



## **Air Sparge Pilot Cart**

May 2023

# **OPERATION AND MAINTENANCE MANUAL**

## **Manual WO-7288**

**Prepared for:**

**Prepared by:**

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# TABLE OF CONTENTS

<b>1.0</b>	<b>System Overview</b>	.	.	.	.	.	.	.	.	<b>3</b>
<b>2.0</b>	<b>Design Specifications</b>	.	.	.	.	.	.	.	.	<b>4</b>
<b>3.0</b>	<b>System Operation</b>	.	.	.	.	.	.	.	.	<b>9</b>
	<b>3.1</b>	<b>Startup</b>	.	.	.	.	.	.	.	<b>9</b>
	<b>3.2</b>	<b>Control Logic</b>	.	.	.	.	.	.	.	<b>12</b>
	<b>3.3</b>	<b>HMI Control Screens</b>	.	.	.	.	.	.	.	<b>14</b>
	<b>3.4</b>	<b>Remote Access</b>	.	.	.	.	.	.	.	<b>19</b>
<b>4.0</b>	<b>System Maintenance</b>	.	.	.	.	.	.	.	.	<b>23</b>
<b>5.0</b>	<b>Troubleshooting</b>	.	.	.	.	.	.	.	.	<b>27</b>
	<b>WARRANTIES AND INSPECTION FORMS</b>	.	.	.	.	.	.	.	.	<b>30</b>
	<b>TECHNICAL SUPPORT</b>	.	.	.	.	.	.	.	.	<b>34</b>
	<b>FIGURES</b>	.	.	.	.	.	.	.	.	<b>35</b>
	<b>Figure 1:</b>	<b>System Layout</b>								
	<b>Figure 2:</b>	<b>P&amp;ID</b>								
	<b>Figure 3:</b>	<b>Control Schematic</b>								

## APPENDICES

**Appendix A: General Equipment Manuals - Digital Version**

**\*The digital version of the manual can be located on the PRM Flash Drive.**

## 1.0 SYSTEM OVERVIEW

Product Recovery Management (PRM) is pleased to provide you, our Client, with this remediation system for pollution abatement. All PRM systems are built off of designs and specifications supplied by the Client.

Remediation systems have inherent potential hazards which need to be addressed on a case by case basis. It is the Client's responsibility to know and assess any associated hazard. As an example, your system may have been designed for a Class 1 Division 2 Hazardous Location. It is the Client's responsibility to confirm that the hazardous location is addressed properly. In the event that a system is used in a location where site conditions and hazards have changed, it is the Client's responsibility to assess the new conditions and evaluate the remediation system properly. The Client needs to contact PRM ASAP if any operation/design discrepancies arise due to changing conditions.

A licensed electrical contractor must be used to connect power to the system. Please tell the electrical contractor to contact PRM corporate office (919)-957-8890 with any questions about connecting power to the system. Failure to use a licensed electrician will void the warranty.

If a high leg exists make sure that it is connected to the center phase (L2) of the distribution block in the panel.

Field wiring interconnections are not to cross the intrinsically safe zone of the panel because intrinsic safety may be impaired.

Hearing protection should be worn at all times when equipment is operating. Permanent hearing damage may occur if proper protection is not worn.

PRM is pleased to have provided our client with this Water Treatment System, assembled on a customized 7 x 12 Conex.

When the system is activated, the .75hp Ebara ACDU Series water pump pulls water from the client supplied tank which has its contained volume tracked by a teardrop float. The water is sent through the bag filter housing before it goes through the three VP-55 Liquid Phase Carbon Vessels plumbed in series. After the water passes through the final carbon vessel it is discharged to the client's designated location.

## 2.0 DESIGN SPECIFICATIONS

PRM has provided this skidded water treatment system for your project in accordance with the design specifications. The equipment is itemized in the written proposal below

### **Air Stripper**

- PRM Model AST-385 Air Stripper, stainless steel construction, 36" wide x 96" long with 5 trays. Unit to be skid mounted.
- 10 Hp Pressure blower 230/460V, 3 Phase, TEFC blower, 1200 cfm
- Design Flow rate of 40 GPM to reduce 200 ppb Acetone by 80% or better.
- Sump pressure gauge
- Manual sump drain valve
- 316 SS three float stem mounted in the sight tube to control the transfer pump
- Pressure Gauge and transmitter will be plumbed on outlet of discharge of AST blower
- Transfer pump is a 3 hp centrifugal pump, Cast iron construction and capable of 60 gpm @ 105' TDH (45 psig). See adder for SS construction. Pump discharge includes pressure gauge, sample port, throttle valve, union, and check valve. Inlet includes union and ball valve.

## **3.0 SYSTEM OPERATION**

A SYSTEM OPERATION plan should be developed for the remediation system that ensures continuous draw down from the recovery wells and proper operation of the treatment system. This plan should be developed based on actual site conditions such as overall air/water flow rate. During the first two weeks of operation, daily inspections should be made of the system. Components should be adjusted for maximum system efficiency.

### **3.1 STARTUP**

The following items should be completed before energizing the main power.

For All Systems:

1. Level the equipment. If in a trailer or building, check door openings to see if additional leveling is necessary.
2. Tighten all terminals where wires are terminated. Electrical components may work loose during shipping.
3. Remove IS barriers from bases if present.
4. Check to ensure that both the hazardous and non-hazardous sides of the IS barriers are properly grounded directly to the main ground or to a grounding stake as per the codes of the local authorities.
5. Before the system is energized, check your voltage to ground on each leg for high voltage. If voltage above 215 from phase to ground is detected then damage to the system will occur.
6. If you have a PLC, check to ensure the PLC is in "auto" mode.
7. Test each input going into the Hazardous side of the IS barrier for proper IS barrier locations. This can be done by using an electrical multi-meter and check for continuity to ground. Have one person hold the meter while another person manually operates the switch or float. Ensure that the switches are field wired as normally closed or normally open as specified on the electrical drawings.
8. Check the alignment of all motors. They may come out of alignment during shipping.
9. Manually rotate motors to ensure they are not seized.
10. Check the voltage on each phase of power to ground. The voltage on each leg should be the same or close to the same. If one phase is higher, the "high leg" should be on the center lug.
11. Check to ensure there is only one source of neutral. If there is a 120 volt control transformer in the panel then we ground the neutral and no neutral should be brought into the panel.
12. 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 after all the items listed above have been completed.

The following can be completed once the system is energized 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 transformer if present and check the power on the primary and secondary sides of the AC transformer.
3. Install fuses to the DC transformer if present and check the power to the primary and secondary sides of the DC transformer.
4. Close the remaining fuse holders and check for power on the bottom of each fuse holder to ensure the fuses are good. If a fuse is blown then 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. Less than 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 the higher voltage. Find the source of the stray voltage and repair the problem. Install the IS barriers only when proper voltage is detected.
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 is 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 shut-down alarms to ensure they are operating properly.
8. Install the fuses for motors and bump the motors to check for proper rotation. To reverse rotation switch two of the power legs. Refer to the wiring diagram on the motor. If a single phase motor is rotating in the wrong direction, then check for proper wiring.
9. Always refer to the specified documentation for each piece of equipment to ensure that they are tested for proper rotation. Some equipment cannot be run dry or in reverse. Please familiarize yourself with the equipment before operation.
10. Remove motor fuses and test the operation of the logic without the motors actually running. Test the inputs with jumper wires.
11. Plug in the fuses for motors and check the valves in the system to ensure that all required valves are open and ready for operation. Check to ensure that no pumps will deadhead or starve for water.

### To prepare the system to start:

1. Follow any guidelines set for maintenance and inspections.
2. Correct and clear any active alarms by pressing **F4** on TDE mounted on the Control panel
3. Ensure all setpoints are set to desired values.
  - 3.1. To adjust the user selectable setpoints, use the arrows on the TDE to go to the time date screen then press ESC. Highlight and press enter on the following selections: LOGO! Settings > Program > Set Parameter. From here highlight the parameters that you want to adjust and press enter. Only the 'On' and 'Off' setpoints should be adjusted for the parameter.
4. Check that all manually adjustable valves are in the correct position to achieve the desired process.
5. When ready, turn the panel mounted HOA Switch for the water pump to the Auto position.

\* To adjust the speed of the pump follow step 3.1 above and change the SP value under the PMP SPD parameter

\*\* Devices can be operated manually by holding the HOA Switch in the Hand position. **Note: Operating a device manually will bypass system alarms and may cause damage. i.e. A pump in manual operation will continue to run even if no water remains, causing damage to the pump.**

## 3.2 CONTROL LOGIC

When an Alarm is activated, the display screen of the TDE will turn red and show the current alarm. Once the issue has been resolved, press the F1 button to clear the alarm.

Parameter Settings:

**PRE-BAG:** The Pre-Bag parameter is used for internal math equations and should not be adjusted.

**POST BAG:** The Post Bag parameter is used for internal math equations and should not be adjusted.

**POST BAG LOW:** The pressure after the bag filter has dropped below the setpoint.

**DISCHARGE HIGH:** The discharge pressure from the pump has exceeded the setpoint.

**POST LP HIGH:** The Post LP High Alarm is caused by the pressure on the discharge side of the pump exceeding the setpoint.

**PRE-BAG LOW:** This alarm indicates a possible water leak

**DIFF PRESS:** The differential pressure takes readings from the Pre-Bag and Post Bag pressure transmitters to identify. This alarm could indicate a need to change the bag filters.

**PMP SPD:** The PMP SPD parameter is used to control the speed of the pump.

**MOTOR OVERLOAD:** A motor overload has been tripped. Press the reset button on the contactor overload inside the Control Panel.

**INFLUENT LOW:** The Influent Low alarm is activated when the water level in the Influent Tank drops low enough to activate the low level switch.



## 4.0 SYSTEM MAINTENANCE

### Daily Checklist

- Check the control panel for system status
- If available, connect to the system using the remote access capabilities to check system operation for the following:
  - Alarms
  - Operating
    - Temperature
    - Pressure
    - Vacuum

### Weekly Checklist

- Check for leaks
- Check for excessive noise of various components
- Check for alarms
- Check and record vacuums, pressures, temperatures
- Check for excessive moisture inside the control panels, transmitter boxes, and lines
- Check for corrosion and grease the moving parts if required to reduce corrosion

### Scheduled Maintenance – Monthly

- Test critical inputs for proper shutdown setpoints
- Follow maintenance procedures for specific items as listed in the maintenance manuals
- Test the operation of the overloads

### Annual Maintenance

- Test each input
- Test alarm conditions
- Test the operation of each output device
- Complete the weekly checklist

## **Major Components**

This section can be used as a reference material to form a maintenance schedule for your system. These recommendations should be used in conjunction with the manufacturer's operating and maintenance manuals. Each site is unique and the maintenance schedule should be created to accommodate the specific site. Component manuals can be found on the flash drive System ID Card located in the technical drawings sleeve. Please return the flash drive after each use.

**Always follow proper safety protocols, such as lockout/tagout procedures.**

### **Electrical Boxes and Panels**

- Open the box and check for moisture and condensation. Condensation can be a problem in humid climates that experience temperature fluctuations. The temperature change causes the box to breathe and condensation will form inside. If high humidity is a problem, desiccant bags should be kept inside the box or panel to absorb moisture. These bags should be changed regularly. The desiccant will be blue when it is dry and orange when it is wet. The bag can be dried in a microwave or oven depending on the material.
- Check for proper grounding or leaks

### **Bag Filter Housing**

- Increased pressure before the Bagfilter Housing indicates the filter bags need to be changed.

### **Carbon Units**

- Each unit has a port downstream for sampling. If samples have higher contaminant levels than expected for that stage of the process, the media will need to be replaced.

### **Ebara Pumps**

Regularly scheduled maintenance should not be necessary. However, periodic inspection is recommended to ensure the pump is running properly. Periodic checks and preventive maintenance will reduce sudden or significant problems and repairs.

Common maintenance operations include:

- Replacement of mechanical seals
- Replacement of grommets
- Replacement of bearings
- Replacement of single-phase motor capacitors.

Although subject to typical wear, correct operation of the pump will prolong the service life of these parts. If the pump will not be operated for a long period, it should be emptied completely, with the discharge and fill caps removed, then washed and rinsed carefully with clean water.

Avoid leaving residual water inside the pump.

To prevent damage to pump components, these steps should also be followed if freezing temperatures are expected.

**Component Model and Serial Numbers:**

<b>COMPONENT</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>
COMPRESSOR (1)	GREELOY	AIRCOMGM1600120V1PH	43632
COMPRESSOR (2)	GREELOY	AIRCOMGM1600120V1PH	43634
ROTAMETER	PRM	FMDFG25	
0-100 PSI LF GAUGE	PRM	PGCNBTY6302515100PSI	
32-250F TEMPERATURE GAUGE	PRM	THERMOBTY760563	

## 5.0 TROUBLESHOOTING

Centrifugal Pump		
Symptom	Potential Cause	Possible Solution
Pump does not produce sufficient pressure	Pump is not primed	Prime pump
	Pump is rotating in the wrong direction	Check and change rotation if needed
	Pressure gauge is faulty	Replace gauge
	Pump is not operating at required RPM	Check motor and replace if necessary
	Pump has wrong size impeller	Check impeller and replace if necessary
	Obstruction between pump & gauge	Check for flow restrictions in strainers and piping
	Pump has no power	Check power supply to pump
Pump is leaking	Gaskets are damaged or worn	Replace gaskets
	Pump housing has cracked from freezing	Replace pump housing
	Mechanical seal has been overheated by operating pump dry	Replace mechanical seal
	Fittings are leaking	Tighten fittings and/or apply thread sealant
Pump flow rate is too low	Back-pressure is too high for pump	Reduce back-pressure
	Improper pump size	Replace pump with correct size
	Pump impeller is worn	Check impeller and Replace if necessary
	Ball valve on discharge is restricted	Adjust ball valve
	Clogged strainer or piping	Check for flow restrictions in strainers and piping
Pump is making excessive noise	Manually rotate pump impeller and listen for clearance problems	Disassemble pump and repair the clearance problem
	Impeller has trash lodged in it	Check impeller and Replace if necessary
	Motor shaft is bent	Replace motor
	Motor bearing failure	Replace motor

<b>Analog 4-20mA Transmitters</b>		
<b>Symptom</b>	<b>Potential Cause</b>	<b>Possible Solution</b>
Transmitter is sending a signal that is not accurate	There may be water in the air lines that is disrupting the reading	Drain moisture out of the air lines
	Transmitter and PLC ranges do not match	Verify that transmitter and PLC are identically ranged
	Transmitter may be out of Calibration	Refer to manual to calibrate transmitter
Transmitter is sending a 0-2mA signal to the PLC input	Transmitter may be improperly wired or wire connections may be loose	Check wiring against the device specification sheet and wiring schematic in manual. Check for loose connections
	Transmitter may be damaged	If you have a similar transmitter installed in another location on the system, switch the transmitters to determine if the faulty transmitter works in another location.
Transmitter sends out a signal over 20mA	Transmitter is faulty	Replace transmitter

## LIMITED EQUIPMENT WARRANTY

PRM warrants its equipment to be free of defects in materials and workmanship for a period of 12 months from the date of completed manufacture. Equipment must be operated and maintained in accordance with the Maintenance manual provided with the equipment. This includes the site specific manual as provided by PRM as well as the individual component manuals with the guidelines established in the Operation & Maintenance manual provided. Warranty service shall not be applicable unless a complete logbook of monthly maintenance is kept. Warranty service shall not be applicable unless all outstanding invoices which are overdue are paid in full. To ensure equipment longevity all equipment must be protected from the elements.

In the event of a problem or failure, immediately contact PRM's corporate office and request technical assistance and have the PRM Project Number available. A technician will assist in determining if the equipment is operating properly and if not will guide the onsite technician in proper settings and adjustments. If a failure of a component has occurred, PRM will request the component be shipped back to PRM for repair or replacement. In the event that the repair requires PRM to be onsite for the repair, PRM will send a qualified technician to the site to make the repair.

PRM systems are thoroughly tested prior to shipment and we have an extremely low component failure record. Most calls are about equipment that has been incorrectly adjusted and a few minutes on the phone with the onsite technician can correct the problem. If there is a component failure, it is our commitment to the customer to remedy any problems as soon as possible.

All technical support matters are EXTREMELY important to PRM. We strive to make sure that all systems and equipment manufactured by PRM have high percentages of uptime and long life.

Sincerely,  
Product Recovery Management

Mel Phillips  
President

**Mandatory: You are required to complete this form for warranty consideration**

PRM is committed to using the highest quality control components in all of our systems. We only use copper wiring to ensure that we provide the utmost protection of all controls. Despite our attempts to ensure the safe operation of our systems, it is always possible for control components to become loose in transit or during operation. Any system that we ship should always be inspected at start-up, and all power conductors within the control panel should be re-torqued once the system has arrived on site.



Once power has been supplied to the system and it has been running for 1 week, all wiring should be re-inspected and re-torqued. During the early run time of any system, there is always a possibility of wires loosening as thermal expansion and contraction occurs with power cycles at the terminals. After 2 months of operation, this process should be completed again to ensure there are no abnormalities. PRM also recommends that this type of inspection is done yearly, or as frequently as needed, to ensure system integrity. If the system is relocated from one site to another, the entire inspection process should be repeated. This applies to rental systems as well.

If the system is under the warranty period provided by PRM, it is required that the client provide proof of these inspections to PRM in order to maintain the warranty. The proof of these inspections, and the results, should be provided to PRM as they occur. This proof should be provided through email with an attached inspection document (included) and an image of the panel interior. If a condition on site causes power terminal failure due to damage to the control panel components, and the client has not provided PRM with proof of these inspections in advance, the client accepts liability of costs necessary to repair the system. Please keep in mind that these failures can also lead to auxiliary equipment failures such as motors, resistive heaters, and other loads. In the event that a power anomaly occurs on site, such as lightning and other surges, PRM is not responsible for the downtime and/or loss of income due to such damages. It is the clients responsibility to mitigate and repair such damages as soon as possible. By operating the system after delivery, the client agrees to default to PRM's judgment in the event a disagreement occurs after such damages occur.

**Only qualified technicians should be allowed to work inside of the system control cabinet or with other electrical components, and power should always be disconnected prior to conducting such work. PRM will always support the client to expedite repairs when possible.**

## Mandatory Electrical Inspection Form

Start-Up Inspection      Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Electrical Notes: \_\_\_\_\_

Week 1 Inspection      Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Electrical Notes: \_\_\_\_\_

2 Month Inspection      Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Electrical Notes: \_\_\_\_\_

Annual Inspection      Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Electrical Notes: \_\_\_\_\_

Please email the completed form to [warrantyfulfillment@prmfiltration.com](mailto:warrantyfulfillment@prmfiltration.com)



# REMEDATION EQUIPMENT TERMS OF ACCEPTANCE AND WARRANTY CARD

1. All remediation equipment supplied by PRM must be wired by a licensed electrician. The electrician to perform the work should be familiar with typical applications and all work must conform to the NEC. Failure to have a licensed electrician perform connections will void the system warranty.
2. All mechanical work should be done in a neat and orderly fashion without kinks and strains imposed on hoses and piping systems.
3. Each system supplied by PRM must be registered with PRM a minimum of 2 days prior to startup. This allows PRM to assign a technical support number to the project for start up and technical assistance. Failure to register the equipment will cause technical support delays.
4. Equipment supplied by PRM that will be powered by a generator will require low voltage protection across each phase. Equipment with electronic or solid state controls must be provided with clean power that is supplied with surge protection and appropriate equipment to provide a regulated power source. Failure to provide this power protection will void the warranty on the control system and possibly on the equipment itself.
5. Technical support is available 8:30am to 4:30pm Eastern Standard Time. Monday through Friday except for Holidays. Technical support offered after hours will be billable at a rate of \$95.00 per hour with a minimum 1 hour billing.

**WARRANTY CARD WO-7288**

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**WARRANTY CARD WO-7288**

Site Name \_\_\_\_\_

Electrician \_\_\_\_\_ License No. / Ph. No. \_\_\_\_\_

Size of service \_\_\_\_\_ Conductors \_\_\_\_\_

THIS CARD MUST BE RETURNED TO PRM FOR TECHNICAL SUPPORT TO BE ACTIVATED.

# TECHNICAL SUPPORT

## SUPPORT

Technical support calls are handled on a case by case basis. When calling PRM for support, please have the PRM project Work Order Number (**WO-7288**).

PRM provides free technical support for warranty related repairs and issues. Technical support provided for troubleshooting assistance or training in system operation is not covered as free support.

Due to the high volume of troubleshooting calls, PRM will invoice for these support services. Fees for technical support are \$65 per support call up to 30 minutes. Additional phone based support is invoiced at \$125.00 per hour. Fees are subject to change without notice.

## PROGRAMMING

PRM will modify system programs for a programmable logic controller (PLC) only by issuance of a purchase order or approved payment method if applicable. Certain PLC programming logic is proprietary information to PRM and PRM will not share logic that it deems proprietary. PRM will make logic changes to systems for a nominal fee.

If during the system warranty period, PRM finds a programming bug or error, PRM will make program repairs at no charge to the client.

