

XO₂ Treatment System Design & Installation
Manual
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Manufactured by:

Lowridge Onsite Technologies

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XO₂ Tanks

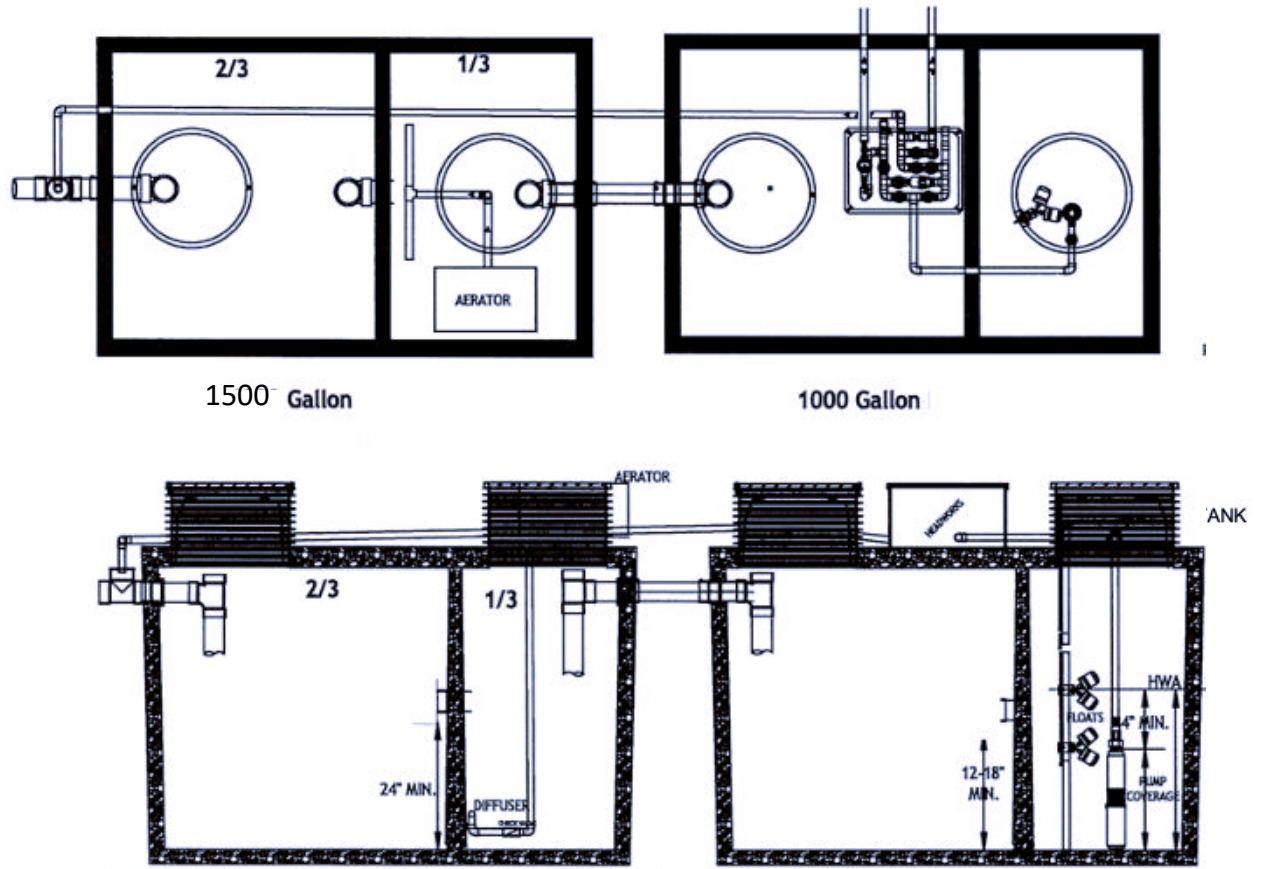


Figure 1

Introduction:

The XO₂ treatment system is comprised of two tanks: a treatment tank and a discharge tank. The treatment tank has two compartments that share the same liquid level. The first compartment provides primary treatment while the second compartment is aerated to provide secondary treatment.

The discharge tank is a two compartment tank, each compartment also sharing the same liquid level. Its first compartment provides clarification while the second compartment holds the floats and discharge pump.

Wastewater is collected in the primary treatment chamber where solids are settle out or floated. The waste stream is aerobically treated in the secondary treatment chamber. By the time the wastewater passes through the discharge tank the expected average waste strength will be 25 mg/l CBOD₅ and 8 mg/l TSS. Effluent from the discharge chamber is dosed through a 120 mesh disc filter to

either a sub-surface drip field comprised of *Netafim Bioline* tubing, a pressure distribution drainfield, or *OSCAR* coils.

Installers and Operations and Maintenance providers must be certified by *Lowridge Onsite Technologies, Inc.* Contact *Lowridge* for certification training. An Idaho complex installer's license is required for installers. An Idaho service provider certification is required to perform operation and maintenance. Contact an Idaho Public Health District to obtain the alternative system installer's registration permit and service provider certificate; annual renewal is required.

Design:

The *XO₂* system is designed in sizes between 500 and 1,500 gallons per day. A system design of a 1 to 4 bedroom home requires the minimum *XO₂*-500 system. For design flows of 501 to 1,000 gpd size the septic tank per the Technical Guidance Manual, and the . The *XO₂* is intended for domestic sewage. Seek advise from *Lowridge* for other sewage types.

Tanks

All tanks must be approved by *Idaho Department of Environmental Quality* as wastewater containment vessels. Minimum tank sizes for a 500 gpd or 4 bedroom design flow or less is:

- Treatment tank **1,500 gallons**
- Discharge tank **1,000 gallons**

Treatment tank: The treatment tank is a double compartment tank split 2/3 first compartment and 1/3 second compartment. The first 2/3 provide primary treatment and the last 1/3 provides secondary treatment. The partition between each compartment has a flow through port 24 inches above the bottom of the tank floor or a normal tee baffle.

Discharge tank: The discharge tank is a double compartment tank split 2/3 first compartment and 1/3 second compartment. The first 2/3 is for calcification and the last 1/3 houses the discharge pump. The partition between compartments has a 4 inch diameter flow through port 12-18 inches above the bottom of the tank. The flow through port is below the minimum liquid level. Both side of the discharge tank share the same liquid level.

For design flows greater than a 4 bedroom home or 500 gpd design, the tanks must be sized according to *Idaho Technical Guidance Manual*, 5.2. All tanks must be concrete or polyethylene approved by *Idaho Department of Environmental Quality*. No tanks can be clam-shell designed. Polyethylene tanks must be of one piece construction.

Each XO_2 unit will include:

- LF1P-RF-AR control panel
- LOT-30, 1/2 hp, 120 volt pump
- Hi-Blow Aerator, HB-80 (80 liter/minute)
- Hi-Blow diffusers
- PVC fittings and drip tubing adapters
- HWN-.7-RF automatic headworks
- Solid ½ inches poly tubing for connections
- 2 float switches

Dispersal Component:

Trenches

1. Distances shown in Table 4-21 of the TGM must be maintained between the trench bottom and limiting layer.
2. Capping fill may be used to obtain adequate separation distances from the limiting layers but must be designed and constructed according to the guidance for capping fill trenches in section 4.3 of the TGM.
3. Pressure distribution may be used with the following design considerations:
 - A. The pressure distribution system related to the drainfield is designed according to section 4.19 of the TGM.
 - B. The recirculation tank for the LOWeFLOW filter may not be used as the dosing chamber for the drainfield.
4. The drainfield shall be sized by dividing the maximum daily flow by the hydraulic application rate for the applicable soil design subgroup listed in Table 4-22 of the TGM.

Drip Dispersal

The XO_2 system can be followed by a drip dispersal system designed and installed according to section 4.5 of the TGM.

OSCAR

The OSCAR, in conjunction with the XO_2 , has a different loading rate criteria than an *OSCAR-II*. The OS-50 coils are loaded up to 62.5 gallons per day while the OS-100 are loaded up to 125 gallons per day. See the *Installer's Design Manual* for details.

Pumps/Aerators/Control Equipment

The XO_2 Treatment system incorporates a pump which has two functions: dose and flush drip tubing and disc filter. The pump performance curve is in Appendix B.

The standard control panel used in most residential application is the **LF1P-RF-AR** which will accommodate the discharge pump, the aerator, and the reverse flush headworks.

The number of aerators must be increased proportional to the design flow. For each 500 gallons of design flow an additional 80 l/min. aerator must be added:

- ≥ 500 gpd = 1 aerator
- 501-1,000 gpd = 2 aerators
- 1,001-1,500 gpd = 3 aerators

Appendix A: Headworks (HWN-.7-RF)

- $\frac{3}{4}$ inches Arkal disc filter, mesh, 130 micron
- $\frac{3}{4}$ inches Arad flow meter
- Three oil filled pressure gauges (0-100 psi)
- 5 Netafim normally closed solenoid valves (Model 80)



Appendix B: LOT-30 Pump performance curve

SUBMITTAL DATA SHEET

Thermoplastic



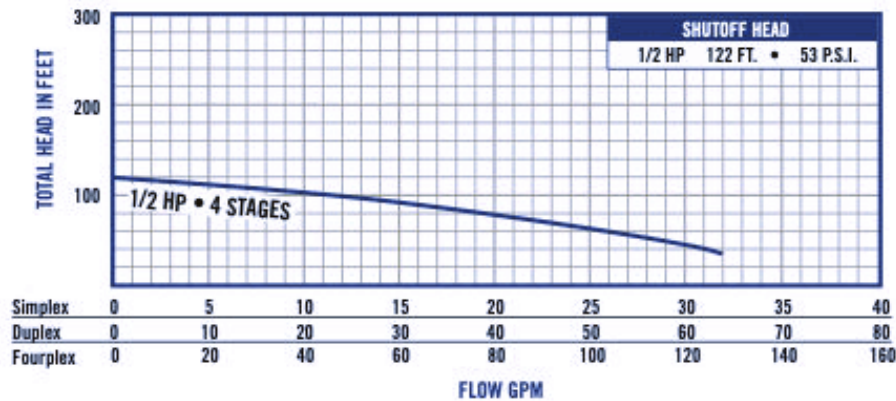
Reinforced Thermoplastic motor bracket and discharge with built-in guide bearing. This 1/2 HP pump has a stainless steel top bearing and motor coupling. These are assembled with our A.Y. McDonald stainless steel motors. Two wire single phase models include pump, motor, and 10' lead.

This four inch submersible is supplied with grounded leads meeting the National Electrical Code (N.E.C.) specifications. The performance curve below will assist you in choosing the pump that meets your needs.

MODELS | E - 30 GPM



E - 30 GPM



Specifications

Model	HP	Material	Volts	Phase	A	B	Wt.
LOT-30	1/2	Plastic	115	1	10.94	9.53	23

SUBMITTAL INFORMATION

- Stainless steel pump shell and pump shaft
- Reinforced Thermoplastic diffusers and impellers
- Thermoplastic intake screen and cable guard
- Powered by A.Y. McDonald submersible motors 1/2 HP.
- 1 1/4" FNPT Discharge



NO-LEAD: The weighted average of the wetted surface of this no-lead product contacted by consumable water contains less than one quarter of one percent (0.25%) lead.



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A.Y. McDonald considers the information on this assembly drawing correct when published. Item and option availability, including specifications, are subject to change without notice.

Submitted by:

Appendix C: Vertical separation table

Table 4-21. Intermittent sand filter vertical setback to limiting layers (feet).

Limiting Layer	Flow < 2,500 GPD	Flow ≥ 2,500 GPD
	All Soil Types	All Soil Types
Impermeable layer	2	4
Fractured rock or very porous layer	1	2
Normal high ground water	1	2
Seasonal high ground water	1	2

Note: gallons per day (GPD)

Appendix D: Secondary application rates

Table 4-22. Secondary biological treatment system hydraulic application rates.

Soil Design Subgroup	Application Rate (gallons/ square foot/day)
A1	1.7
A2a	1.2
A-2b	1.0
B1	0.8
B2	0.6
C1	0.4
C2	0.3

Installation Manual

Prior to Installing an XO₂ Unit:

Before installing an XO₂ systems, the installer must complete in-class and in- field training by representatives designated by *Lowridge Onsite Technologies, Inc.* The Installer must insure that no water softener discharge is plumbed into any of the drains that feed the system. The residential XO₂ unit is intended to treat ***only*** wastewater generated by normal activities from laundry machines, toilets, showers, and kitchen and bathroom sinks. No special chemical additives are needed for the normal functioning of the XO₂ unit.

List of components:

1. Control panel: *LF1P-RF-AR*
2. Reverse flush Headworks: three (3) oil filter 0-100 psi pressure gauges, one (1) 3/4"- 100 micron *Arkal*[™] disc filter, five (5) Netafim 1" normally closed solenoid valves and container.
3. Float switches (2)
4. Discharge pump, ½ hp, LOT-30.
5. 3/4" *ARAD* flow meter
6. Aerator.
7. Misc. fittings and blank tubing

Unloading and un-packaging instructions:

Lowridge Onsite Technologies, Inc. takes great care to manufacture and package the XO₂ unit to prevent damage during shipping and handling. It is expected that everyone from the manufacturing personnel to the installation crew take reasonable steps not to drop, throw, or damage the product.

If there are defects in any of the components, call *Lowridge*.

Installation steps:

For reference, please see instructional videos on our website at: www.oscaronsite.com, click on “Training Video” page, select Idaho State and then XO2.

Step 1: Determine the orientation and position of the tanks.

Some designs will have specific locations for the system components based on required setbacks, elevation, logistical issues, or aesthetic concerns. Before excavating begins, verify that the proposed locations of the tanks are laid out in a manner that will allow for efficient pipe connections.

Step 2: Excavate the holes for tanks.

Excavate the tank holes by leaving 6-12 inches of space between tanks and excavation sides. Take appropriate steps to insure the tanks will not settle after backfill. Fill tanks with water during back filling.

Step 3: Setting tanks.

Tanks: Bed tanks is sand, pea gravel, or 5/8- inch crushed rock. Sand must be water settled in fill in any voids along tanks. Always place discharge tank below the OSCAR.

Step 4: Plumbing connections

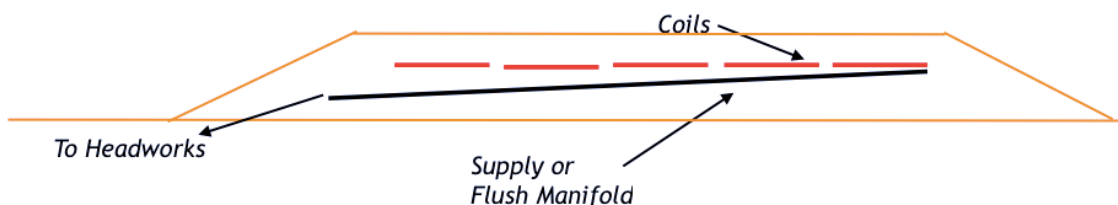
The headworks has four plumbing connections: pump line from dosing pump, supply line, flush line, and vent line from headworks to inlet of septic chamber. Plumb the connections to the headworks so that the pipes are supported by the top of the tank or hand bed the pipes before backfilling the system.

Freeze Protection:

To avoid freezing, the plumbing must drain between each dose. Always install the discharge tank at or below the elevation of the OSCAR. The headworks must be placed directly on top of the discharge tank. The plumbing must be sloped to allow liquid to drain from the OSCAR coils, manifolds, supply and flush lines back through the headworks into the tank.

It may be necessary to install the treatment tank near the house and the discharge tank near the OSCAR location.

The coils must be installed level. The supply and flush manifolds must be graded to allow drainage between cycles.



Step 5: Wire control panel, floats, and pump.

Mount the control panel chest to eye level.

Always use PVC electrical conduit between the splice boxes and the control panel and follow all applicable electrical codes. Do not use direct burial wire on XO2 systems. Follow the wiring directions provided inside the control panel.

Power requirements for the XO2 system are as follows:

- Discharge pump, 110 volt, up to 18 amps start and 11 amps running
- Headworks 24 volts, 0.4 to 0.6 amps\
- Aerator requires 10 amp, 110 volt.

Step 6: Aerator and Diffusors.

Install the two 12” diffusors provided as shown in the stock tank details. The diffusors must be installed adjacent to the partition wall and exit the tank through the riser wall. The aerator is housed inside the box provided and is located under the eave of the house or other location out of the rain.

Step 7: Pump and Floats settings.

Set float using the floats and float clips provided. The bottom float (Timer enable float) should be set at a minimum of 24 inches above the bottom of the tank to insure the entire pump motor and wet end are completely submerged. The top float (high level alarm) should be set at least 4 inches above the bottom float. A greater distance can be used if a large working volume is required.

Step 8: Back fill and water test.

Prior to backfilling, all tanks should be water tested and all start-up procedures must be completed. Fill and back fill tanks in 12 inch lifts. Water test tank tanks by filling to 2 inches above riser connections and mark water level. There should be no measurable water loss for 2 hours. Backfill tanks with sand, pea gravel or crushed rocket to at least mid-seam of tank body. Back fill the to top of the tanks to final grade with appropriate soil free of sharp rocks.

Step 9: Panel Operation and Start-up procedures.

Panel Operation:

The **LF1P-RF-AR** control panels are 110 volt universal panels for single family XO₂ systems. It has the capacity to operate three major outputs: discharge pump, Aerator, and the "Reverse Flush" headworks. 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).

Start Up Procedures:

Start Up Procedures:

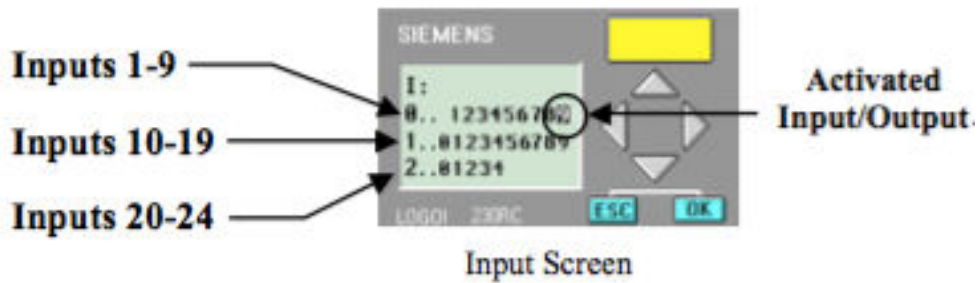
Prior to conducting any of the following procedures, inspect the wiring to insure the system is correctly wired. Pull the float tree from the tank and place across the tank opening so all the floats hang down. Now power up the system and turn all the breakers to the "ON" position and all of the toggle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

Aerator:

There should be no water inside the aerator housing. The tank needs to be a full of water to the outlet of the aeration chamber. Energize aerator. There should be a copious amount bubbles rising to the liquid surface.

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.

Replacement Instructions:

There are several components that are critical to process performance: solenoid valves in the headworks, drip tubing in the *Coil*, aerator in the aeration tank, and the discharge pump.

Solenoid Valves, 2-way throttling valve, Netafim part number, LVET1GH2:

To replace remove six screws, remove bonnet, remove and replace bonnet and tighten screws. Valves can be purchased from distributors of *Lowridge Onsite Technologies, Inc.*



LVET1GH2

Coil, laterals of Netafim Bioline, 08WRAM.4-06V500:

To replace the *Coil* remove sand media from top of *Coil*, cut the 1/2 inch poly feed lines adjacent to the manifolds and remove *Coil*. Place the new *Coil* in the sand, couple to the feed lines, and cover *Coil* with sand. *Coils* can be obtained from any OSCAR dealer or Lowridge Onsite Technologies, Inc.

Discharge pump, model LOT-30:

Cut power to pump, disconnect wire connections in splice box, remove pump from tank, and disconnect pump from piping. Connect new pump piping, connect wiring in splice box, place pump into tank, and re-energize power to pump circuit.

Material Specifications:

Tank man-hole openings must be 24 inch diameter or greater nominal size to surface grade with a locking lid to preclude un-authorized access. All tanks must be water tight to the riser lid opening. All protrusion through the riser wall for electrical conduits and other piping must be sealed to preclude any water infiltration.

Plumbing: All piping must be PVC. The 1 inch supply and flush lines must be sch 40.

Assembled components:

Lowridge assembles the following components: headworks, *Coil* (partially assembled), and *Coil* manifold connections.

Headworks: the headworks for the OSCAR-XO₂ is made of all 1" sch PVC pipe and fittings, 1 inches Normally closed *Dorot* solenoid valves, 3/4 inches *Arkal* disc filter (120 mesh, 130 micron), three oil filled pressure gauges, and a polyethylene valve box with lid.

Coil: The *Coil* is constructed of Netafim Bioline™ (0.42 gph emitter at 6 inch spacing) attached to a 1/2 inches or 1 inches Sch 40 PVC bracket.

Aerator: the aerator will be housed in the box provided. The aerator is a Hiblow-80.