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

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System Description

The *XO2-in-a-Box (XO2-B)* is an onsite sewage treatment 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 effluent is then discharged to drainfield.

Performance expectations

The typical performance of the *XO2-B* system produces final effluent quality that is clear and odorless. The *XO2-B* system meets Class I wastewater treatment standards set forth in NSF/ANSI standard 40 and *Oregon Department of Environmental Quality's* treatment standard 1. Testing performance during NSF testing was:

CBOD	TSS	Fecal coliform w/UV	Turbidity
<2	**<3**	**<200 MPN/100ml**	**<2 NTU**

Parts list

Aeration box:

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

Aeration chamber:

- 2, 12 inch HB diffusers

Discharge tank:

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

Headworks:

- Housing
- 3/4" *Netafim*™ disc filter, 120 mesh, 130 micron (part number 25A45-120)
- 1" Spears gate valve
- 3/4" ARAD flow meter
- 3-Pressure gauges: 0-100 psi oil filled

XO2-in-a-Box:

Media
ASTM C-33 concrete sand.

Containment vessel:
30 mil PVC membrane or equivalent.

Coils
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
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 2 annual inspections.

Annual inspections: Components to be checked and observations recorded are: Headworks pressure and forward flow, and surfacing effluent on XO2-B 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.

Maintenance:

- Clean disc filter.

XO2-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.*

Problem:	**Possible causes:**	**Solutions:**
No flow through the *Coil*.	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"**.

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 deferential 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.*

Diagnostic check of manual flush headworks:

Place pump 1 toggle switch to MAN position. Close the flush valve by turning completely clockwise. All three pressure gauges should stabilize about 50 psi. Gauge 3 may read as low as 40 psi. No water should be flowing into septic tank.

Place open the flush valve completely counter clockwise and pump #1 in MAN. Pressure on gauge 1 & 2 should indicate about 40 psi, and gauge three should indicate between 0-3 psi and water should be flowing into septic tank at a moderate rate (about 14-18 gpm).

Close the gate valve completely then open the valve 1 and 1/2 turns.

Position all toggle switches to AUTO.

c. Check timer default settings:

V1 OFF = 3 minutes
V1 ON = 30 seconds
V2 OFF = 30 seconds
V2 ON = 15 seconds
V1V3 OFF = 30 seconds
V1V3 On = 2 minutes

Pump runs and gauges G1 and G2 register pressure and G3 is "0". Take out the water meter and check the plastic screen on the inlet of the meter. It is possible that over time enough solids have gummed that up and have slowed or completely stopped water being able to flow beyond the headworks.

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).

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 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-ARA*** 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, 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:

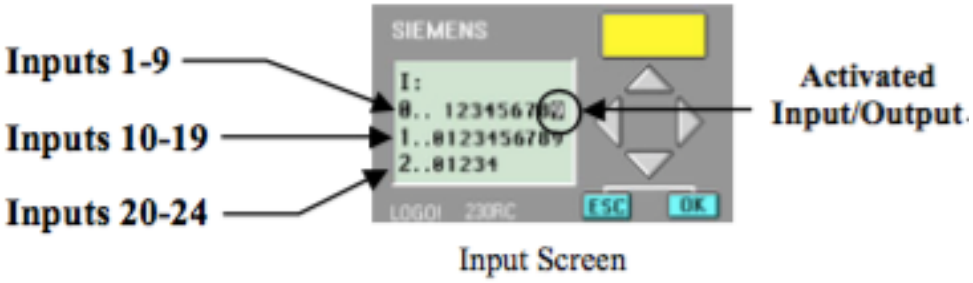
Start Up Procedures:

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.



Input Screen

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:

Lift top float. Input indicator “2” will back light and the alarm should sound and the beacon should illuminate in 6 seconds.

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

b. Test pump:

Pump:

Place 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.

Position all toggle switches in the AUTO position.