

**XO2-in-a-Box Treatment System**  
**O & M and Troubleshooting Manual**  
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**Manufactured by:**

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## System Description

The *XO2-in-a-Box (XO2-B)* is an onsite sewage treatment and dispersal system for use with treated wastewater meeting concentrations of no more than 200 mg/l carbonaceous biological oxidation demand and 150 mg/l total suspended solids. Wastewater first passes through a treatment vessel for primary treatment and settling then aerated. Effluent flows into the discharge tank for clarification and then into a dosing chamber where it is dosed to the *XO2-B* coils. Effluent is micro dosed into a layer of ASTM C-33 sand where physical, biological, and chemical treatment processes remove organic compounds and pathogens from the waste stream. Treated liquid then migrates downward to the receiving soil where final discharge of treated wastewater enters the soil environment.

## Performance expectations

The typical performance of the *XO2-B* system produces final effluent quality that is clear, odorless. The *XO2-B* system meets Class I wastewater treatment standards set forth in NSF/ANSI standard 40 and *Washington State Department of Health's* treatment level B. Testing performance during NSF testing was:

<u>CBOD</u>	<u>TSS</u>	<u>Fecal coliform w/UV</u>	<u>Turbidity</u>
<b>&lt;2</b>	<b>&lt;3</b>	<b>&lt;200 MPN/100ml</b>	<b>&lt;2 NTU</b>

## Parts list

Aeration box:

- Hiblow HB-80
- Pressure switch (PRESAIR USA, TVP117B-0.7PR)

Aeration chamber:

- 2, 12 inch HB diffusers

#### Discharge tank:

- HWN-.7-RF Headworks
- Lowridge, 1/2 hp, 30 gpm, model LOT-30.
- Floats switches, normally open (SJ Rhombus)
- Control panel (**LF2P-RF-OS-AUX**), *Lowridge Onsite Technologies, Inc.*)

#### Headworks:

- Housing
- 3/4" *Netafim*™ disc filter, 120 mesh, 130 micron (part number 25A45-120)
- 5- 1" 24 volt solenoid valves, model number LVET1GH2 (made by *DOROT*)
- 3/4" ARAD flow meter
- 3-Pressure gauges: 0-100 psi oil filled

#### *XO2-in-a-Box:*

##### Media

ASTM C-33 concrete sand as per *WADOH Recommended Standard & Guidance for Intermittent Sand Filter.*

##### Containment vessel:

30 mil PVC membrane.

##### Coils

OS-50 or OS-100 coils (*Netafim Bioline*, 0.42 gph emitters, 6 inch spacing).

### **Basic Tools and Equipment**

Cordless drill motor & misc. bits

Philips and flat head screwdrivers

Multi test meter

DO test kit (recommend ampoule type)

Litmus paper

Shovel  
Channel locks  
Pipe cutter  
Pipe saw  
Glue  
Water hose and nozzle  
Extension cord  
Wire cutters  
Wire strippers  
Turkey baster  
Sump pump w/adapter to garden hose  
Rubbing alcohol  
Dielectric grease

### **Spare Parts**

3/4" disc filter cartridge, 120 mesh, 130 micron  
1" normally closed two- way solenoid valve, Netafim™  
Normally open float switches  
Splice box screws  
Riser lid bolts  
Wire nuts for 12 gauge and 16 gauge wire

### **Maintenance Schedule:**

During the first two years after installation there are 4 inspections: two six month and two annual inspections. The items and intervals to be inspected are as follows:

Six month inspections: At six months and 18 months after installation the inspections are cursory in nature. Components to be checked and observations recorded are: Headworks pressure and forward flow, and surfacing effluent on XO2-B.

Annual inspections: All components listed for the six month inspection plus all other items listed on the O&M inspection check list.

## **Routine Procedures**

The most important aspects of operation and maintenance of onsite systems are the accurate observation of system performance and the complete recording of the observations. Incomplete or inaccurate data will lead to false conclusions and the corresponding maintenance activities could be un-necessary and costly. In a majority of cases, monitoring visits will result in a confirmation that the system is functioning as intended. Other than routine, preventative maintenance, very little should be required to keep the system functioning properly. In the few instances where something is actually wrong with the system and significant corrective action is needed, proper diagnosis starts with correct observation. To insure no component of the system is skipped, follow the flow of wastewater: septic chamber, aeration tank, discharge tank, headworks, *OSCAR* field. For details of how to perform the specific operations mentioned below, see appendices.

### **Septic chamber:**

Observations:

- Solids accumulation.
- Effluent clarity.

### **Aeration chamber:**

Observations:

- Aerators bubbling.
- Any odors?

### **Clarifier/Discharge tank:**

Observations:

- Solids accumulations
- Effluent Clarity
- Measure sludge level.
- Check float switches: properly attached and function.
- Check proper pump operation.

Maintenance:

- When 6" of sludge accumulates, pump the tank.
- Check inside splice box and remove any accumulated condensation.

### Headworks:

Observations:

- Check and record pressures and flow      Check proper operation of flushing sequence.

Maintenance:

- Clean disc filter.

### XO<sub>2</sub>-B:

Observations:

- No visible liquid on sand. Sand should have vegetative growth.

Maintenance:

- Automatic during normal flushing sequence.

## Trouble Shooting

This section will outline the common problems that may arise. There will follow a detailed description of how to diagnose the critical internal components. For further information contact *Lowridge Onsite Technologies, INC., 877-476-8823.*

<b>Problem:</b>	<b>Possible causes:</b>	<b>Solutions:</b>
No flow through the <i>Coil</i> .	Dosing pump doesn't run. Valves 1 or 2 don't open Disc filter plugged Emitters plugged	Repair or replace pump Repair or replace valve(s) Clean or replace disc cartridge Chlorine wash or replace
Disc filter clogging	Flush sequence failed Tanks need servicing	Restore flushing sequence Pump tanks

**Failed float switch:** If all other indicators test negative (no high water conditions and pumps work) a float switch may be shorting out. Use a clamp type amp meter to measure possible amperage on float switch leads inside the control panel. The float that registers current is shorting out and needs to be replaced.

**Leaky tanks:** If alarms are occurring during periods of rain fall, the tanks maybe leaking. Connections at the riser/tank connects, pipe connection to tanks, and protrusions through risers could be leaking. Inspect and seal as needed.

**Aerator not running:** Check for power. If no power, restore power source. If aerator has failed, replace aerator.

**Pump doesn't work:**

See section on "**High Level Alarms**".

**Valves #1 and #2 Don't Open:** See "**Disc Filter Clogging**" section.

**Disc Filter Clogged:** "**Disc Filter Clogging**" section.

**Emitter Clogged:** Flush Coil into septic tank with chlorine solution or replace *Coil*.

**Liquid Surfacing on OSCAR:**

**Wrong Media:** Refer to the media specifications in "**Parts List**".

**Biological Overloading:** Examples of the causes of biological overloading can be one or a combination of the following: heavy use of medications by the residence of the house, heavy use of disinfectants and cleaners, certain cooking habits (heavy use of cooking oils and fats), heavy use of oil based soaps and lotions. This list is not inclusive!

Effluent samples must be sent to a certified laboratory for analysis: biological oxidation demand (BOD), total suspended solids (TSS), and fats, oils and grease (FOG).



A professional should be consulted to determine what the cause of the over load is before lasting corrective action can be taken.

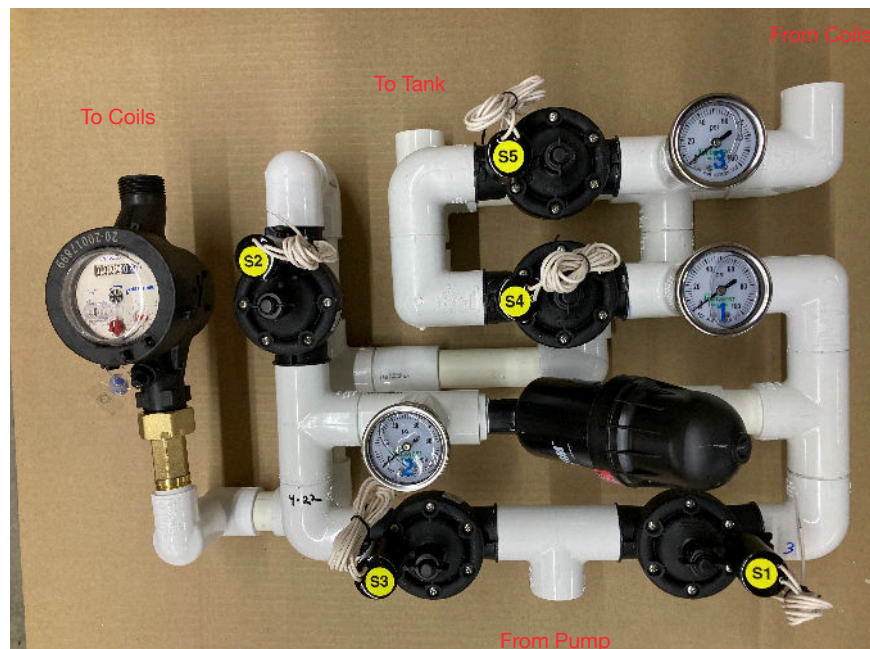
### **Disc Filter Plugging:**

To determine if the disc filter is plugged, review the pressure gauge readings. The pressure gauges should read between 48-50 psi. There should be no more than 1-2 psi differential between gauges #1 and #2. There should be about 1 or 2 psi differential between gauge #2 and gauge #3. A pressure drop between #1 and #2 indicates the disc filter is plugging and restricting flow to the *Coils*. If so, conduct a manual flush of the disc filter. If the pressures are not corrected then disassemble and replace disc cartridge with a clean unit. The disc filter could be plugging for a variety of reasons.

- If any of the wastewater tanks has not been serviced adequately, excessive solids may carry-over into the pump tank.
- Inappropriate wastewater habits in the house may cause a biological upset in the septic tank resulting in higher organic concentrations in the effluent.
- The Headworks valves malfunction and do not properly flush the disc filter or *Coil*.

### **Headworks Diagnostics:**

To trouble shoot the headworks, refer to the following illustration and Appendix B:



## **Diagnostic check of reverse flush headworks:**

Position all toggle switches inside the control panel to "OFF" mode.  
Position pump 1 and valves 1 & 2 in "HAND" mode.

**Pump runs but no pressure on any gauges.** While pump is running manually open S1. If pressures on all three pressure gauges begin to rise, the solenoid for S1 needs replacing or solenoid is not being energized (possible bad wire connection). Check voltage at panel between V1 and VN, and in the headworks at the corresponding wire connections. If voltage is good (24-27 volts) the solenoid is bad.

**Pump runs and gauges G1 and G2 register pressure and G3 is "0".** Manually open S2. If the readings on G3 begin to rise, the solenoid for S2 needs replacing or solenoid is not being energized (or wire connection is bad). Check voltage at panel between V2 and VN, and in the headworks at the corresponding wire connections. If voltage is good (24-27 volts) solenoid is bad.

**Pump runs and all gauges read the same pressure (more than 0 psi).** Emitters are plugged.

**Pump runs and G1 registers pressure and G2 and G3 read 0 psi (or significantly less than G1).** The disc filter is plugged. Further diagnostic work is needed to determine why filter is not functioning (see below).

**Disc Filter Flush Diagnostics:** Open inlet of septic tank. Position pump #1 and valves 3 & 4 in "HAND" mode (all other toggles in OFF). G2 will have a higher reading than G1, and G3 will be zero and water will be entering into the inlet of the septic tank at a rapid rate. If not, follow the diagnostic steps:

**Pump running with no pressure and no flow into septic tank inlet.** Manually open S3. If pressure on G2 and G1 rise and water flows into septic tank inlet, S3 needs replacing or is not getting energized (possible bad wire connection). If pressures rise with no water flowing into septic tank inlet, manually open S4. If pressures

drop and water flows into septic tank, both S3 and S4 are bad or both are not getting energized. Check voltage at panel between V2 and VN, and in the headworks at the corresponding wire connections. If voltage is good (24-27 volts) one or more solenoids are bad.

**Coil Flush Cycle Diagnosis:** Position pump #1, valves 1 & 2, and 5 in "HAND" position.

**Pump runs, pressures on all gauges are close to identical and no flow into septic tank inlet.** Manually open S5. If pressure on G2 and G3 drop and water flows into septic tank inlet, S5 solenoid is bad or valve is not being energized (or has a bad wiring connection). Check voltage at panel between V3 and VN, and in the headworks at the corresponding wire connections. If voltage is good (24-27 volts) solenoid is bad.

At completion of the diagnostic steps position all toggle switches in the "AUTO" position.

## Appendices

### Measuring Coil Dose Discharge Rate:

Position all Toggle switches in the "OFF" position. Switch pump 1, valves 1 & 2 to "HAND" and allow pump to run for a minute. While pump is running, measure flow for 1 minute on the flow meter. Flow for one OS-50 is 0.35 gpm. Flow for an OS-100 is 0.7 gpm.

Reposition all toggle switches to the "AUTO" position.

### Panel Operations

The **LF2P-RF-OS-AUX** control panels are 110 volt universal panels for single family *XO2-in-a-Box* systems. It has the capacity to operate four major outputs: discharge pump, Aerator, the "Reverse Flush"

headworks, and disposal pump. All logic is controlled by an Siemens LOGO . The pump operation options are as follows:

- Discharge Pump (Pump #1): is operated in a time-dose mode. Pump #1 pressurizes the coils and back-flushes the disc filter and forward flushes the coils. The LOGO allows the operator to determine the number of dose cycles before the disc filter flush and coil flush cycles.

The timers have the following factory default settings:

- Discharge-pump dosing: 3 minutes 38 seconds off, 30 seconds on. (V1\_OFF, V1\_ON)
- Disc filter flush: after pre-set number of dose cycles have completed, the disc filter flush "ON" cycle runs for 15 seconds. (V2\_ON).
- *Coil* flush: after Disc filter flush is completed, the *Coil* flushes for 2 minutes (V1V3\_ON).

**Parameter Setting Instruction: See instruction inside panel.**

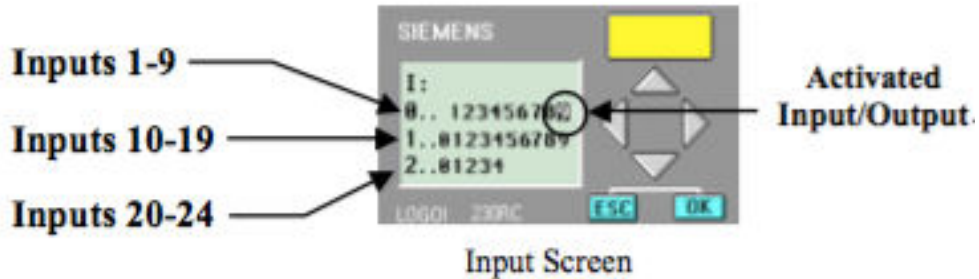
### **Start Up Procedures:**

#### **Start Up Procedures:**

Prior to conducting any of the following procedures, inspect the wiring to insure the system is correctly wired. Pull the float tree from the tank and place across the tank opening so all the floats hang down. Now power up the system and turn all the breakers to the "ON" position and all of the toggle switches in the off position. Ensure there is enough water in tanks to conduct pump tests.

- a. Test floats:

On the Siemens Logo scroll to the input screen. When first turning on the system wait for the display screen to open. Use the down arrow to find the screen with the date time display. Then, use the right arrow to find the input display as shown below.



When lifting the floats check this screen to determine if the floats are wired into the correct position. When the floats are lifted a corresponding digit will be back lit. The input values are as follows:

- 1 = bottom float
- 2 = top float

#### Test alarm float:

Temporarily modify alarm delay to 6 seconds. Lift top float. Input indicator “2” will back light and the alarm should sound and the beacon should illuminate in 6 seconds. Re-set high level alarm back to 6 hour delay.

Lift bottom float. Input indicator “1” will back light.

#### b. Test pump and valves:

##### Pump and valves:

Place valve 1 & 2 toggle switch and pump 1 toggle switch to HAND position. Pump should dose and all three pressure gauges should stabilize. No water should be flowing into septic tank.

Place valve 3 & 4 toggle switch to HAND and valves 1 & 2 toggle switch to OFF, pump #1 in HAND. Pump should run, pressures should change: gauge 2 highest pressure, gauge 1 less than 2, and gauge 3 should indicate 0 psi. Water should be flowing into septic tank very rapidly.

Place valves 1 & 2 and valve 5 in HAND position and valves 3 & 4 in OFF position, and pump 1 in HAND. Pressure on gauge 1 should indicate the highest pressure, gauge 2 less than 1, and gauge three should indicate between 0-3 psi and water should be flowing into septic tank at a moderate rate.

Position all toggle switches in the AUTO position.