags have been heat treated to give a glazed finish to help reduce fiber migration.



Filter Medium: Polyester

Handle: Optional, Twill Tape

Micron Ratings: 1, 3, 5, 10, 15, 25, 50, 75, 100, 150, 200 Nominal

Ring: Polypropylene or Steel, Zinc plated

Options: Covers

Maximum Differential

Pressure: 50 PSID (3.5 kg/cm²) in restrainer basket

Maximum

Temperature: 300°F (135°C)

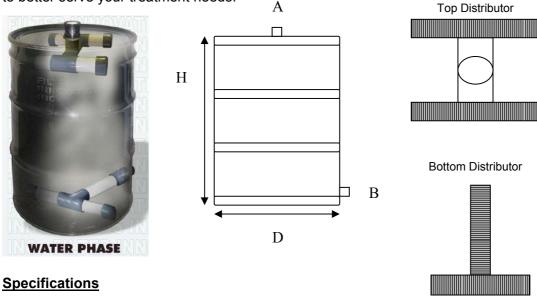
Dimension:

Model	Size	Dimensions (D x L)
PE- LFB1	P3	4 1/8" X 8"
PE- LFB2	P4	4 1/8" X 15"
PE- P1P	P1	7 1/16 " X 16 ½ "
PE-P2P	P2	7 1/16" X 32"



PRODUCT DATA SHEET FII WATER POLLUTION CONTROL BARRELS

FII Water Pollution Control Barrels are low cost, self-contained water purification adsorbers designed to treat liquid streams of up to 20 GPM. The units are available in three different sizes to better serve your treatment needs.



Features/Models	FII – 55 – WAT - AC	FII – 85 - WAT -AC	FII - 110 - WAT - AC
D- Diameter	24"	28"	32"
H - Height	35"	39"	43"
A- Inlet	2" MPT	2"FPT	2" FPT
B - Outlet	2" MPT	2" FPT	2" FPT
Carbon Weight, lbs	165	300	400
Max. Flow Rate, GPM	5	15	20
Max. Pressure, psig	10	7	7
Temperature, ° F	140	140	140
Flow direction	Downflow	Downflow	Downflow

Connections

Metal connections with standard pipe threads ensure easy, durable and leak proof hookup to the system. Unions or quick connect fittings are advised to better facilitate drum exchange.

Distributors

Both inlets and outlets have low pressure drop slotted schedule 40 PVC distributors to help resist challenging. Stainless Steel is available for high temperature applications.

<u>Cover</u>

The removable 16-gauge lid is secured by ring-and-bolt closure and has a poly clad cellulose gasket.

Coatings

The inside is coated with a heat-cured phenolic resin while the outside coating is industrial enamel. A poly liner is available for extra corrosion resistance.





TM-100- Modified Organophillic Clay

TM-100 is a proprietary granular filtration media that reliably absorbs oil and greases and other high molecular weight low solubility organics from water. It is a mixture of 30% active sorbet and 70% anthracite filter media, which allows for maximum utilization by the large sorption capacity of TM-100 without excessive pressure build-up in the column.



Properties	Value
Appearance:	Brown and Black granules
Specific Gravity:	2.5
BTU Value of Spent Media:	9,800 – 10,000 BTU/lb.
Solubility in Water:	Negligible
Melting Point:	1400°F
Density	60 lbs/cu.ft
Effective Size	8x30 US Mesh
Hydraulic loading	2-5 gpm/sq.ft.
Support Bed	2" Over Underdrain required (Anthracite)
Retention time	7-10 minutes
Backwash expansion	20% of Bed depth
Density	50lbs/ft3

TM-100 is capable of absorbing up to 60% of its weight in oil and other organic wastes. It can be used as a pre-treatment to GAC and extend its lifetime by as much as 500%, and also increases its GAC overall efficiency by preventing surface pores from blinding caused by oils. greases and other less water-soluble organics. TM-100 absorbs organics through a series of clay platelets, making it less susceptible to blinding and more efficient overall.

TM-100 is designed to be a fixed bed media in a column operation. The spent material is easily removed and can be classified as non-hazardous, depending on what has been removed and what remains. The high BTU value of TM-100 makes recycling through fuel blending desirable, whether classified as hazardous or non-hazardous.

Features and Benefits

Non reactive, non hazardous

Packaged in 50# boxes or bulk super sacks for easy storage and movement Can accommodate surges in organic concentration levels caused by plant upsets Unique sorption mechanism eliminates blinding and maintains flow rates Effective treatment on different types waste streams containing organic materials Removes dissolved, mechanically emulsified, and free oil from wastewater TM-100 can be easily adapted in general filtration systems Can be applied as a fixed bed media or removable cartridge.



www.filterinnovations.com

GC 12X40 S Granular Activated Carbon From Coconut Shell

GC 12X40 S is a virgin activated carbon, which is granular in form. Made from selected grades of coconut shell, it is ideal for many liquid phase applications including the removal of organics from water streams. Its superior level of hardness makes it cleaner than most other carbons and gives it longer life expectancy.

Specifications

Mesh size - 12x40, %:	90(min)
Less than No. 12, %:	5(max)
Greater than No. 40, %:	5(max)
lodine Number, mg/g:	1100(min)
Surface Area, m ² /g:	1100(min)
Hardness, %:	98(min)
Ash Total, %:	4.0(max)
Moisture, % (as packaged):	5.0(max)
Typical Density, lbs./cu.ft.:	29-33
g/cc:	0.46-0.53

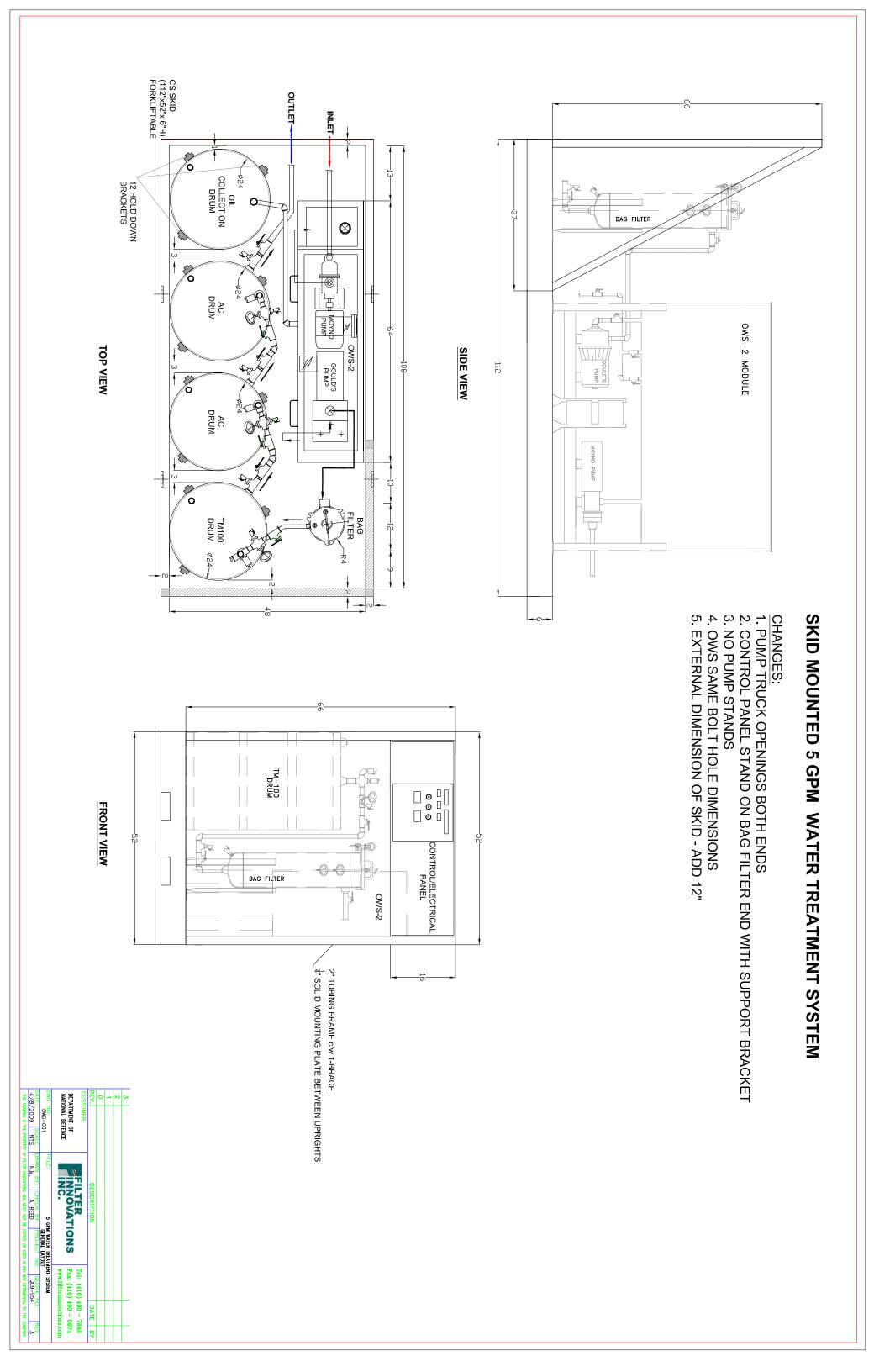
^{*}Standard packaging is in 55 lb. vinyl bags. Other packaging is available upon request.

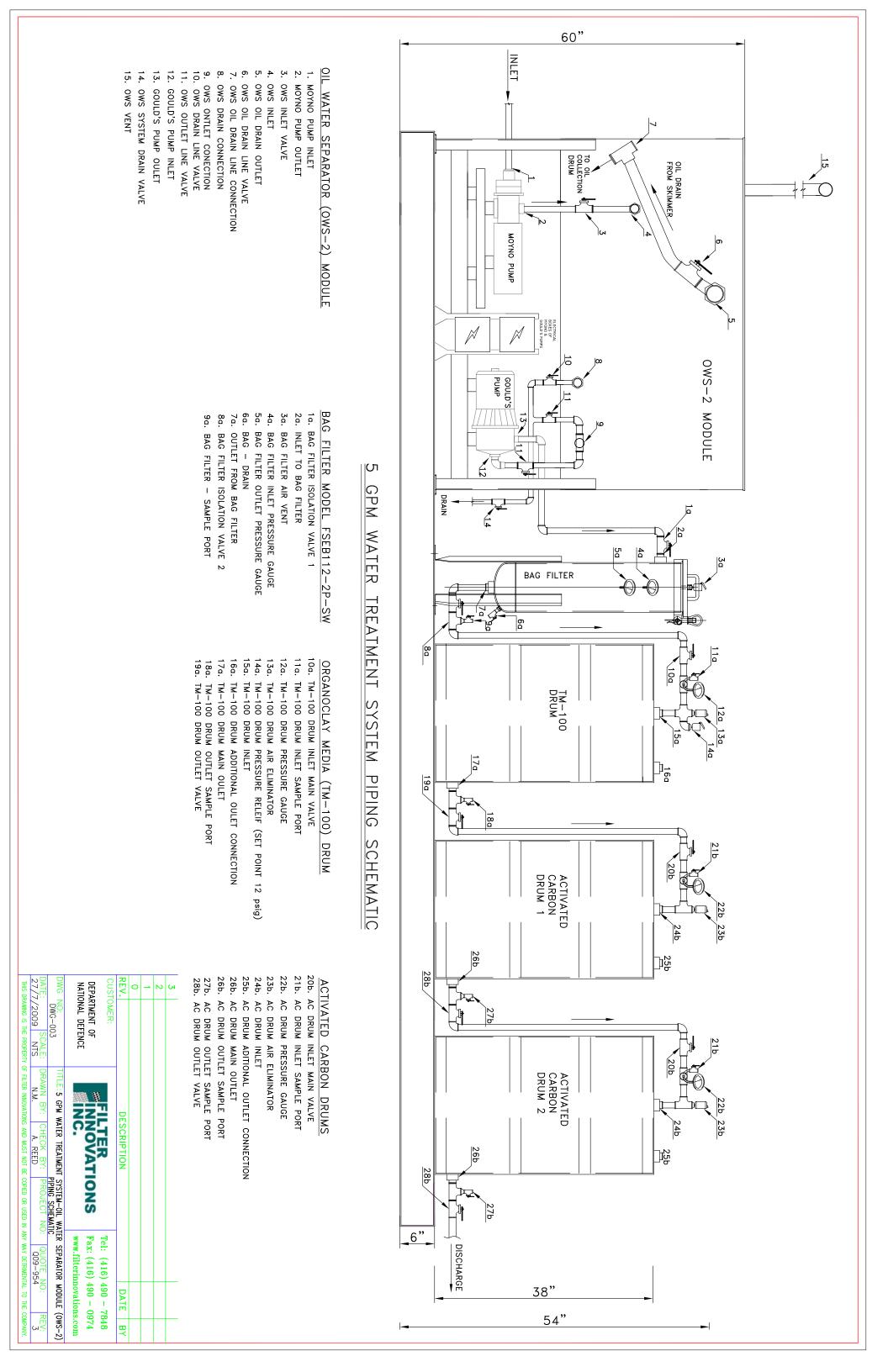
Caution!

Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels. Confined space/low oxygen procedures should be put in place before any entry is made. Such procedures should comply with all applicable local, state and federal guidelines.

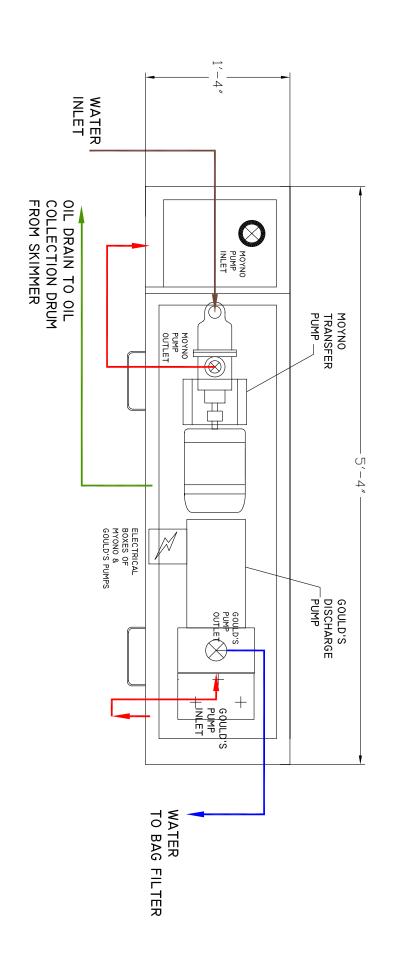
TECHNICAL DRAWINGS







OIL WATER SEPARATOR MODULE (OWS -2) SYSTEM SCHEMATIC LAYOUT

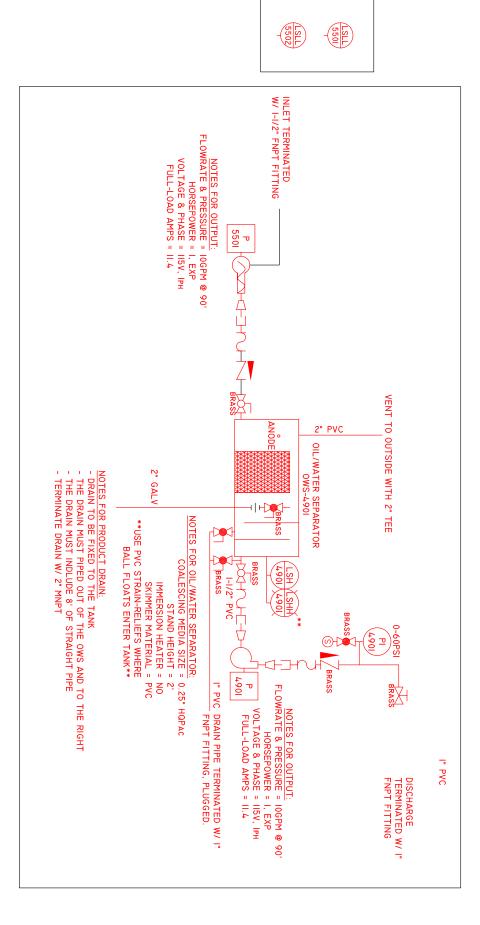


Notes:

- MOUNT PUMPS UNDER OWS
- PROVIDE AN 8' PRODUCT DRAIN PIPE, LOOSE.



PROCESS & INSTRUMENTATION DIAGRAM (P&ID) OIL WATER SEPARATOR MODULE



WIRING AND SPECIAL PROJECT NOTES

INPUT CONNECTIONS PROVIDE A NEMA4 JUNCTION BOX ON OWS FOR

OUTPUT CONNECTIONS PROVIDE A NEMA4 JUNCTION BOX ON OWS FOR

HAVE A HOV PLUG FOR POWER. PUMP) EACH TO POWER ONE PUMP, AND EACH TO PROVIDE TWO NEMA4 PANELS (ONE FOR EACH

- PIPING DETAILS:

 WATER FLOW METERS: PROVIDE 10 DIA. OF STRAIGHT PIPE BEFORE AND 5 DIA.

 OF STRAIGHT PIPE AFTER METERS. ENSURE THAT THROTTLING VALVES ARE

 NOT DIRECTLY IN LINE WITH METERS.

 AIR FLOW METERS: PROVIDE 8 DIA. OF STRAIGHT PIPE BEFORE AND 3 DIA. OF
- STRAIGHT PIPE AFTER METERS, IF POSSIBLE. AVOID TEES AND ELBOWS BEFORE AND AFTER METERS.

 MATERIALS OF VALVES AND FITTINGS TO BE THE SAME AS THE DESCRIPTION AT THE LINE.

 IF THERE IS A TRANSITION FROM PLC TO STEEL, THE VALVE SHOULD BE BRASS.

 THERE IS A TRANSITION FROM PLC TO STEEL, THE VALVE SHOULD BE BRASS.

 THERE ARE NO SPECIAL PIPING REQUIREMENTS OTHER THAN WHAT IS EXPLAINED
 ON THE DIAGRAM.

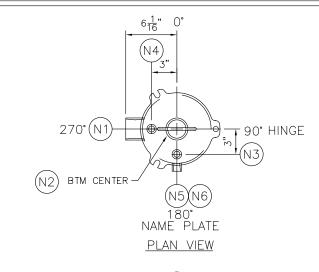
 ON THE DIAGRAM.

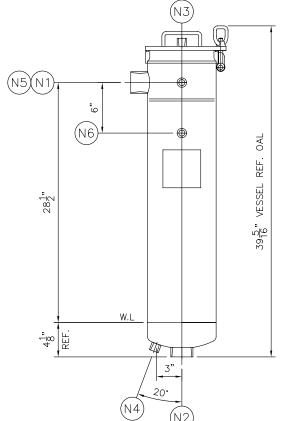
 WHEN PLC HOSE IS SPECIFIED, ALWAYS USE VACUUM HOSE; USE GREEN HOSE FOR PRESSURES BETWEEN GOPSI AND ISOPSI.

 PRESSURES LESS THAN GOPSI; USE TAMY TRUCK HOSE FOR PRESSURES BETWEEN GOPSI AND ISOPSI.

 PLC PIPE MAY BE SUBSTITUTED WITH EQUAL-SIZED PLC HOSE WHERE A FLEXIBLE CONNECTION IS PREFERRED.
- DWG NO:
 DWG-003

 DATE:
 27/7/2009 SCALE:
 THS DRAWING IS THE PROPERTY OF DEPARTMENT OF NATIONAL DEFENCE TITLE:5 OPM WATER TREATMENT SYSTEM-OIL WATER SEPARATOR MODULE (OWS-2)
 PROCESS & INSTRUMENTATION DIAGRAM
 DRAWN BY: CHECK BY: PROJECT NO: QUOTE NO: REV.
 A REED INNOVATIONS INC. Tel: (416) 490 - 7848 Fax: (416) 490 - 0974 DATE BY





ELEVATION VIEW (SEE PLAN VIEW FOR TRUE ORIENTATION)

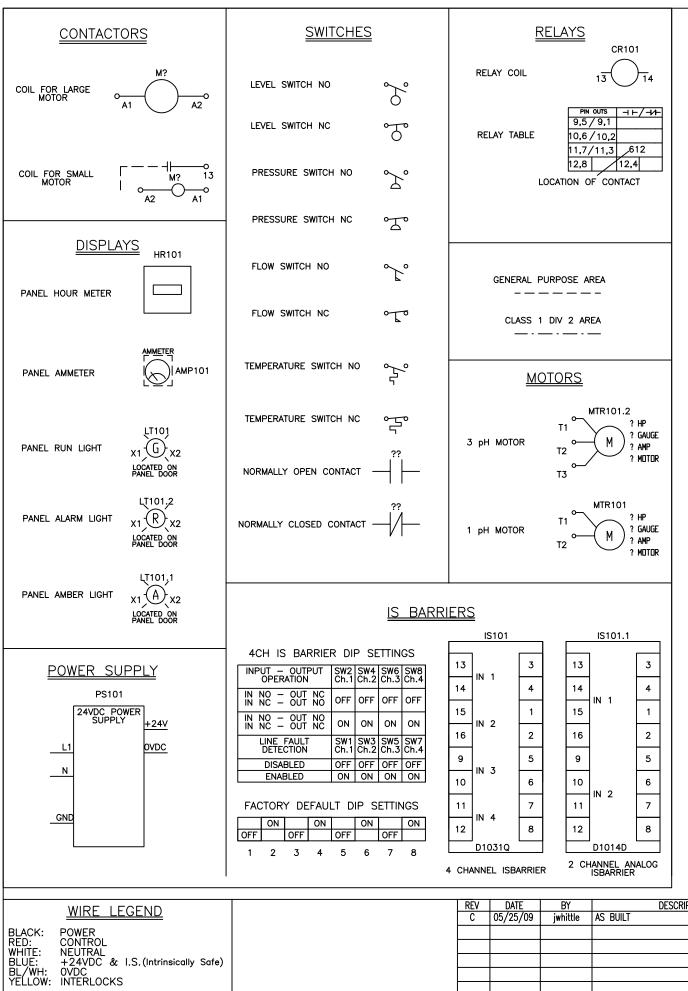
DESIGN DATA									
DESIGN	I PRES	SSURE	1	150 PSIG					
MIN./MAX.	DESIGN	TEMPERATURE	-	-20/225°F					
CODE				ASME SECT.	VIII DIV.1				
CODE	STAMP			NONE					
CRN				NONE					
CORRO!	SION AL	LOWANCE		NONE					
RADIO	GRAPH`	ſ	NONE						
PWHT				NONE					
		VESSEL O	PI	PENING SCHEDULE					
MK. NO.	SIZE	RATING		FITTING	REMARKS				
N1	2"	150#		FNPT	INLET				
N2	2"	150#		FNPT	OUTLET				
N3	1/2"	3000#		FNPT	VENT				
N4	1/2"	3000#		FNPT	DRAIN				
N5	1/2"	3000#		FNPT	DPI				
N6	1/2"	3000#		FNPT	DPI				

- NOTE:
 1. FLANGE BOLT HOLES SHALL STRADDLE NORMAL
 2. REMOVE ALL SHARP EDGES
 3. SURFACE PREPARATION:
 INTERNAL: AS WELDED
 EXTERNAL: ELECTRO POLISH
 COATING:

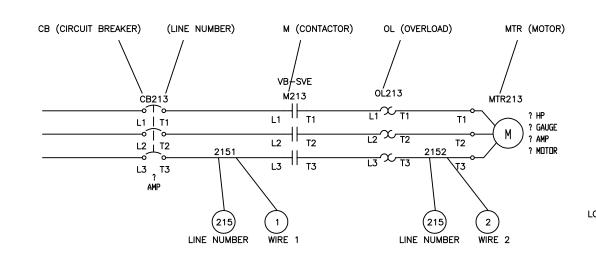
INTERNAL: NONE
EXTERNAL: NONE
4. ESTIMATED EMPTY WEIGHT: 85 LBS.

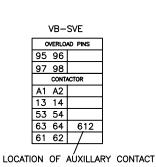
CUSTOMER: CUSTOMER P.O: QUANTITY: FSI WORK ORDER NO.: MATERIAL OF CONSTRUCTION: 304SS OR 316SS APPROVED FOR FABRICATION:

TOLERANCES		EVISION	1 S		T.OOO									
(EXCEPT AS NOTED)	NO.	DATE	BY		RINNOVA	TIONS INC.								
DECIMAL	1				TORONTO, ONTARIO, C	CANADA								
± 0.125"	2			TITLE										
FRACTIONAL	3			MODEL FSE	B112-2P-SW (general arrangeme	ENT							
± 3/8"	4			DRW: CD	DATE: FEB 4 2008	DRAWING NO.	REV							
ANGULAR	5			снеск'd: FSI	DATE: FEB 4 2008	CS FSEB112-1P-SW	0							
±1°	6			appr'd: PB	scale: NTS	SHT.NO: 1 OF 1								

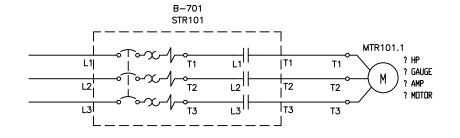


WIRE NUMBER DESCRIPTION





COMBINATION MOTOR STARTER



	B-	701
	TERM	INALS
A1	A2	
13	14	
53	54	
63	64	
97	98	
53 5	540L	

REV	DATE	BY	DESCRIPTION		NAME	DATE
С	05/25/09	jwhittle	AS BUILT		NAME	DATE
				DRAWN	PR	07/06/0
						<u> </u>
				CKD		
				ADDD		
				APPR		ĺ

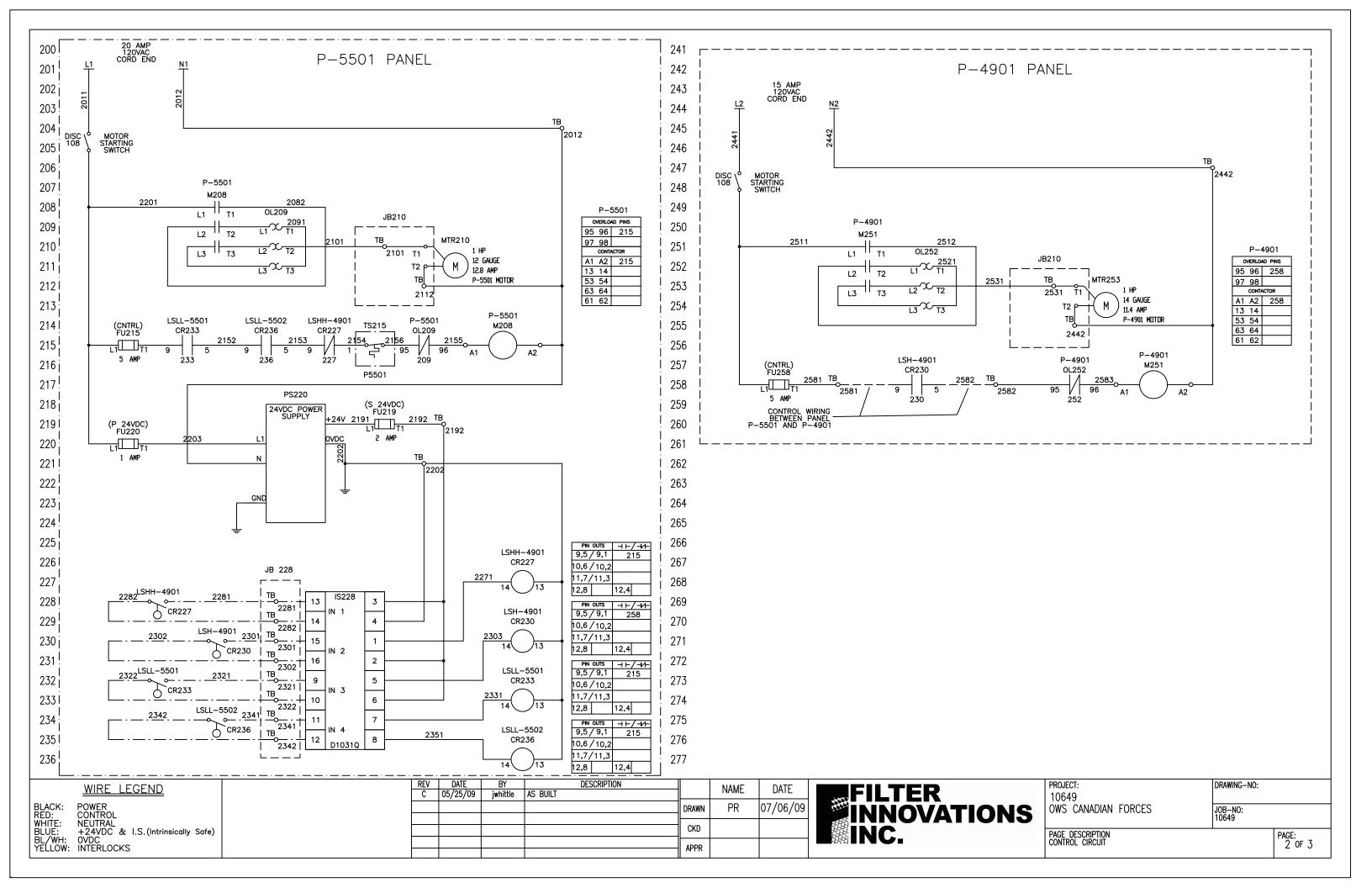
LINE NUMBERS

[\]214

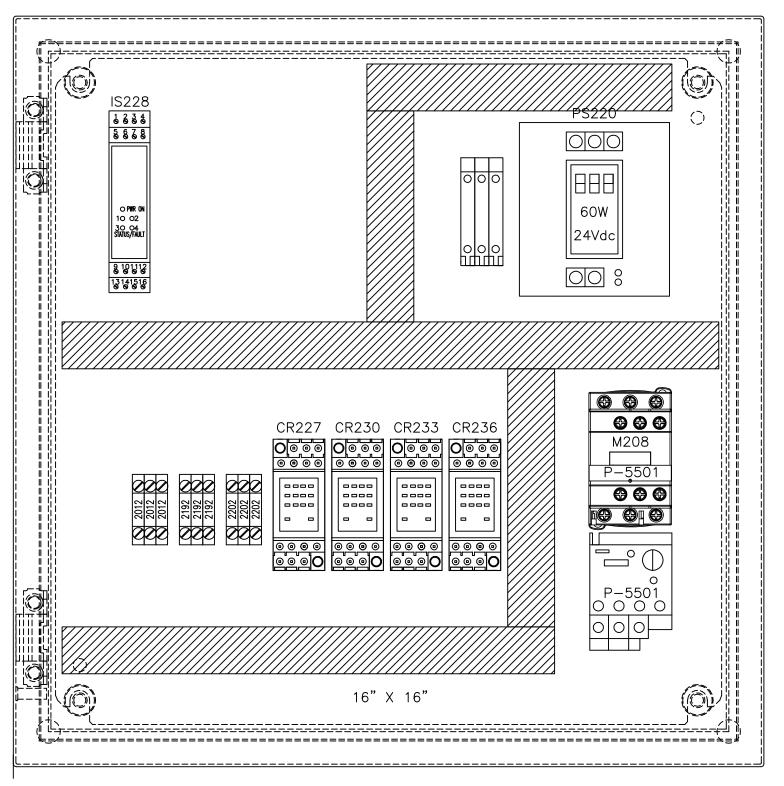
[\]215



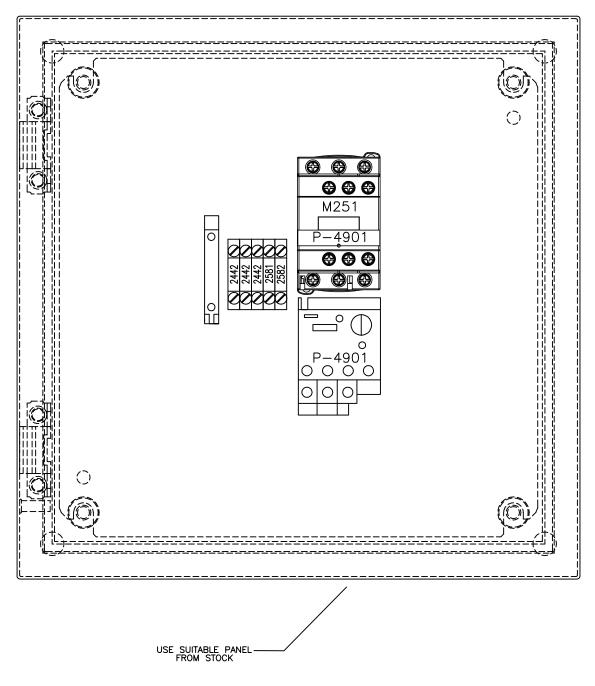
PROJECT:	DRAWING-NO:	
10649		
OWS CANADIAN FORCES	JOB-NO: 10649	
PAGE DESCRIPTION CAPE DYER		PAGE: 1 OF 3



P-5501 PANEL



P-4901 PANEL



	WIRE LEGEND	REV	DATE	BY	DESCRIPTION		NAME	DATE
	WINE LEGEND	С	07/14/09	jwhittle	AS BUILTS		INAME	DATE
BLACK:	POWER					DRAWN	PR	07/06/0
RED:	CONTROL NEUTRAL					\vdash	<u> </u>	, ,
BLACK: RED: WHITE: BLUE: BL/WH: YELLOW:	+24VDC & I.S.(Intrinsically Safe)					CKD		
BL/WH:	OVDC INTERLOCKS					APPR		
TELLOW:	INTERLOCKS					AFPK	· '	



PROJECT: 10649 OWS CANADIAN FORCES	DRAWING-NO: JOB-NO: 10649	
PAGE DESCRIPTION		PAGE: 3 OF 3

Inputs and Setpoints

10649 Project:

OWS Canadian Forces

Digital Input Summary Digital PLC Inputs: 0

Digital PLC Frequency: 0 Analog(4-20) Inputs: 0 Analog(5V) Inputs:

Analog(10V) Inputs: 0

Analog Input Summary

Analog IS: 0 Digital IS: 4

Legend for Class ISA: Intrinsically Safe Analog ISD: Intrinsically Safe Digital GP: Wire General Purpose D1: Wire as DIV1 D2: Wire as DIV2

<u>PLC</u> <u>Signal</u> Datalogger (DLO6) Name Class High Units SQR Fctr Offsite_Col Note Main Monthly (Daily for 30 days Tag Type Input Value State Low Digital_Relay 4900 Oil/Water Separator Level Switch High - Oil Water Separator Digital_Relay ISD LSH-4901 NormOpen Controls P-4901. Control panel to be Nema LSHH-4901 Level Switch High High - Oil Water Sepa Digital_Relay ISD NormOpen Controls P-5501 Control panel to be Nema 4 5500 Inlet Tank LSLL-5501 Level Switch Low Low - Sump 1 Digital_Relay ISD NormOpen Controls P-5501 Control panel to be Nema 4 LSLL-5502 Level Switch Low Low - Sump 2 Digital_Relay ISD NormOpen Controls P-5501 Control panel to be Nema 4

Thursday, July 16, 2009 Page 1 of 1

		-	Total Amps: Total Watts: Largest Mot													
Tag	PLC Loc	L		tage	Watts	HP	Switches Amps At Device	On Panel	<u>Panel Setu</u> Hourmete	<u>)</u> er Ammeter	Analog Setup Signal_Low Signal_High	Offsite Communicati	on Package Offsite_Color	Offsite_Name	Hourmeter Ammeter	<u>Datalog</u> Monthly Mai
Digital Rela	<u>vy</u> bil/Water Separator						Logic									
P-49	901	Motor	Cntr 115	V-1ph		1	11.4 None	None	None	None						
Pum	np - Oil Water Separator								RUN AND LSH-4901 IN RUN OR LSH-49	-						
							110V wall or	itlet. Will need to	rel switch. Control bo o use IS relays or IS I DADS on motor starte	arriers. Refer	plug into to					
<i>5500</i> In	nlet Tank															
P-55	501	Motor	Cntr 115\	V-1ph		1	11.4 None	None	None	None						

PUMP FEEDS OWS PUMP START: SYSTEM IN RUN AND LAHH-4901 OFF AND LSLL-5501

ON AND LSLL-5502 ON PUMP STOP: SYSTEM NOT IN RUN OR LAHH-4901 ON OR LSLL-5501

NOTE: Pump to be run off level switch. Control box to be able to plug into 110V wall outlet. Will need to use IS relays or IS barriers. Refer to 10643(GP version). OVERLOADS on motor starters.

OWS Canadian Forces

OFF OR LSLL-5502 OFF

Thursday, July 16, 2009

Page 1 of 1

10649

Project

Discharge Pump - Inlet Tank

Outputs

SYSTEM PHOTOS





System control panels



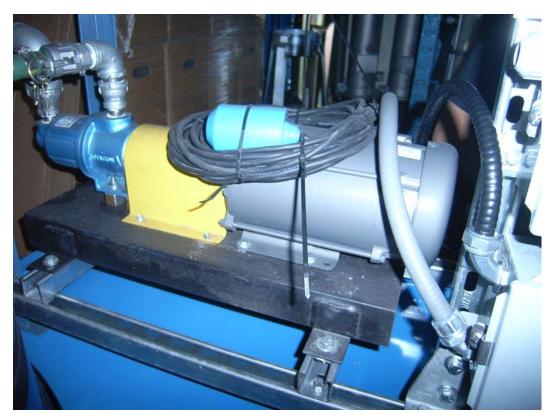
Control panel for Moyno pump (detail)



Control panel for Gould's pump (detail)



Gould's pump



Moyno Pump



5 GPM treatment skid



5 GPM treatment skid (alternate view)

QUOTATION



www.filterinnovations.com

June 8, 2009

Department of National Defence

Room 305, Building 22, 74 Polaris Box 1000 Stn Forces Astra, ONTARIO K0K 3W0

Tel: 613-392-2811 x 3997 (Cell: 613-849-4687)

Fax: 613-965-3368

Email: <u>Don.Kovanen@forces.gc.ca</u> / <u>Clive.Batchasingh@dcc-cdc.gc.ca</u>

Quote #: **Q09-954 rev 3.0**

Attn: Don Kovanen/ Clive Batchasingh (X.4223) Cell (613) 921-4612

Re: 5 GPM water treatment system

Dear Don,

As a follow-up to your inquiry, I am pleased to present you with the following quotation for consideration.

Water treatment system

The system would consist of a sump pump to pump the water into the oil water separator to remove all the free products down to 15-20 ppm. Removed oil will be collected in a collection drum and water will continue into a bag filter where all the particulates will be removed and then continues into the treatment system for more polishing. The Gould pump will pump the water from OWS into the bag housing and media drums. Then it would continue into a treatment system that would consist of one or two treatment trains (depending on the flow rates). Each train consists of TM 100 organoclay drums and activated carbon drums (all piped in series). If there are two treatment trains, they will be piped in parallel. TM 100 will remove remaining oil and activated carbon will remove small organic molecules. All the vessels will be mounted on a skid for easier mobility.

Engineering Assumptions:

120V single-phase power available

Hazardous CL 1 DIV 2 location for equipment

Non-hazardous location for control box

Site noise constraints: none specified

Contaminants: none specified Ambient up to 100 degrees F

Altitude 100 feet

Design Parameters:

Inlet transfer pump to OWS - 10 GPM @ 100' TDH

10 GPM oil water separator with integral water retention tank

Water transfer pump from OWS - 10 GPM @ 90' TDH

www.filterinnovations.com

5 gpm treatment system consists of:

- One skid Approx dimensions: 4ftx8ft to mount:
 - o One Inlet Moyno pump to OWS 10 GPM @ 100' TDH
 - One 10 GPM oil water separator with integral water retention tank
 - Small control junction box for pumps and level switches
 - o One water transfer pump from OWS 10 GPM @ 90' TDH
 - o One bag filter/ filter bags
 - o One TM 100 Organo Clay drum
 - o Two Activated Carbon drums
 - o All media
 - All external piping
 - o Interconnecting piping will be flex hose
 - One day site service included.
 - Delivery to Trenton Included.

Description of the components:

Oil Water Separator Module:

Oil Water Separator Module:

Model **OWS-2**,10 GPM oil water separator with:

- Dimensions 64"L x 36"H x 12"W
- Designed for oils with a specific gravity of less than 0.85
- 25 micron removal size
- Carbon steel construction
- Exterior to be primed and painted with a two component chemically-cured urethane gloss enamel (Blue)
- Interior to be sandblasted with an epoxy coating
- Removable, gasket sealed, hinged lid
- Sacrificial anode to prevent corrosion of tank
- Adjustable rotary skimmer
- Easily removable HQPac coalescing media
- 2' stand
- Ventilation stack
- 23 G water effluent chamber
 - o Effluent chamber high level alarm switch
 - o Effluent chamber pump control switch
- Manual drains

Inlet progressive cavity Moyno transfer pump with 1 HP 120/230V motor:

- Performance: 10 GPM at 90' TDH
- Motor: EXP
- 120V/1P plug on pump for plug into 15amp GFI

Water discharge piping from inlet transfer pump to contain the following components:

Pressure gauge



www.filterinnovations.com

- Sample port
- Check valve
- Recirculation line
- PVC piping

Water inlet piping to discharge transfer pump to contain the following components:

Ball valve

Discharge Gould's NPE model 1ST centrifugal transfer pump with 1 HP 120/230V motor:

- Performance: 10 GPM at 90' TDH
- Motor: EXP
- 120V/1P plug on pump for plug into 15amp GFI

Water discharge piping from discharge transfer pump to contain the following components:

- Pressure gauge
- Sample port
- Gate valve
- Check valve
- Anti-siphon safety valve
- PVC piping

Small junction boxes for level switch and pump connection:

Bag filter housing (one required)

Model EB112-2P-SW (Single-bag filter housing)

To handle flows of up to 180 USgpm

Description

150 psig carbon steel double-length bag filter housing (Non-coded)

- Buna-N O-rings
- Side entry
- 2" FNPT inlet/outlet connections
- ½" FNPT Drain connection
- ½" FNPT Vent connection
- 1/2" FNPT Pressure gauge connections
- Adjustable galvanized steel legs
- 316 stainless steel restrainer basket
- Accommodates size 2 filter bags (7" diameter x 32" length)
- Shipping weight: 55 lbs.
- Vessel exterior coated with enamel paint

Filter bags for above housing (one case required)

Model PE1 P2P

One micron (1µ) polyester filter bag with polypropylene ring

Description

Polyester needle felt features a three dimensional structure of high porosity. This results in a much higher solids loading capacity over the equivalent area of mesh fabric. The



outer surfaces on all filter bags have been heat treated to give a glazed finish to help reduce fibre migration.

Micron rating: 1µ nominal
Bag dimensions: 7" X 32"

Ring material of construction: Polypropylene

- Maximum Differential pressure: 50 PSID (3.5 kg/cm²) in restrainer basket
- Maximum temperature to be used in application: 300°F (135°C)
- Standard packaging: Boxes containing 40 filter bags

Organoclay media drum

Model FII55WAT-CSI-TM100

To handle flows of up to 10 USgpm

Description

Disposable carbon steel water-phase pollution control barrel with internal PVC distributors filled with TM-100 modified organoclay media

- Nominal capacity of 55 U.S. gallons (44 imperial gallons)
- 2" FNPT top inlet/ bottom outlet connections
- Dimensions: 24" diameter x 35" height
- Media weight: 300 lbs.
- Total shipping weight: 360 lbs.
- Maximum flow rate: 10 USgpm
- Recommended flow: 5 USgpm
- Maximum pressure: 10 psig
- Maximum temperature: 140 °F
- Drum interior has a phenolic coating
- Drum exterior coated with enamel paint
- Includes 50lbs of Anthracite covering bottom header

Activated carbon drums

Model FII55WAT-CSI-1240S

To handle flows of up to 10 USgpm

Description

Disposable carbon steel water-phase pollution control barrel with internal PVC distributors filled with model 12x40S coconut shell-based activated carbon

- Nominal capacity of 55 U.S. gallons (44 imperial gallons)
- 2" FNPT top inlet/ bottom outlet connections
- Dimensions: 24" diameter x 35" height
- Carbon weight: 165 lbs.
- Total shipping weight: 225 lbs.
- Maximum flow rate: 10 USgpm
- Recommended flow: 5 USgpm



Maximum pressure: 10 psigMaximum temperature: 140 °F

- Drum interior has a phenolic coating
- Drum exterior coated with enamel paint

Interconnecting piping

All the vessels come complete with one set of 1" external piping such as inlet and outlet ball valve isolation valves, vent, drain valves, pressure gauges, sample ports, air eliminators, and pressure relief valve on TM 100 drum only. 100 ft of 1" Nylon Braded hose will be also included.

Special Notes:

- FII General Terms & Conditions are located at the end of the quote in Appendix
 A.
- 2. FII Warranty Statement is located at the end of the quote in Appendix B.
- 3. Obtaining any required site permits (i.e. building) is the responsibility of the customer; FII is not responsible for any such items.
- 4. All required site inspections including but not limited to electrical, building and fire are the responsibility of the customer; FII is not responsible for any such items.

Require (2) two weeks notice from customer to coordinate. **Startup Requirements to Validate Warranty.** FII highly recommends that the system be started by a FII factory trained startup technician to ensure the long-term success of your project. We understand that this may not always be feasible in which case we would require a highly skilled technician capable of trouble shooting both mechanical and electrical aspects of a process treatment system and be familiar with our manual and, equipment and be capable of training the operators on operating and maintenance requirements of the treatment system. The startup technician is responsible for carrying out the final step in our Quality Assurance process and is critical to reliability and operational success on your site. FII will provide a startup checklist to be completed by the startup technician that will be required to validate the warranty of your treatment system. The purpose of this checklist is to test the functionality of electrical, control, and mechanical components to ensure the system operates as originally designed. This testing is then documented so it can be referenced at a later date if needed.

Terms

All prices in Canadian dollars
Taxes and shipping extra (Shipping details to be confirmed upon placement of order)
50% with the PO, 50% Net 30
Prices are valid for 60 days
FOB Trenton

Regards,

Irene Hassas

MSDS SHEETS





MATERIAL SAFETY DATA SHEET

1. Product and Company Id€ TM 100

Material name M-100™

Chemical name Organoclay
CAS # Mixture

Company information Filter Innovations Inc.

744 Gordon Baker Road Toronto, ON M2H 3B4

(416) 490-7848

Emergency CHEMTREC (800) 424-9300

General information (800) 527-9948

2. Hazards Identification

Emergency overview

Potential health effects

Prolonged exposure may cause chronic effects.

Routes of exposure Inhalation. Eye contact

Eyes Dust or powder may irritate eye tissue.

Skin Health injuries are not known or expected under normal use. Not expected to be a primary

skin irritant

Inhalation May cause irritation of respiratory tract. Repeated or prolonged inhalation may cause toxic

effects. For additional information on inhalation hazards, see Section 11 of this safety

data sheet.

Ingestion Health injuries are not known or expected under normal use. Small amounts (a

tablespoonful) swallowed during normal handling operations are not likely to cause injury;

swallowing amounts larger than that may cause injury.

Chronic effectsThis product has the potential for generation of respirable dust during handling and use.

Dust may contain respirable crystalline silica. Overexposure to dust may result in pneumocononiosis, a respiratory disease caused by inhalation of mineral dust, which can lead to fibrotic changes to the lung tissue, or silicosis, a respiratory disease caused by inhalation of silica dust, which can lead to inflammation and fibrosis of the lung tissue. Occupational exposure to nuisance dust (total and respirable) and respirable crystalline

silica should be monitored and controlled.

3. Composition / Information on Ingredients

Components	CAS#	Percent
ANTHRACITE	8029-10-5	60 - 80
Non-hazardous and other components below reportable levels		20 - 40

The second secon

Composition comments

This product contains naturally occurring crystalline silica (not listed in Annex I of Directive

67/548/EEC) in quantities less than 6%.

4. First Aid Measures

First aid procedures

Eye contact Flush eyes with water as a precaution. Get medical attention if irritation develops or

persists.

Skin contactWash off with soap and water. Get medical attention if irritation develops or persists.InhalationRemove to fresh air. If not breathing, give artificial respiration or give oxygen by trained

personnel. Call a physician if symptoms develop or persist.

Ingestion No special measures required. If ingestion of a large amount does occur, seek medical

attention.

Notes to physician Symptoms may be delayed. Provide general supportive measures and treat

symptomatically.

General advice If you feel unwell, seek medical advice (show the label where possible).

3/6/2008 1/5



5. Fire Fighting Measures

Unusual fire & explosion hazards Material can spontaneously ignite (pyrophoric) when exposed to air at normal or slightly

elevated temperatures.

Extinguishing media

Suitable extinguishing media Use any media suitable for the surrounding fires. Dry chemical, CO2, water spray or

regular foam.

Protection of firefighters

Protective equipment for

firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH

(approved or equivalent) and full protective gear.

6. Accidental Release Measures

Personal precautions Wear a dust mask if dust is generated above exposure limits.

Environmental precautions No special environmental precautions required. Prevent further leakage or spillage if safe

to do so.

Methods for containment Eliminate all sources of ignition or flammables that may come into contact with a spill of

this material.

Avoid the generation of dusts during clean-up. Collect dust or particulates using a vacuum Methods for cleaning up

cleaner with a HEPA filter. Flush area with water to remove trace residue.

7. Handling and Storage

Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at Handling

places where dust is formed. In case of insufficient ventilation, wear suitable respiratory

equipment.

Keep the container dry. Keep in a cool, well-ventilated place. Guard against dust Storage

accumulation of this material.

8. Exposure Controls / Personal Protection

Occupational exposure to nuisance dust (total and respirable) and respirable crystalline Exposure guidelines

silica should be monitored and controlled.

ACGIH - Threshold Limits Values - Time Weighted Averages (TLV-TWA)

ANTHRACITE 8029-10-5 0.4 Mg/m3 TWA (dust, respirable fraction)

Particulates (Inert Dust) RR-00072-6 10 Mg/m3 TWA (inhalable particles, recommended); 3 mg/m3 TWA (respirable particles,

recommended)

ACGIH - Threshold Limits Values - TLV Basis - Critical Effects

ANTHRACITE 8029-10-5 lung damage; pulmonary fibrosis (dust)

Canada - Alberta - Occupational Exposure Limits - TWAs

Particulates (Inert Dust) RR-00072-6 10 Mg/m3 TWA (total particulate); 3 mg/m3 TWA (respirable particulate)

Canada - British Columbia - Occupational Exposure Limits - TWAs

ANTHRACITE 8029-10-5 0.4 Mg/m3 TWA (respirable dust)

Particulates (Inert Dust) RR-00072-6 10 Mg/m3 TWA (total dust); 3 mg/m3 TWA (respirable fraction)

Canada - Manitoba - Occupational Exposure Limits - TWAs

Particulates (Inert Dust) RR-00072-6 10 Mg/m3 TWA (total dust containing no asbestos and <1% free silica)

Canada - Ontario - Occupational Exposure Limits - TWAEVs

Particulates (Inert Dust) RR-00072-6 10 Mg/m3 TWAEV (inhalable); 3 mg/m3 TWAEV (respirable)

Canada - Quebec - Occupational Exposure Limits - TWAEVs

10 Mg/m3 TWAEV (total dust, containing no asbestos and less than 1% crystalline silica) Particulates (Inert Dust) RR-00072-6

U.S. - OSHA - Final PELs - Time Weighted Averages (TWAs)

Particulates (Inert Dust) RR-00072-6 15 Mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)

If material is ground, cut, or used in any operation which may generate dusts, use **Engineering controls** appropriate local exhaust ventilation to keep exposures below the recommended

exposure limits. If engineering measures are not sufficient to maintain concentrations of

dust particulates below the OEL, suitable respiratory protection must be worn.

Personal protective equipment

Eye / face protection Wear dust goggles. Eye wash fountain is recommended.

Skin protection No special protective equipment required. Normal work clothing (long sleeved shirts and

long pants) is recommended.

When workers are facing concentrations above the exposure limit they must use Respiratory protection

appropriate certified respirators.

General hygiene considerations Use good industrial hygiene practices in handling this material.

3/6/2008 2/5



9. Physical & Chemical Properties

Appearance Powder. Granular.
Color Not available

Form Solid.
Odor None.

Odor threshold Not available

Physical state Solid

pH Not available
Melting point 750 °F (398.9 °C)
Freezing point Not available
Boiling point Not available
Flash point Non-flammable
Evaporation rate Not available
Flammability limits in air, lower, % 50 g/cm3

by volume

Flammability limits in air, upper, %

by volume

Vapor pressureNegligibleVapor densityNot availableSpecific gravity1.2 - 1.7Solubility (H2O)Non-soluble

Octanol/H2O coeff Not available

Auto-ignition temperature 260 - 365 °F (126.7 - 185.0 °C)

Decomposition temperature Not available

Percent volatile Negligible

10. Chemical Stability & Reactivity Information

Chemical stabilityStable at normal conditions.Incompatible materialsIncompatible with oxidizing agents.

Not available

Hazardous decomposition products Upon decomposition, this product emits oxides of sulfur, carbon monoxide, carbon dioxide

and/or low molecular weight hydrocarbons.

Hazardous polymerization Will not occur.

11. Toxicological Information

Routes of exposure Inhalation. Eye contact

Acute effects Acute LD50: 23810 mg/kg, Rat, Oral

Component analysis - LD50

Toxicology Data - Selected LD50s and LC50s

BENTONITE 1302-78-9 Oral LD50 Rat: >5000 mg/kg

Inhalation Overexposure to dust may result in pneumocononiosis, a respiratory disease caused by

inhalation of mineral dust, which can lead to fibrotic changes to the lung tissue, or silicosis, a respiratory disease caused by inhalation of silica dust, which can lead to

inflammation and fibrosis of the lung tissue.

3/6/2008 3/5



Chronic effects

In 1997, IARC (the International Agency for Research on Cancer) concluded that crystalline silica inhaled from occupational sources can cause lung cancer in humans. However in making the overall evaluation, IARC noted that "carcinogenicity was not detected in all industrial circumstances studied. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." (IARC Monographs on the evaluation of the carcinogenic risks of chemicals to humans, Silica, silicates dust and organic fibres, 1997, Vol. 68, IARC, Lyon, France.)

In June 2003, SCOEL (the EU Scientific Committee on Occupational Exposure Limits) concluded that the main effect in humans of the inhalation of respirable crystalline silica dust is silicosis. "There is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk..." (SCOEL SUM Doc 94-final, June 2003)

According to the current state of the art, worker protection against silicosis can be consistently assured by respecting the existing regulatory occupational exposure limits. Occupational exposure to nuisance dust (total and respirable) and respirable crystalline silica should be monitored and controlled.

Carcinogenicity

ACGIH - Threshold Limits Values - Carcinogens

ANTHRACITE 8029-10-5 A4 - Not Classifiable as a Human Carcinogen

12. Ecological Information

EcotoxicityThis material is not expected to be harmful to aquatic life.

Environmental effects Based on the physical properties of this product, significant environmental persistence

and bioaccumulation would not be expected.

Ecotoxicity - Freshwater Fish Species Data

BENTONITE 1302-78-9 96 Hr LC50 Salmo gairdneri: 8-19 g/L

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations.

14. Transport Information

Department of Transportation (DOT) Requirements

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations OSHA Process Safety Standard: This material is not known to be hazardous by the

OSHA Highly Hazardous Process Safety Standard, 29 CFR 1910.119.

U.S. - FDA - Food Additives Generally Recognized as Safe (GRAS)
BENTONITE 1302-78-9 21 CFR 184.1155

CERCLA (Superfund) reportable

quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - No

Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No

Section 302 extremely hazardous substance

Section 311 hazardous chemical Yes
WHMIS status Controlled

3/6/2008 4/5



WHMIS classification

D2A - Other Toxic Effects-VERY TOXIC

D2B - Other Toxic Effects-TOXIC

WHMIS labeling



Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	
Canada	Domestic Substances List (DSL)	
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (CCS)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan Sapanese Inventory of Existing and New Chemical Substances (ENCS)) No
Korea	Korea Korean Inventory of Chemicals (KICS)	
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause

cancer.

16. Other Information

Recommended restrictions Workers (and your customers or users in the case of resale) should be informed of the

potential presence of respirable dust and respirable crystalline silica as well as their potential hazards. Appropriate training in the proper use and handling of this material

should be provided as required under applicable regulations.

Further information This safety datasheet only contains information relating to safety and does not replace

any product information or product specification.

HMIS ratings Health: 1*

Flammability: 0 Physical hazard: 0

NFPA ratings Health: 1

Flammability: 0 Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge,

information and belief at the date of its publication. The manufacturer expressly does not make any representations, warranties, or guarantees as to its accuracy, reliability or completeness nor assumes any liability, for its use. It is the user's responsibility to verify

the suitability and completeness of such information for each particular use.

Third party materials: Insofar as materials not manufactured or supplied by this manufacturer are used in conjunction with, or instead of this product, it is the responsibility of the customer to obtain, from the manufacturer or supplier, all technical data and other properties relating to these and other materials and to obtain all necessary information relating to them. No liability can be accepted in respect of the use of this product in

conjunction with materials from another supplier.

Issue date 04-14-200

MSDS sections updated Product and Company Identification: Alternate Trade Names

3/6/2008 5/5



MATERIAL SAFETY DATA SHEET

Section 1. COMPANY IDENTIFICATION AND CHEMICAL PRODUCT

COMPANY IDENTIFICATION:

Filter Innovations 744 Gordon Baker Road Toronto, ON, M2H 3B4

Revision Date: January 22, 2008

Chemical Product:

Product Name: Anthracite Coal Formula: N/A

Synonym (s) Coal, Anthracite Chemical Family: N/A

Section 2. COMPOSITION INFORMATION ON INGREDIENTS

Permissible Air Level

<u>Ingredient</u> <u>CAS No.</u> <u>Wt. %</u> <u>OGHA PHL</u> <u>AGGIH TLV</u>

Anthracite Coal N/A 100% 2.4 2.0

Coal consists mainly of a complex mixture of organic compounds. Small amounts of sulfur, crystalline silica, silicates, and other inorganic compounds may also be present.

Section 3. HAZARDS IDENTIFICATION

Health Effects/Signs and Symptoms: Excessive, long term inhalation exposure to coal dust may lead to a condition called worker's pneumoconiosis (or "Black Lung"). This condition May be characterized by or associated with a cough, shortness of breath, reduction in pulmonary function, pulmonary hypertension, bronchitis, emphysema and premature death. It primarily occurs among employees in the coal mining industry where chronic exposure to coal and associated hard rock are common.

Usual Route (s) of Entry: Inhalation, if handled in such a manner that dusts are generated.

Medical Conditions Possibly Aggravated: Chronic diseases or disorders of the respiratory system.

Carcinogen Information: Not considered to be a carcinogen.

SEE LAST PAGE FOR ADDITIONAL TERMS AND CONDITIONS INCLUDING DISCLAIMER OF WARRANTIES.

Section 4. FIRST AID MEASURES

Eye Contact: If dust causes mechanical irritation, wash eye (s) thoroughly with large amounts of water. If symptoms persist, seek medical attention.

3/6/2008 1/4



SKIN CONTACT: Not anticipated to pose an acute or significant skin contact hazard.

INHALATION: Not anticipated to pose an acute or significant inhalation hazard.

INGESTION: Not considered to be an ingestion problem.

Section 5. FIRE FIGHTING MEASURES

Flash Point: (Method): N/A

Autoignition Temperature: N/A

Fire Hazard: Moderate in the form of dust when exposed to heat or flame.

Explosion Hazard: Slight in the form of dust when exposed to heat or flame.

Extinguishing Media: Steam, water fog, dry chemical or carbon dioxide.

Special Fire Fighting Procedures: Wear goggles or face shield and self-contained breathing apparatus. Water may be used to cool fire exposed containers.

Unusual Fire and Explosion Hazard: None.

Section 6. ACCIDENTAL RELEASE

Procedures to follow if Material is Released or Spilled: No unusual hazards. Material should be placed into appropriate containers. Avoid generating dust.

Waste Disposal Method (s): Landfill disposal or other methods which are in accordance with local, state and federal regulations. Wastes may be recovered for further use.

Section 7. HANDLING AND STORAGE

Work Practices (Handling and Storage, etc.): Use in such a manner as to avoid creating large amounts of dust. Keep away from sources of heat and flame. Avoid high storage temperatures.

Section 8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Engineering Controls (Ventilation, etc.): Ventilation should be sufficient to maintain dust levels below the applicable exposure limit for coal dust.

EYE PROTECTION: Safety glasses or goggles are recommended when dust levels are excessive.

SKIN PROTECTION: Gloves and long-sleeve clothing are recommended when dust levels are excessive.

RESPIRATORY PROTECTION: When engineering controls are not sufficient to lower dust levels below the applicable exposure limit, use a NIOSH approved respirator for dusts within the use limits of the respirator.

3/6/2008 2/4



www.filterinnovations.com

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid PH: N/A

Appearance: Dark lumps Specific Gravity: 1.6 – 1.8

Odor: Odorless Vapor Pressure: N/A

Boiling Point: N/A Vapor Density: N/A

Melting Point: N/A Evaporation Rate: N/A

Solubility in Water: Negligible % Volatile by Volume: N/A

Section 10. STABILITY AND REACTIVITY

Stability: Stable

Incompatibilities (Materials to avoid): Strong oxidizers.

Hazardous Thermal Decomposition Products: Carbon Monoxide, Carbon Dioxide, Sulfur Oxides,

Hydrogen Sulfide.

Polymerization: Will not occur.

Section 11. TOXICOLOGICAL INFORMATION

It is recommended that the air be analyzed for crystalline silica where inhalation exposures to this product may occur. Should the collected dust contain greater 5% crystalline silica, it may be appropriate to use the applicable exposure limit for silica.

Section 12. ECOLOGICAL INFORMATION

Release to the Environment: No unusual hazards to fish, plants or birds.

Section 13. DISPOSAL CONSIDERATIONS

Proper Disposal: No extraordinary measures are required. Refer to Section 6.

Section 14. TRANSPORT INFORMATION

Transportation Methods: Transport per any DOT regulations.

Section 15. REGULATORY INFORMATION

Regulatory Procedures: Follow any Environmental Protection Agency (EPA) regulations, or relevant regulations from other countries that may apply.

3/6/2008 3/4



www.filterinnovations.com

Section 16. OTHER INFORMATION

Abbreviations:

N/A Not Applicable N/E Not Established

UNK Unknown (No applicable information was found)

GT Greater Than LT Less Than

Footnotes:

- Concentrations may vary somewhat between batches or lots. Where possible, a concentration range is indicated. Occasionally, however, levels may even fall outside of the usual concentration ranges.
- Common names, if applicable, appear in parentheses following the chemical names.
- 3) All values, unless otherwise specified, refer to 8-hour time-weighted average concentrations and units are in mg/M.
- 4) These values apply to a respirable coal dust fraction containing less than 5% crystalline silica. If the crystalline silica level exceeds 5%, consult Table Z-3 (Mineral Dusts) under 29 CFR 1910-1000 or the most recent edition of the AGGIM TLV Booklet for obtaining the appropriate crystalline silica TLV computing formula.

This document has been prepared in a format developed by the American National Standards Institution (ANSI), solely for the intent of compliance with the provisions of Subpart 2 of Part 1910 of Title 20 of the Code of Federal Regulations, paragraph 1910.1200.

***The information contained herein is accurate to the best of our knowledge. Filter Innovations Inc. makes no warranty with respect hereto said information and disclaims all liability from reliance there in ***

3/6/2008 4/4



www.filterinnovations.com

MATERIAL SAFETY DATA SHEET

Section I - Identity

Identity (As Used on Label and List): Activated Carbon, (Powdered, Granular or Pelletized)

Manufacturers Name: Filter Innovations Inc.

> 744 Gordon Baker Road North York, ON M2H 3B4

Tel: 416.490.7848

Section II - Hazardous Ingredients/Identity Information

Hazardous Components - (Specific Chemical Identity: Common Names)

OTHER LIMITS

OSHA PEL ACGIH TLV RECOMMENDED %

Carbon: Activated Carbon N/A N/A N/A 100

CAS #: 7440-44-0 UN Number: UN1362

This product is non-hazardous according to the definition for "health hazard" and "physical hazard"

provided in the OSHA Hazard Communication Law (29 CFR Part 1910).

Section III - Physical/Chemical Characteristics

Boiling Point: N/A

Vapor Pressure (mm Hg): N/A Vapor Density (AIR = 1): N/A

Specific Gravity (H₂O = 1): 2.3 g/cc real density

Melting Point: N/A

Evaporation Rate (Butyl Acetate =1): N/A

Solubility in Water: Insoluble

Appearance and Odor: Black, Powder, Odorless, Solid

Section IV - Fire and Explosion Hazard Data

Flash point (Method Used): N/A

Flammable Limits in Air % by Volume: N/A

LEL: N/A UEL: N/A

Extinguishing Media: Flood with copious amounts of water

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: Contact with strong oxidizers such as ozone, liquid oxygen,

chlorine, permanganate, etc. may result in fire

Section V - Reactivity Data

Stability: stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): strong oxidizers such as, liquid oxygen, chlorine, permanganate, etc.

Hazardous Decomposition or Byproducts: carbon monoxide may be generated in the event of fire.

Hazardous Polymerization: will not occur

3/6/2008 1/2



www.filterinnovations.com

Section VI - Health Hazard Data

Primary Routes of Entry: Inhalation: Yes

Skin: Yes Ingestion: Yes

Health Hazard(Acute and Chronic): Acute inhalation is LC50 (RAT) is 64.4 mg/l (nominal concentration) for activated Carbon. The product is not a primary skin-irritant. The primary skin irritation index Rabbit is

0. The product is non-toxic through ingestion. The acute oral LD50 RAT is 10 g/kg.

NTP: N/A

IARC Monographs: N/A OSHA Regulated: N/A

Signs and Symptoms of Exposure: N/A

Medical Conditions Aggravated by Exposure: Contact Lens Users without Proper Eye Protection.

Emergency and First Aid Procedures: Eyes: Flush with Water for At Least 15 minutes

Skin: Wash with Soap and Water

Section VII - Precautions For Safe Handling and Use

Steps To Be Taken In Case Material Is Released Or Spilled: Sweep up unused carbon and discard in refuse container or repackage. Use mask to avoid breathing dust.

Waste Disposal Method: Dispose of unused carbon in refuse container. Dispose of in accordance with local, state and federal regulations.

Precautions to Be Taken in Handling and Storing: Wet activated carbon removes oxygen fro air causing a severe hazard to workers inside carbon vessels and enclosed or confined spaces. Do not get in eyes, or on skin or clothing. Do not breathe dust.

Other Precautions: Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state and federal regulations

Section VIII - Control Measures

Respiratory Protections (specify type): NIOSH approved particulate filter respirator is recommended if excessive dust is generated.

Ventilation: Local Exhaust: recommended

Mechanical (General): recommended

Special: N/A Other: N/A

Protective Gloves: Rubber gloves recommended Eye Protection: Safety goggles/glasses recommended

Other Protective Clothing or Equipment: None

Work/Hygienic Practices: Wash thoroughly after handling

***The information contained herein is accurate to the best of our knowledge. Filter Innovations Inc. makes no warranty with respect hereto said information and disclaims all liability from reliance there in ***

3/6/2008 2/2

SPARE PARTS LIST



REPLACEMENT PARTS/ MEDIA

Product Description	Model Number
Bag filter housing	EB112-2P-SW
Polyester filter bags (1 micron)	PE1P2P
Modified organoclay drum	FII55WAT-CSI-TM100
Modified organoclay media	TM-100
Granular activated carbon drum	FII55WAT-CSI-1240S
Granular activated carbon	12x40S

ORDERING INFORMATION

If you wish to place an order, we ask that the following information be provided. This helps to increase efficiency and reduce the possibility of errors.

Who to contact?

To place an order, please send us a PO via e-mail (<u>Orderdesk@filterinnovations.com</u>) or fax (416-490-0974); alternately you can provide us with a purchase order number verbally over the phone (416-490-7848).

Orders can also be placed conveniently and securely through our online store: www.filterinnovations.com/store

Shipping method

Please indicate your preferences with regards to shipping method:

- Prepaid and charge (freight organized by Filter Innovations; customer is billed at a later date)
- Collect shipment (freight sent on customer's account; FII can still organize shipping)
- Customer pick-up (Customer responsible for transporting order from FII)

Required date

Although we provide a realistic estimation of product availability in the quote we suggest providing us with a desired delivery date.