AdvanTex® O&M MANUAL

SUPPLEMENTAL INFORMATION, AX-RT

Introduction: AdvanTex® AX-RT Treatment Unit Operation

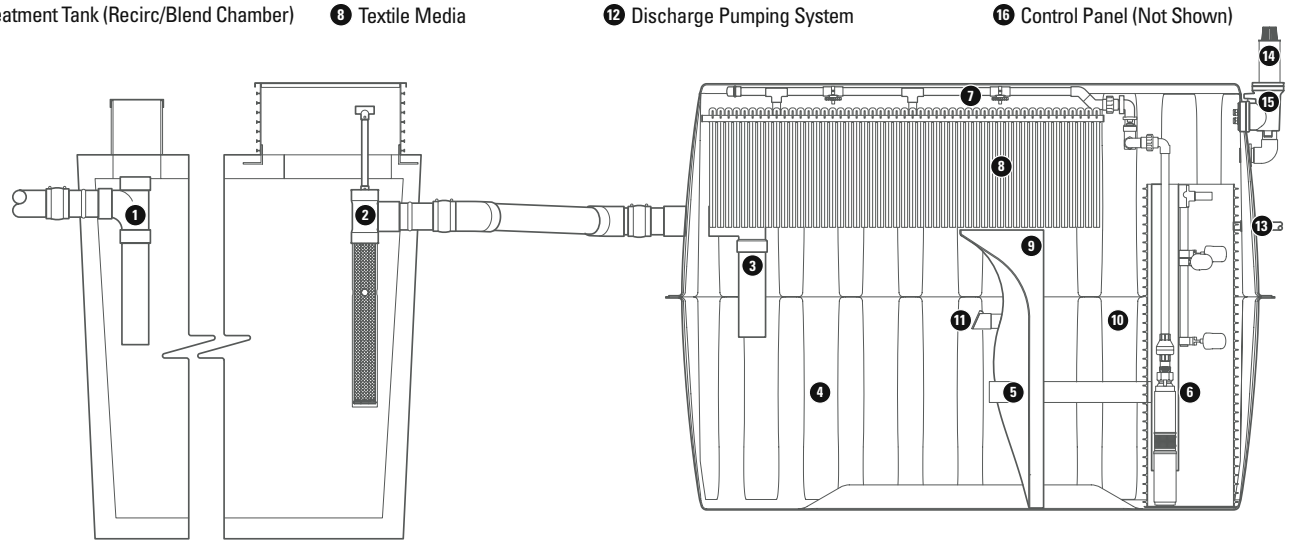
This supplement contains information to help you successfully operate and maintain an AdvanTex® AX-RT Treatment System. The AX-RT operates similarly to the AdvanTex AX20 Treatment System, but there are some differences to be aware of when performing O&M activities. A big difference is that the AX-RT consists of a single, self-contained module for recirculation, treatment, and dosing, instead of separate units.

Another difference is that the AX-RT has no Recirculating Splitter Valve (RSV). Effluent percolates down through the textile media and is split — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chambers of the AX-RT recirculating treatment tank.

Raw sewage enters the septic tank through its inlet tee. In the septic tank, the raw sewage separates into three distinct zones — a scum layer, a sludge layer, and a clear zone. Effluent from the clear layer passes through a Biotube® effluent filter and is discharged by gravity to the recirc/blend chamber of the AX-RT unit. The effluent then flows through the recirc transfer line to the recirc pumping system. The recirc pumping system pumps effluent from the recirc/blend chamber through the manifold to the spray nozzles in the top of the unit. Effluent percolates down through the textile media and is divided — by means of a tank baffle — between the recirc/blend chamber and the recirc/filtrate chamber inside of the unit.

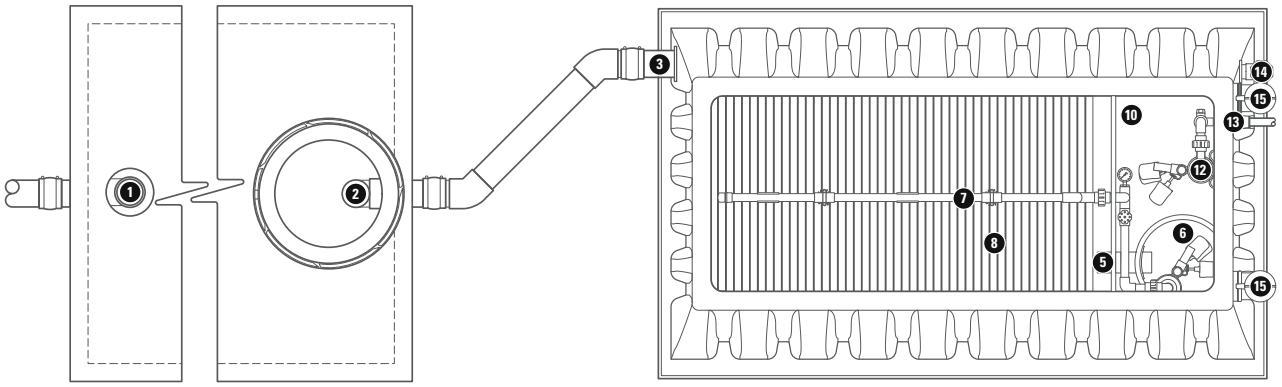
Figure 1. AdvanTex® AX-RT Functional Areas and Components (AX20-RT Shown):

1. Septic Tank Inlet Tee
2. Biotube® Effluent Filter
3. AX-RT Inlet and Tee
4. Treatment Tank (Recirc/Blend Chamber)
5. Recirc Transfer Line
6. Recirc Pumping System
7. Manifold and Spin Nozzles
8. Textile Media
9. Tank Baffle
10. Treatment Tank (Recirc/Filtrate Chamber)
11. Recirc-Return Valve
12. Discharge Pumping System
13. AX-RT Outlet
14. Passive Air Vent
15. External Splice Box
16. Control Panel (Not Shown)



Side view, septic tank

Side view (AX20-RT pump discharge model)



Top view, septic tank

Top view (AX20-RT pump discharge model)

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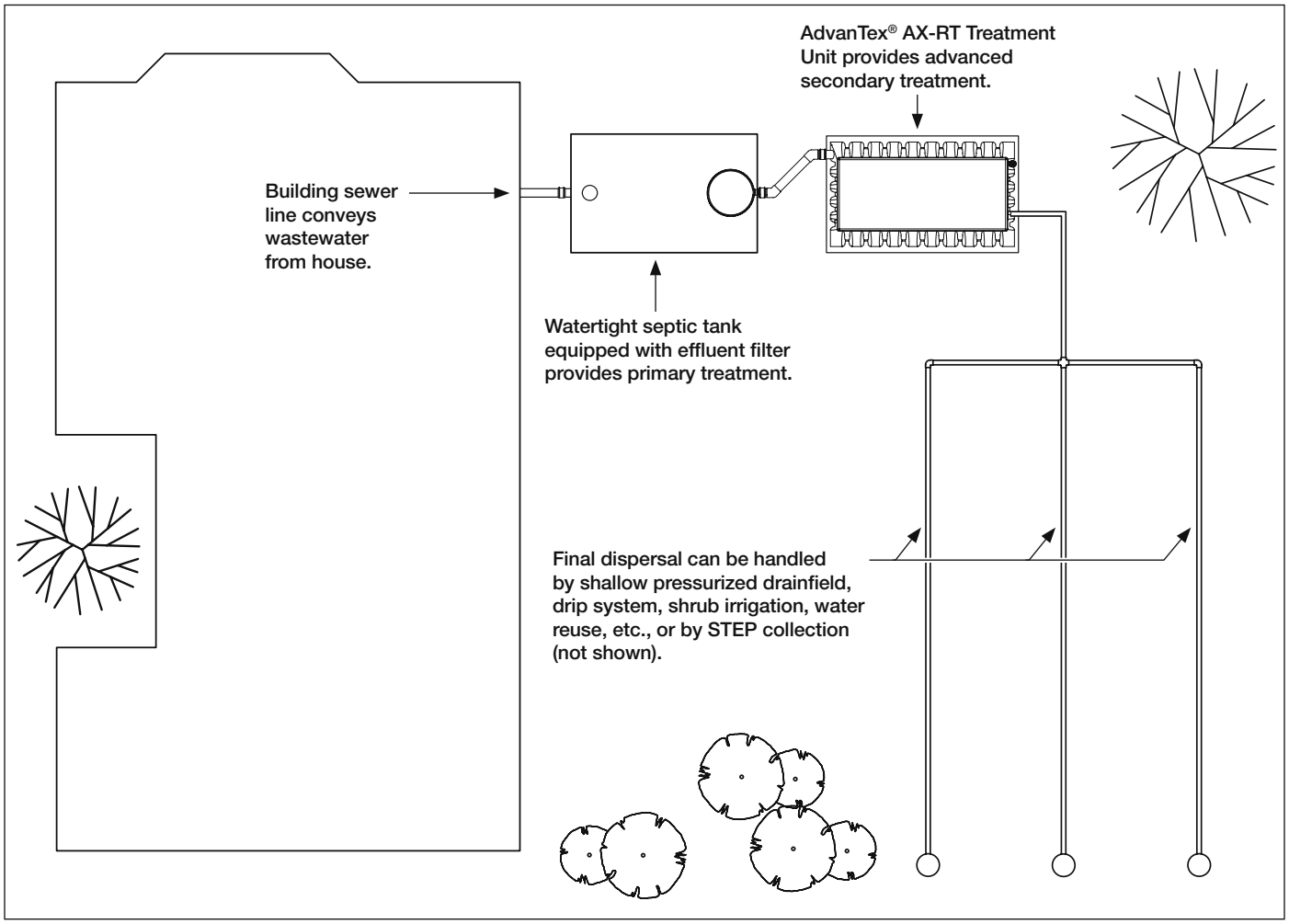
Introduction to AdvanTex AX-RT, continued

The recirc pump's operation is controlled by a timer in the control panel. It allows the pump to dose the textile media for short periods (usually a 1-1.5 minutes), typically 72 times a day. These frequent "micro-doses," which optimize the treatment process, occur 24 hours a day, to maintain the proper biological environment.

Treated effluent can be discharged to the drainfield by means of a discharge pump system or by gravity discharge. The "High Level Alarm" and "ON" floats for the discharge pump are set at the factory and are non-adjustable. Dose volume for the discharge pump system is determined by adjustments to the "OFF" float. AX-RT units with gravity discharge simply discharge when the level of treated effluent in the recirc/filtrate chamber is at the level of the discharge outlet. For units equipped with UV disinfection, the effluent passes through the UV treatment unit before being pumped or flowing by gravity to final dispersal.

Typical Site Plan for an AdvanTex AX-RT Treatment Unit



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AdvanTex O&M Manual: Changes Specific to the AX-RT

The following shows AX-RT-specific information not found in Parts 1 and 2 of the *AdvanTex® O&M Manual* that are relevant to operating and maintaining the AdvanTex AX-RT Treatment Unit. Use the general information found in the *O&M Manual* along with this information to start up and properly service AX-RT systems.

Start-Up Checklist Changes

Primary Treatment

Note: *All pumping equipment is contained in the AX-RT unit. Substitute the checklist item below for the checklist items in the "Process Tank Pumping Equipment" and "Process Tank Pumping System" sections.*

Septic Tank

☐ Biotube® filter installed correctly on the septic tank outlet.

Note: *There is no recirculating splitter valve (RSV) or separate discharge basin in an AX-RT system. Floats in the recirculation pump system are set at the factory for correct performance. Do not adjust the floats in the recirculation pump system. Substitute the checklist items below for the checklist items in the "Secondary Treatment" section.*

Secondary Treatment

AX-RT Unit

☐ AX-RT unit installed level.

☐ All piping properly covered and compacted.

Ventilation System

☐ Passive air vent on AX-RT unit properly installed.

Recirculation Pump System

☐ Floats operate properly.

☐ Pump plumbing connected correctly to manifold.

Recirculation Pump System Operation

☐ Pump operates in "Manual."

☐ Pump operates in "Automatic."

☐ Pump run amps:_____

☐ Pump rest volts:_____ run volts:_____

AX-RT Filter Operation

☐ Complete, square spray square pattern with full coverage of sheets

☐ Manifold pressure:_____
(Typically 3.0-3.5 psi or 20.7-24.1 kPa.)

AX-RT Discharge Unit (pump discharge only)

☐ Floats operate properly.

☐ Pump discharge plumbing connected correctly.

☐ "Off" float adjusted for correct discharge dose to dispersal.

Setting Timers for New Systems

Initial timer settings for an AX-RT should be established based upon expected average daily flows and a recirculation ratio of 4:1 (filter recirculation ratio). Table 1 provides recommended timer settings. If flows vary significantly from expected flows, timer settings should be adjusted accordingly. Contact Orenco for more information.

Table 1. Recommended Timer Settings for New Systems

Models AX20-RT, AX20-RTUV	Number of Residents	Time On Setting Min (Sec)	Avg Daily Flow, gpd (L/day)	Time Off Setting Min
	2	0.8 (45)	100 (379)	30
	3	0.8 (45)	150 (568)	20
	4	0.8 (45)	200 (757)	15
	5	0.8 (45)	250 (946)	15
	6	0.8 (45)	300 (1136)	10
	7	0.8 (45)	350 (1325)	10
	8	0.8 (45)	400 (1514)	8
Model AX25-RT	**Number of Residents**	**Time On Setting Min (Sec)**	**Avg Daily Flow, gpd (L/day)**	**Time Off Setting Min**
	2	1.0 (60)	100 (379)	40
	3	1.0 (60)	150 (568)	30
	4	1.0 (60)	200 (757)	20
	5	1.0 (60)	250 (946)	15
	6	1.0 (60)	300 (1136)	15
	7	1.0 (60)	350 (1325)	10
	8	1.0 (60)	400 (1514)	10
	9	1.0 (60)	450 (1703)	8
	10	1.0 (60)	500 (1893)	8
	11	1.0 (60)	550 (2082)	7
	12	1.0 (60)	600 (2271)	7

- *Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3:1. (Filter recirculation ratio of 4:1.)*
- *Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.*

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Setting Discharge Dose Volume

The AX-RT is pre-set at the factory for a discharge dose volume of 43 gal/dose (162 L/dose). If necessary, use the discharge pump "Off" float to make adjustments to the discharge dose volume. Each 1-in. (12.7 mm) increase or decrease in "Off" float height is equal to approximately 8.7 gal. (33 L) change in dose volume.

Do not adjust the settings of the "High-Level Alarm" and "On" floats.

Table 2. Dose Volume Information

Pump gal./min (L/sec)	10 (0.6)	20 (1.3)	30 (1.9)	50 (3.2)
Factory float setting*, in. (mm)	30 (762)	30 (762)	30 (762)	30 (762)
Lowest "Off" setting, in. (mm)	16 (406)	18 (457)	20 (508)	24 (610)
Max dose volume, gal. (L)	156 (591)	139 (526)	123 (466)	90 (341)

**Settings are measured from the bottom of the discharge side of the AX-RT unit.*

Perform Field Sampling

When you arrive at the site, remove the lid from the AX-RT and take your sample from the recirc/filtrate side of the AX-RT unit before doing anything else, so that the sample won't be contaminated by material that you stir up while working.

When you collect effluent samples, be careful not to touch the textile sheets, unit walls, or other components. Disturbing the sheets, walls, or other components could contaminate the samples. Also, be sure to thoroughly clean and dry your sampling device between uses to avoid cross-contamination.

Measure Sludge and Scum

Measure sludge and scum in the septic tank AND on the recirc/blend side of the AX-RT unit. Follow the instructions for pumpouts found in the *AdvanTex O&M Manual* for the process tank.

NOTE: *A light buildup of solids is expected to form in the AX-RT unit over time. After the second year that the system is in use, we recommend measuring solids accumulation in the AX-RT whenever you perform regularly scheduled maintenance.*

If more than trace amounts of scum or solids are found in the recirc/blend side of the AX-RT unit, check the recirc/filtrate side of the unit for solids and scum, schedule a pumpout, and begin troubleshooting the system. The Advanced Service Tips and Troubleshooting Guide can help you determine the cause. You may need to change timer settings or discuss household habits with the system users.

Notes

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Part 1: Start-Up and Routine Maintenance of AdvanTex® Residential Wastewater Treatment Systems

RESIDENTIAL
O&M
MANUAL

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Introduction

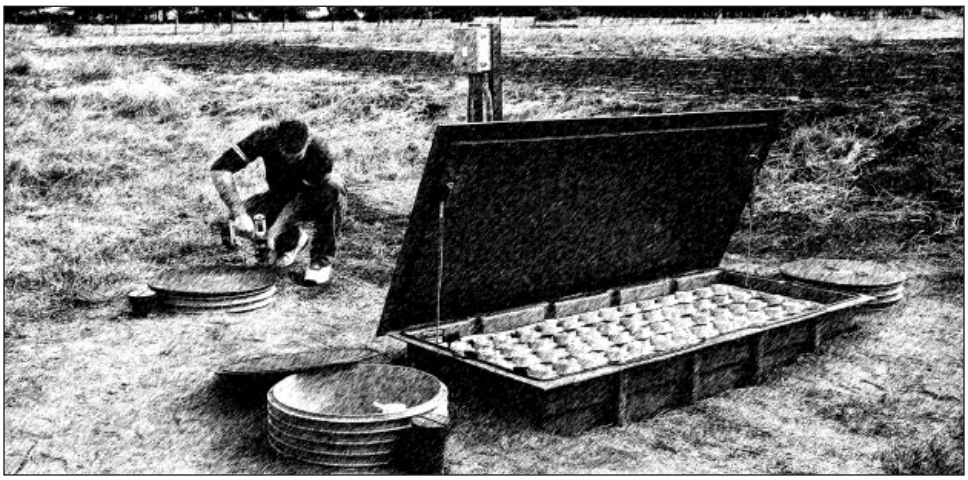
As a trained AdvanTex Service Provider, you play a crucial role in Orenco's AdvanTex Program.

Orenco has always advocated regular, professional servicing of all onsite systems ... not just during the warranty period but for the life of the system. Regular servicing optimizes the treatment process and protects the property owner's investment. It also ensures that onsite systems protect public health, protect the environment, and are viewed as a reliable, sustainable technology.

Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive maintenance, and work to keep the system under a continuous service contract. Equally important, we rely on you to keep good service records on the system, creating a "history" of its performance.

To make your job easier, Orenco has created one of the most service-friendly and trouble-free onsite systems on the market. Then we paired that system with a remote telemetry control panel, to allow you to "view" the system right from your computer.* And we've provided a Web-based business tool — advantexservice.com — to help you file and retrieve system data automatically, schedule service events, and manage service technicians.

Finally, we've provided classroom and field training, as well as support materials, like this O&M Manual. Please read this manual thoroughly, for up-to-date information on the best practices for system start-up and routine maintenance. You can find information about troubleshooting in Part 2 of our O&M Manual: *Advanced Service Tips and Troubleshooting Guide*.



We're very proud of our AdvanTex Treatment System. Like all our products, it has gone through extensive research, development, and field-testing. Then each component is built to written specifications and subjected to quality review, before shipping. In addition, our AXN models meet the requirements of NSF-ANSI Standard 40 for Class I Systems. If any component of this system does not meet your expectations, please call your authorized AdvanTex Dealer.

Thank you, in advance, for your knowledge, your conscientiousness, and your good work.

** Orenco® MVP control panels are available in some markets. For more information, contact your Dealer or Orenco*

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AdvanTex® O&M MANUAL

PART 1: START-UP AND ROUTINE MAINTENANCE

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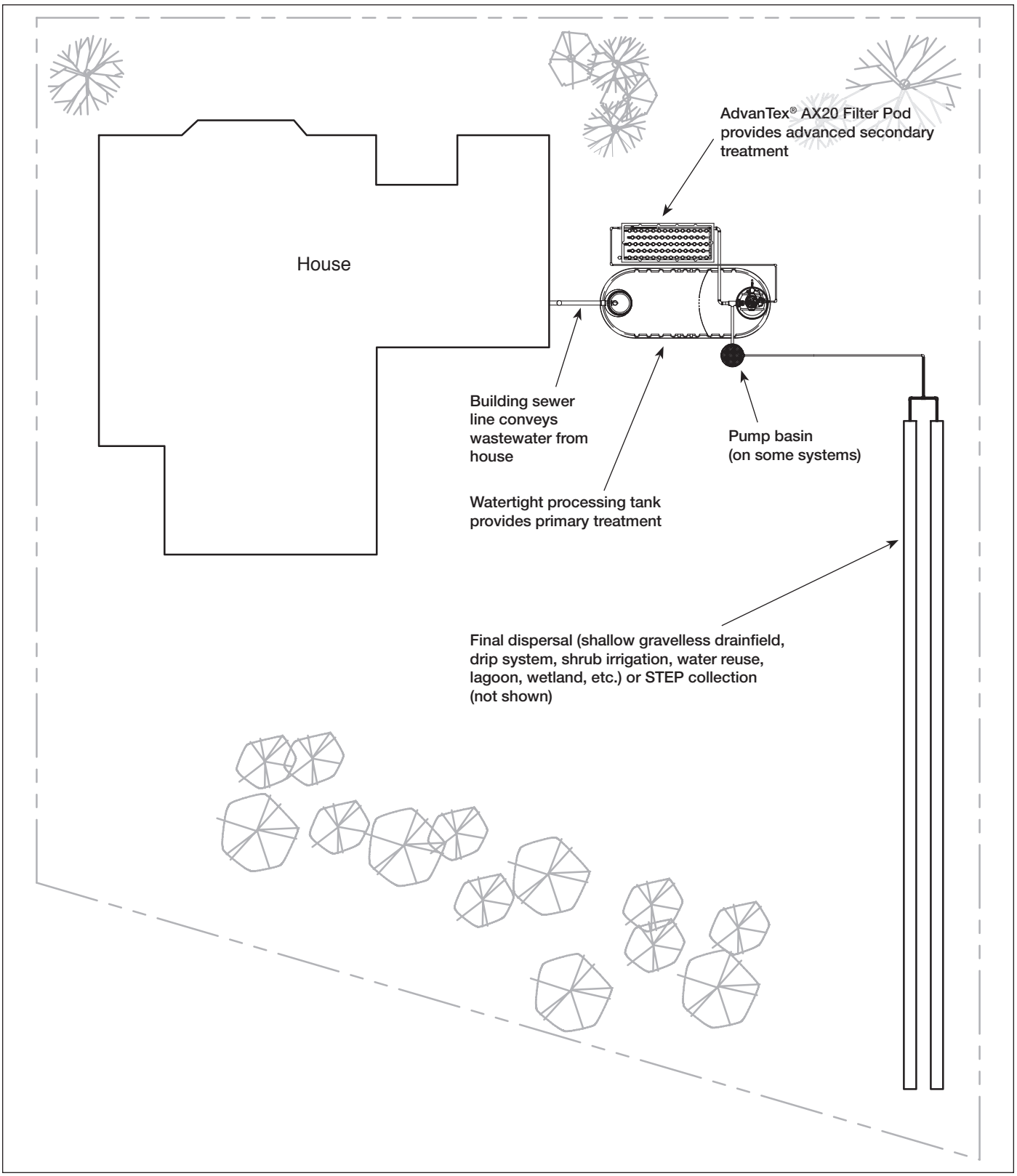
Typical Site Plan for an AdvanTex Treatment System



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How the AdvanTex Treatment System Works

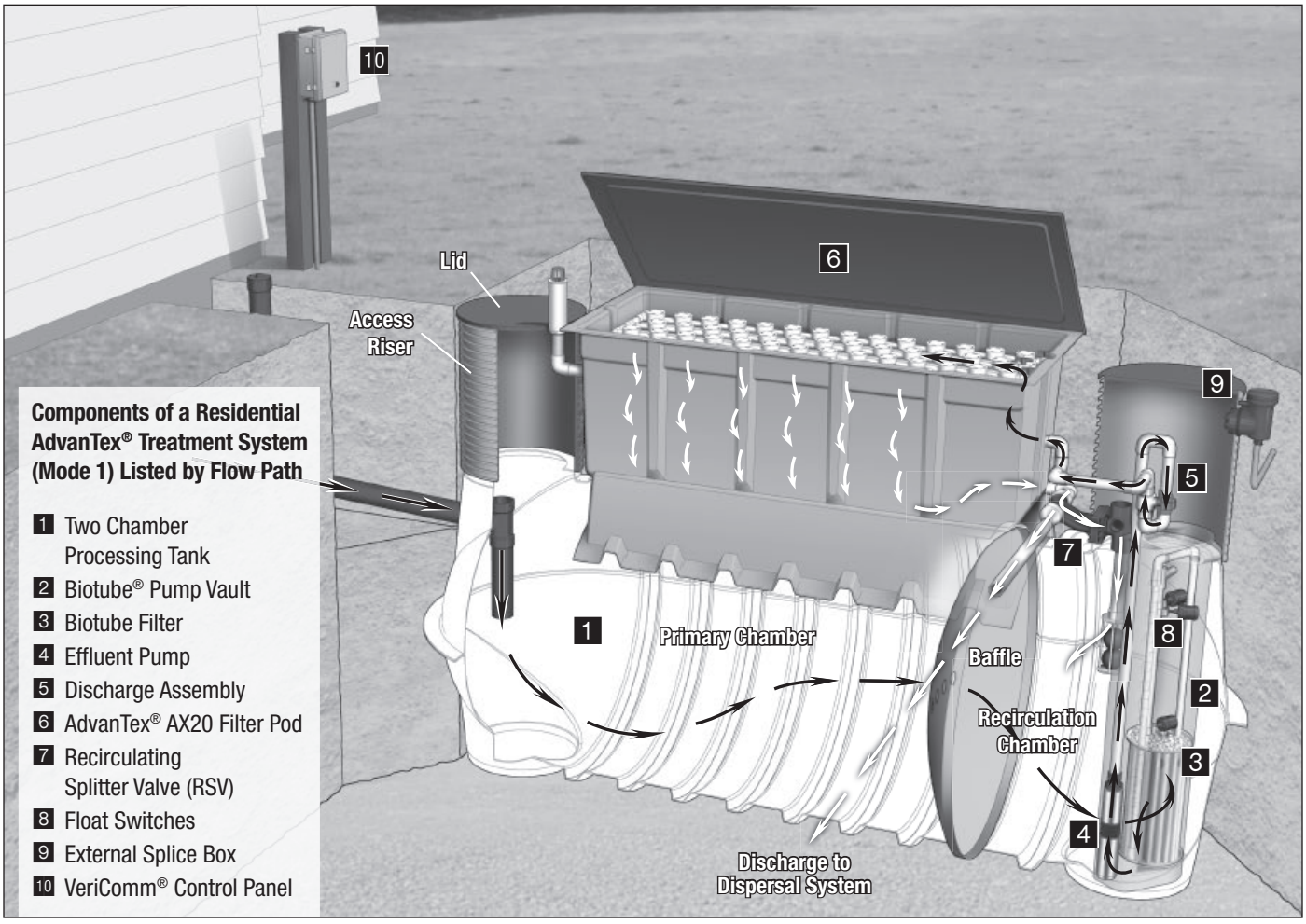
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: a floating scum layer, a bottom sludge layer, and a relatively clear layer of liquid effluent in the middle.

From the secondary chamber, a pump draws liquid effluent through the Biotube® filter and sends it to the AX20 pod. There, the effluent is sprayed over hanging sheets of porous synthetic textile media. Microorganisms live in this moist, oxygen-rich (aerobic) environment. As effluent trickles over and through the sheets, the microorganisms remove impurities from it.

Effluent recirculates between the tank and the AX20 pod. In Mode 1, the most common configuration, the effluent recirculates to the second compartment of the tank. In Mode 3, effluent recirculates to the first compartment. This mode is used where maximum removal of nitrogen from the effluent is required.

After recirculating several times, the effluent is discharged, either directly from the processing tank or after first being collected in a pump basin. Depending on the design for a particular site, the treated effluent may be discharged to a drainfield, an underground drip irrigation system, a constructed wetland, an effluent sewer (STEP) system, or a reuse system. The system may include equipment for ultraviolet (UV) disinfection before ultimate dispersal of the effluent.

Properly sited, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 10 mg/L BOD and 10 mg/L TSS. This level of treatment is better than what municipal wastewater plants provide. The system can also be configured to reduce nitrogen levels as required locally. When effluent treated in this way is dispersed to the soil, natural processes purify it further, and it eventually returns to the underlying water table, where it can be used again.



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Equipment List

Routine maintenance and troubleshooting requires a variety of tools, equipment, and spare parts. We recommend that all trained AdvanTex Service Providers have the following items at hand:

For Routine Inspection and Maintenance

- Cordless drill with 3⁄16-inch Allen wrench for lid bolts on risers and pod
- Extra lid bolts
- Sludge and scum measuring device (e.g., Nasco Sludge Judge® for sludge and Orenco SMUG for scum)
- Hook for raising floats to test them
- Biotube® filter cradle (OM-BIOTUBECRADLE)
- Bronze threaded check valve, for measuring pump flow rate in systems with drainbacks
- Backpack pressure washer
- Trash pump (and generator, if pump is electric) for removing solids from discharge basin
- AX20 manifold brush (AX-LATERALBRUSH)
- AX20 sheet cleaning wand (AX-CLEANINGWAND)
- Handheld computer (PDA) or laptop computer with Bluetooth® Kit and BT-VCOM software (optional, to turn pump on and off at a distance from the panel)
- Electrical tester (voltage and amperage)
- Phone line tester (available from RadioShack®)
- Dissolved oxygen (DO) meter or colorimetric ampoules
- Sample bottles
- Turbidity meter
- pH meter or pH test strips
- Test strips for nitrate, ammonia, alkalinity
- Tape measure
- Calculator
- A copy of the *AX20 Installation Instructions* (NIM-ATX-AX-1), for reference

For Repairs

- Structural adhesive and adhesive/sealant
- Control panel parts (circuit breakers, motor contactors, relays)
- Effluent pump(s)
- Extension cord
- Flashlight
- Hand tools (pliers, wrenches, screwdrivers, drill bits, hammer, shovel, hand saw, etc.)
- Heat gun or torch for bending conduit
- Inspection mirror (e.g., Prototek "Mirror on a Stick")
- Plumber's snake
- PVC cement and primer
- PVC fittings, ¾-inch to 2-inch (20-50 mm)
- PVC pipe, ¾-inch to 2-inch (20-50 mm)
- Spare parts for downstream components (e.g. drip headworks, UV)
- Waterproof wire nuts
- Wire stripping/crimping tool
- Float switches

For Troubleshooting

- Digital camera
- Watch or timer
- A copy of Part 2 of the AdvanTex O&M Manual: *Advanced Service Tips and Troubleshooting Guide* (AIM-OM-ATX-2)

For Personal Hygiene and Cleanup

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Protective clothing
- Rags
- Rubber gloves

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Start-Up Checklist

AX20 Start-Up Checklist

Service Provider _____

Technician | **Start-Up Date** | **Occupancy Date**

Primary Treatment

Process Tank.

- ☐ Proper inlet tee installed.

Process Tank Pumping Equipment.

- ☐ Discharge plumbing properly installed through watertight grommet, threaded connections tight, ball valve in open position.
- ☐ Float assembly mounted in Biotube® vault and properly set per AdvanTex Installation Guide. Float cords neatly wrapped around splice box and tied.
- ☐ Floats operate properly.
- ☐ Floats set properly (measuring from outside top of tank).
- ☐ Splice box mounted on access riser. Watertight connectors used.

Process Tank Pumping System.

- ☐ Pump operates in Manual.
- ☐ Pump operates in Automatic.
- ☐ Pump run amps: _____
- ☐ Pump rest volts: _____ run volts: _____

Secondary Treatment

Recirculating Splitter Valve Assembly.

- ☐ Verify proper RSV setting (measuring from top of cage to outside top of tank).

AdvanTex System.

- ☐ All pods installed level.
- ☐ All piping properly covered and compacted.

Ventilation System.

- ☐ Ventilation intake(s) properly located and installed.

AdvanTex Filter Operation.

- ☐ Squirt height verified.

Discharge Pump Basin/Tank.

- ☐ Basin/tank inspected for infiltration.
- ☐ Basin/tank is set level.

Discharge Basin/Tank Pumping Equipment.

- ☐ Pump and discharge plumbing are compatible (e.g. pressure rating).
- ☐ Discharge plumbing properly installed through watertight grommet, and ball valve is in open position.
- ☐ Floats operate properly.
- ☐ Floats set properly (measuring from outside top of tank).
- ☐ Splice box mounted in access riser. Watertight connectors used.

Discharge Basin/Tank Pumping System.

- ☐ Pump operates in Manual.
- ☐ Pump operates in Automatic.
- ☐ Pump run amps: _____
- ☐ Pump rest volts: _____ run volts: _____
- ☐ Dose volume verified.
- ☐ Flow rate verified (draw down test).

Other System Components

- ☐ Disinfection equipment installed properly.
- ☐ Dispersal equipment operating properly.

Controls

- ☐ Proper timer settings.
- ☐ Proper wire size used based on information provided by manufacturer.
- ☐ All electrical connections in panel secured.
- ☐ Panel wired per manufacturer's wiring diagram.
- ☐ Service provider name/number written on "For Service Call" label.
- ☐ Control panel functional test, as detailed in the *AdvanTex Installation Instructions*, has been followed.
- ☐ Dial tone verified.
- ☐ Control panel diagrams left in panel for future review.

Final/Safety Inspection

- ☐ All access riser hardware is in place. Lids are secured.
- ☐ All splice box lids are secured.
- ☐ Panel circuit breakers are in the "on" position, panel is set for automatic operation, and panel is latched (or locked if necessary).

Homeowner's Package

- ☐ Homeowner's Package reviewed with homeowner.

Comments

_____

_____

_____

_____

_____

_____

_____

_____

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Completing the Start-Up Checklist

System Start-Up Procedure

Your System Start-Up visit provides final confirmation that the system has been correctly installed and is ready to function properly. It also acquaints you, the service provider, with each individual system, so that you are familiar with any special components or requirements.

The *AX20 Start-Up Checklist* (SCL-ATX-OM-1), shown on the preceding page, will help you remember to complete all the steps needed to check the system's functions. While you don't need to return the *Start-Up Checklist* to Orenco, we recommend bringing a copy to the start-up and checking off the steps to make sure that you perform all of them.

As part of the start-up, you'll also download a computer-generated *Start-Up Summary Report* from advantexservice.com and fax it to the fax number on the bottom of the form. An automated system will add the report to the data file for that system on advantexservice.com. This will confirm that the system is ready for operation, so that Orenco and the AdvanTex Dealer can confidently warranty it and your service contract can begin.

Planning the Start-Up

When the installer calls to tell you that the system is ready for start-up, ask the following questions:

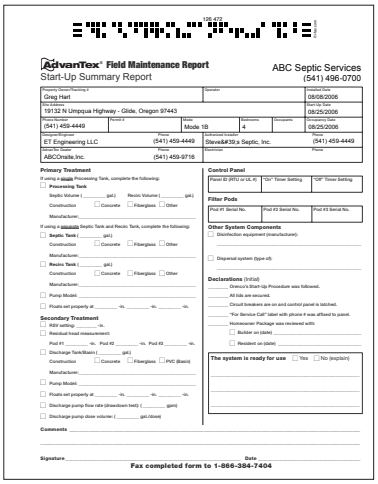
- Did the electrician connect the panel to the home's electrical service and turn the power on?
- Did the installer test the control panel to make sure it was functional?
- Is there phone service, or, at minimum, is the phone line physically connected to the panel?

If the installer answers "yes" to these questions, then the system is ready for start-up.

A typical start-up visit takes about an hour. Arrange to meet the system installer at the site so that he or she can answer any questions you may have about the installation. The installer should bring the site plan or as-built. If the system owners can be present too, this is a good opportunity for them to learn how the system functions. As part of the start-up, you will need to review the Homeowner Package with the homeowners or, if the house has not yet been sold, with a representative of the homebuilder. You can do this at the start-up visit, or arrange a meeting prior to the start-up.

Before Leaving the Office

Download the *Start-Up Summary Report* from www.advantexservice.com. The top of the form should be pre-filled with information about the site. If any information is missing, fill it in. You will fill out the rest of the form at the site as you go through the start-up procedure.



AdvanTex® Field Maintenance Report
Start-Up Summary Report
ABC Septic Services
(541) 496-0700

Fax completed form to 1-866-384-7404

If the system does not have a discharge tank or basin and discharge pump, note that in the *Start-Up Summary Report*.

At the Site

Ask the system installer about the size, material, and manufacturer of each primary tank and discharge tank or basin, and record it on the *Start-Up Summary Report*. Also record the serial number(s) of the AX20 pods.

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Completing the Start-Up Checklist (continued)

Primary Treatment

Open the risers of the tank and of any discharge or recirculation tanks or basins.

WARNING: *Do not enter the tank. Entering a tank without proper confined space procedures and equipment can cause serious injury, asphyxiation, or drowning.*

☐ **Proper inlet tee installed.**

In the inlet riser of the primary processing tank, make sure that the inlet tee is present, firmly attached, and plumb.

☐ **Discharge plumbing properly installed.**

In the outlet riser, make sure that the discharge plumbing is properly installed through a watertight grommet. The threaded connections should be hand-tight, and the ball valve should be open. Look at the pump to make sure that it is the model specified on the plans, and record the model on the *Start-Up Summary Report*.

☐ **Float assembly mounted in Biotube® vault.**

☐ **Floats operate properly.**

Before you test the floats, open the control panel and place it in test mode by pressing and holding the red button on the front for 15 seconds. Inside the panel, the correct yellow digital input LED should light up. Release the button when the audible alarm chirps.

If you can't see the inside of the control panel while you raise and lower the float switches, you may need a helper. Pull the float tree out of the water. The floats will go down, the alarm will sound, and all the yellow LEDs should be off.

Raise the bottom float to stop the alarm. A yellow LED should light up.

Next, raise the middle float, if it is present. No alarm should sound, but another yellow LED should light up.

When you raise the top float, the alarm should sound again and the third yellow LED should light up.

☐ **Floats set properly.**

Replace the float tree in its bracket, making sure it's properly mounted. Neatly coil the float cords, and secure them to the splice box. Measure the float heights from the outside top of the tank and verify that the heights are correct according to the *AX20 Installation Guide*. Record them on the *Start-Up Summary Report*.

NOTE: *Orenco provides float and RSV settings for all tanks approved for use with AdvanTex Treatment Systems in your area. At start-up and during annual maintenance, you need only verify that the actual settings on the equipment match Orenco's recommendations. If you need to adjust the settings to solve a problem, see Appendix 2.*

☐ **Splice box mounted on access riser. Watertight connectors used.**

Inspect the splice box to make sure that it is securely mounted inside or outside the riser; that connections have been made using watertight wire nuts; and that there is no water in the splice box. We also recommend that you seal the conduit using conduit seals or any electrically approved sealant.

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Completing the Start-Up Checklist (continued)

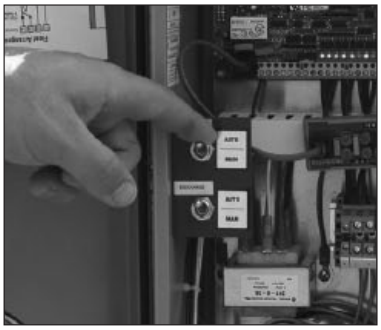
☐ **Pump operates in Manual.**

☐ **Pump operates in Automatic.**

☐ **Pump amps and volts checked.**

At the control panel, with the panel still in test mode, check the run amperage of the recirculation pump and discharge pump by placing the clamp of an ammeter around the wire to each pump's circuit breaker and reading the amperage while each pump is running. You can run the pump by holding the toggle switch on MAN. Amperage should be no more than the pump's maximum service factor amperage.

First for the recirculation pump and then for the discharge pump, measure the voltage with the pump off, by putting the probes of a voltmeter on each pump's terminals. Then measure the voltage with the pump running. The difference between running and rest voltage should be no more than 3 percent. That is 3.6 volts for a 120-volt system, or 7.2 volts for a 240-volt system.



Release the switch back to the AUTO position. Make sure the pump comes on as the timer cycles. Timer cycles are shortened to about 30 seconds in test mode.

Secondary Treatment

☐ **Verify proper RSV setting.**

Measure the distance from the outside top of the tank to the top of the Recirculating Splitter Valve (RSV) ball cage, and record it on the *Start-Up Summary Report*.

NOTE: *Improper RSV settings are a common installation error, so please check them carefully.*

☐ **All pods installed level.**

☐ **All piping properly covered and compacted.**

Check that each AX20 pod is installed level and that all piping is covered with compacted fill.

☐ **Ventilation intake(s) properly located and installed.**

☐ **Squirt height verified.**

Open each AX20 pod and make sure that the ball valves at the end of the laterals are closed. Remove an orifice cover and measure the squirt height. Record the squirt height on the *Start-Up Summary Report* as "Residual Head Measurement."

☐ **Discharge basin/tank inspected for infiltration.**

☐ **Discharge basin/tank set level.**

Inspect the discharge pump basin or tank to make sure that it is set level and there is no sign of water infiltration.

☐ **Pump and discharge plumbing are compatible.**

☐ **Discharge plumbing properly installed.**

Look at the pump to make sure that it is the model specified on the plans, and record the model on the *Start-Up Summary Report*. Verify that the discharge plumbing is installed as specified on the plans; that it is properly installed through a watertight grommet; and that the ball valve is open.

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Completing the Start-Up Checklist (continued)

☐ **Discharge floats operate properly.**

☐ **Discharge floats set properly.**

Check the function and settings of the floats in the discharge basin/tank as described under Primary Treatment Components, and record the float heights on the *Start-Up Summary Report*, as before.

NOTE: *To ensure proper system operation, check to make sure that floats are Orenco "A" or "V" floats.*

☐ **Splice box mounted in discharge access riser. Watertight connectors used.**

Inspect the splice box in the discharge basin/tank to make sure that it is securely mounted inside or outside the riser; that connections have been made using watertight wire nuts; and that there is no water in the splice box. Use conduit seals or electrically approved sealant.

☐ **Discharge pump operates in Manual.**

☐ **Discharge pump operates in Automatic.**

☐ **Discharge pump amps and volts checked.**

Test the discharge pump and check running amps, running volts, and resting volts at the same time you check the recirc pump.

☐ **Flow rate verified.**

☐ **Dose volume verified.**

Determining the discharge pump's actual flow rate enables you to determine the dose volume (the volume of wastewater being treated in each dose) and to calculate timer settings.

Knowing the dose volume also enables you to determine the volume of wastewater being treated in a given period. To do this, multiply the dose volume by the number of doses.

To verify the flow rate, follow Steps 1 through 7, then verify the dose volume in Step 8.

Step 1. Determine the gallons per inch (gpi) or liters per centimeter (L/cm) volume of the dosing tank or basin. A 24-inch (600-mm) diameter basin holds 1.88 gpi (2.8 L/cm). A 30-inch (750-mm) diameter basin holds 2.96 gpi (4.4 L/cm). For tanks, consult the manufacturer's volume chart. For Orenco fiberglass tanks, use Fiberglass Tank Volume Charts, NCH-TNK-1.

Step 2. You'll be running the pump for one minute during the flow rate test, so check the liquid level inside the tank/basin to ensure that there's enough water above the pump's minimum liquid level (MLL), or the lowest float (whichever is higher), to complete the test. For example, in one minute, a pump operating at 10 gpm (37.8 L/min) will draw down approximately 5¼ inch (14 cm) of liquid in a 24-inch (600-mm) diameter basin, or

10 gallons ÷ 1.88 gpi = 5¼ inch, or
37.8 liters ÷ 2.8 L/cm = 14 cm

So, to perform a flow rate test with the pump and basin in this example, you'd need at least 5¼ inch (14 cm) of water above the MLL or the bottom float (whichever is higher). If there is not enough liquid, add some.

Step 3. If your system isn't configured to drain back to the basin after each dose, skip to step 4. If your system is configured to drain back to the basin, you'll need to account for the drainback volume in your calculations. Or you can stop drainback during the test by temporarily installing a threaded check valve between the pump and the pump discharge assembly. This eliminates the need to measure drainback volume.

Step 4. To measure the flow rate, first measure the distance from the top of the tank or basin to the liquid level. Record this as H_1.

Step 5. Using a stopwatch, hold the discharge pump's toggle switch on MAN for exactly one minute. Then switch off the pump. If the system is configured to drain back into the tank or basin after a dose, wait until drainback is complete.

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Completing the Start-Up Checklist (continued)

Step 6. Measure the new distance from the top of the tank or basin to the liquid level. Record this as H_2.

Step 7. To get the pump's flow rate, find the difference between H_2 and H_1. Multiply this number by the gpi (or L/cm) volume of the tank or basin. Add the drainback volume (DB), if applicable. Then divide by the pump run time in minutes (T). For this test, the pump run time in minutes should equal one minute.

$$\text{Pump flow rate (gpm)} = \frac{[(H2 - H1) \times \text{gpi}] + DB}{T}$$

or

$$\text{Pump flow rate (L/min)} = \frac{[(H2 - H1) \times \text{L/cm}] + DB}{T}$$

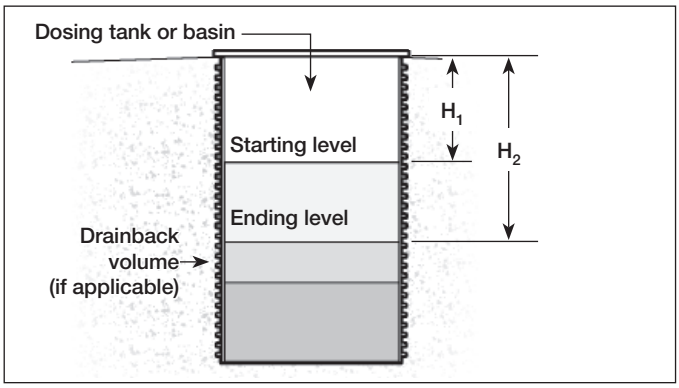
Important: For VeriComm® panels, enter the gpm value on the "Site Details" page at vericomm.net as "Discharge Pump GPM." The VeriComm panel will use it to automatically calculate and record the system's actual flow rates, which can be used for reports, troubleshooting, and determining timer settings.

Step 8. To verify the pump's dose volume, multiply the pump's flow rate (gpm or L/min) by the pump run time in minutes (T) — as determined by float settings or timer operation, depending on panel model — and subtract the drainback volume, if applicable.

$$\text{Dose Volume (V)} = (\text{gpm} \times T) - DB$$

or

$$\text{Dose Volume (V)} = (\text{L/min} \times T) - DB$$



Other System Components

☐ **Disinfection equipment installed properly.**

☐ **Dispersal equipment operating properly.**

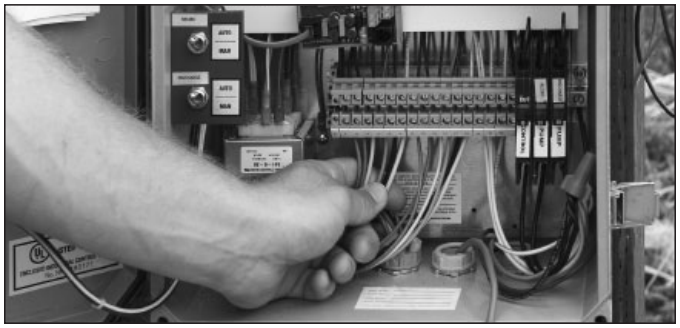
Verify that any disinfection and dispersal equipment specified on the plans is present, and follow the manufacturer's instructions to inspect it for proper functioning. Record the disinfection equipment manufacturer and the dispersal system type on the *Start-Up Summary Report*.

Control Panel

☐ **Proper timer settings.**

Open the control panel and, using a handheld or laptop computer, verify that the timer settings are appropriate for the installation. Record the Panel ID (RTU or UL number) and timer settings on the *Start-Up Summary Report*. Default timer settings are set for an occupancy of 3 people. This may also be adjusted at vericomm.net, for systems equipped with VeriComm.

☐ **Proper wire size used based on information provided by manufacturer.**



For Orenco components, the panel installation instructions provide correct wire sizes.

☐ **All electrical connections in panel secured.**

☐ **Panel wired per manufacturer's wiring diagram.**

Check the panel to make sure that it is wired according to the diagram clipped inside the panel's door. Gently tug on the wires to make sure they are secured in the terminals.

☐ **Service provider name/number written on "For Service Call" label.**

Write in your company's name and phone number, if it hasn't been done already.

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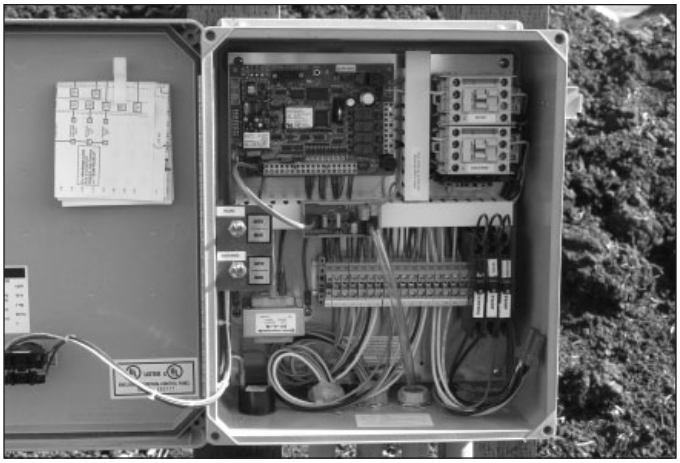
Completing the Start-Up Checklist (continued)



☐ **Control panel functional test, as detailed in the *Residential AdvanTex Installation Instructions*, has been followed.**

The installer should have performed this test during installation. If not, perform it now.

Before performing the next step, return the panel from test mode to normal mode by holding down the alarm button on the front of the panel until the alarm chirps.

☐ **Dial tone verified.**

If phone service to the panel is not yet connected, you will be notified later when the service is connected and the panel automatically starts calling in.

If phone service *is* available to the panel, quickly press the alarm button on the front of the panel 15 times to force the panel to call in to the VeriComm® Web site. The Modem Activity light on the VCOM board should light up.

If the Modem Activity light does not light up, unplug the phone line from the phone jack on the panel and plug the phone line into a phone line tester, or a phone, to see if there is a dial tone. If there is no dial tone, come back and repeat the forced call-in test when phone service is activated to the panel. If there is a dial tone but the modem will not call in, call your AdvanTex Dealer for troubleshooting assistance.

☐ **Control panel diagrams left in panel for future review.**

Remember to leave the diagrams in the panel.

Final/Safety Inspection

☐ **All access riser hardware is in place. Lids are secured.**

☐ **All splice box lids are secured.**

Close and secure all pod, riser, external splice box, and basin lids.

WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated or drowned.*

☐ **Panel circuit breakers are in the ON position, panel is set for automatic operation, and panel is latched (or locked if necessary).**

Make sure all circuit breakers are ON. If the panel is in test mode, it will automatically return to normal mode in 30 minutes. To manually return it to normal mode, hold the alarm button on the front of the panel down until the alarm chirps. Close and latch the panel, and lock it if necessary.

Make sure that the *Start-Up Summary Report* is completely filled out.

Homeowner's Package

☐ **Homeowner's Package reviewed with homeowner.**

Go through the *Homeowner's Package* with the homeowner, or with the builder's representative if the home has not yet been sold.

Back at the Office

Fax the completed *Start-Up Summary Report* to the number on the bottom of the report.

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Scheduled Field Maintenance Report

AdvanTex® Field Maintenance Report

Property Owner/Tracking #				Operator
Site Address				Contact Phone
AX Site ID #	County ID #	Pod #	RTU #/UL #	Date of Last Inspection

Retrieve O&M Info

Daily flow_____

Recirc ratio _____

Timer settings:

Perform Field Sampling/Observations

NTU (15 ± NTUs)	pH (6-9)	DO (2-6)

Odor of Sample

Typical ☐ Musty ☐ Earthy ☐ Moldy

Non-typical ☐ Sulfide ☐ Cabbage ☐ Decay

Oily film in PVU ☐ Yes ☐ No

Foam in tank ☐ Yes ☐ No

Check Control Panel

Recirc Amps	Discharge Amps

Audible and visual alarms ☐ OK

Dial tone (telemetry only) ☐ Yes ☐ No

Inspect/Clean Pump System

	Inspect	Clean
Riser/Lid	☐	
Splice Box	☐	
Float Cords	☐	
Floats	☐	☐
Pump	☐	☐
Biotube® Filter	☐	☐
Biotube Pump Vault	☐	☐
Recirculating Splitter Valve	☐	☐

Measure Sludge/Scum

	Sludge		Scum	
1st Compartment	Current	Previous	Current	Previous
2nd Compartment	Current	Previous	Current	Previous

Inspect/Clean AdvanTex Filter

				Inspect	Clean
Odor:	☐ Normal	☐ Pungent	Laterals/Orifices	☐	☐
Biomat:	☐ Normal	☐ Excessive	Pod Bottom	☐	☐
Bridging/Ponding:	☐ None/Minor	☐ Excessive	Intake Vent	☐	☐

Inspect/Clean Discharge Pump System

	Inspect		Inspect	Clean
Riser/Lid	☐	Floats	☐	☐
Splice Box	☐	Pump	☐	☐
Float cords	☐			

Inspect/Service Other System Components

	Inspect	Clean		Inspect	Clean
Disinfection Equipment	☐	☐	Dispersal Laterals/Orifices	☐	☐

Dispersal Type

Additional Services Rendered

☐ Cleaned textile sheets? ☐ Replaced UV items?

☐ Replaced/Used other items?

Parts Used: W = Warranty, B = Billable (✓ appropriate selection)

W	B	Item Number	Description

Final/Safety Inspection

☐ RSV reinstalled ☐ Lids bolted on

☐ Manifold reconnected; flush valves closed ☐ Control panel reactivated

Summary/Recommendations

☐ System performing; no further action needed ☐ Tank needs pumping

☐ Call for service ☐ Other? _____

Comments _____

_____

Signature _____ **Date** _____

Fax completed form to 1-866-384-7404

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Performing Scheduled Field Maintenance

Residential AdvanTex Treatment Systems require periodic servicing. AX20 systems need a six-month visit, a one-year visit, and annual visits* thereafter. AX20N systems require four visits during the first two years and annual visits* thereafter. Failure to provide required maintenance will void the AdvanTex Treatment System warranty and may place the system out of compliance with local regulations.

Homeowner Communication

Whenever possible, contact the residents when it's time for a service visit, especially if the residents are new to the home. The service visit is an opportunity to talk with them about proper use of the system, so try to schedule the visit when someone will be there.

Retrieve O&M Info

Download the *Field Maintenance Report* form for your site from www.advantexservice.com. The top of the form should be pre-filled with information about the system.

Perform Field Sampling/Observations

When you arrive at the site, remove the lids from the risers and take your sample before doing anything else, so that the sample won't be contaminated by material that you stir up while working. To sample effluent, remove the Recirculating Splitter Valve (RSV) from its quick-release holster and set it aside. There will be enough of a trickle through the RSV plumbing to collect a sample without waiting for the pump to cycle.

IMPORTANT: *To avoid contamination, do not run the pump manually or in test mode to obtain this sample.*

Wash down, brush, or wipe the RSV inlet before taking the sample so there will be no contamination from dislodged solids.

Leave the RSV disconnected for the rest of the service call so that any debris you stir up does not make its way to the drainfield.

☐ **Clarity of sample**

Assess the clarity of the sample by using a portable turbidity meter.

WARNING: *Follow the precautions below when performing field maintenance on AdvanTex Systems.*

- *Do not enter the tank. Entering a tank without proper confined space procedures and equipment can cause serious injury or death.*
- *Use proper personal protection equipment, such as rubber gloves and eye protection, as well as protective clothing, to cover parts of the body that will be exposed to wastewater or effluent.*
- *When working on components that contact sewage or effluent, lay them on a plastic sheet or place them in a trash can, not on the lawn. Several tools that reduce the mess of cleaning Biotube® filters and AdvanTex textile sheets are available from Orenco.*
- *Turn off power to electrical components when working in splice boxes or the control panel or when disconnecting pumps.*
- *When finished, use proper personal hygiene.*

☐ **Odor of sample**

Sniff the sample and assess its odor. Record these observations about clarity (NTUs) and odor on the *Field Maintenance Report* form.

☐ **pH of sample**

☐ **Dissolved oxygen of sample**

Using pH test strips or a pH meter, check the pH of the sample and record it on the *Field Maintenance Report* form. Values from 6 to 9 are normal. Also check the sample's dissolved oxygen (DO) using a DO meter (or DO field test ampoules), and record that on the form. Values from 2.5 to 6 mg/L are normal.

NOTE: *If field sample levels are outside of the norm or if your observations indicate the treatment system may not be functioning properly, further testing in a laboratory environment may be needed.*

Sampling equipment, minimum sample size, and storage procedures should conform to the standard methods required by your federal, state, and local authorities.

☐ **Oily film in PVU**

☐ **Foam in tank**

Check the liquid in the pump vault (PVU) for an oily sheen, and the liquid in the first compartment of the tank for foam or other unusual appearance. Record your observations on the *Field Maintenance Report* form.

*Servicing intervals may vary according to local regulations.

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Performing Scheduled Field Maintenance (continued)

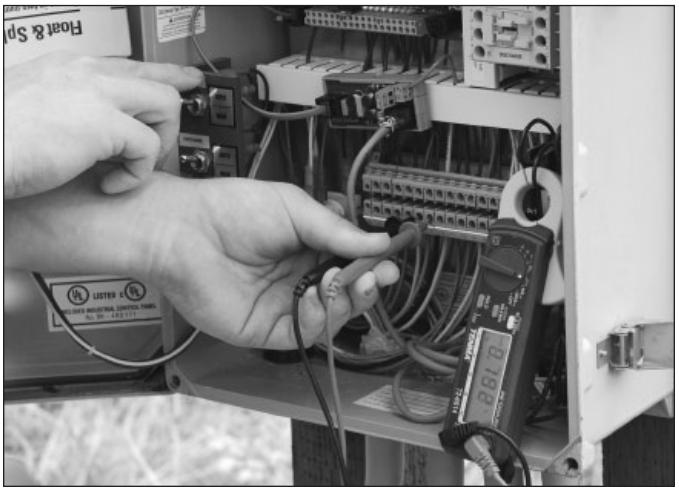
Check Control Panel

Open the control panel and place it in test mode.

☐ **Run amperage**

Check and record the run amperage of the recirculation pump and discharge pump. Place the clamp of an ammeter around the wire to each pump's circuit breaker and read the amperage while each pump is running. You can run the pump by holding the toggle switch on MAN. Amperage should be no more than the pump's maximum service factor amperage.

Release the switch to the AUTO position. Make sure the pump comes on as the timer cycles. Timer cycles are shortened to about 30 seconds in test mode.



☐ **Audible and visual alarms**

Check the operation of the floats and timers by lifting the float trees out of the tank and discharge basin and following the instructions clipped inside the panel door. Make sure that audible and visual alarms are activated when the appropriate float is raised or lowered.

☐ **Dial tone (telemetry only)**

For systems equipped with VeriComm® panels, use a phone line tester or a phone to verify the presence of a dial tone.

Inspect/Clean Recirc Pump System

☐ **Riser/Lid**

Make sure that the lid is intact, and replace it if necessary. Replace any missing lid bolts. Check for marks of liquid infiltration or exfiltration.

☐ **Splice box**

Open the splice box and make sure there is no water in it. If there is, remove the water with a sponge and repair the leak. If you disconnect any connections, do not reuse the wire nuts when you reconnect them — use new ones.

☐ **Float cords**

☐ **Floats**

Verify that the floats are in good condition and properly secured to the float tree. Verify that float cords are neatly wrapped inside the riser so that they cannot interfere with the operation of the floats. Clean floats by hosing or brushing them so that debris falls back into the tank, not into the pump vault.

☐ **Pump**

Turn circuit breaker off at service panel. Switch MOA and circuit breakers in control panel to "Off." Pull the pump and place it on a cleanable surface, like the riser lid, or in a plastic trash can. Check the intake screen; wash off particles as necessary. Record the kinds of particles in the Comments section of the *Field Maintenance Report* form and report findings to user (for preventive maintenance). Reinstall the pump, checking to make sure the discharge valve on the hose and valve assembly is open.

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Performing Scheduled Field Maintenance (continued)

☐ **Biotube® Filter**

☐ **Biotube Pump Vault**

Clean the Biotube Filter at every visit. Make sure that the RSV is out. Slide Biotube cartridge out of vault. Hold Biotube cartridge over open inlet of tank or primary compartment. Carefully spray build-up into tank. (The Biotube Cradle, available from Orenco, holds the Biotube Filter on the lip of the riser and directs debris into the tank away from the pump vault.) Flush vault bottom.

☐ **Recirculating Splitter Valve**

Move the RSV from side to side to check that the balls move freely. Then verify that the liquid level in the tank is within the normal range. If it is low, the ball mechanism could be jammed in the seated position. If it is high, the RSV may not be making a tight seal when the balls are seated. Clean the balls and replace the balls or the cage if necessary. Don't replace the RSV in the tank until you're ready to leave the site.

Measure Sludge/Scum

Measure sludge and scum in both compartments of the tank, and record the measurements on the *Field Maintenance Report* form. Schedule pumping of the tank when the bottom of the scum layer is within 3 inches (75 mm) of the flow-through port of the tank baffle or when the sludge accumulates to within 6 inches (150 mm) of the flow-through port.

Note any unusual appearance or smell of the tank's contents, and consult the *Advanced Service Tips and Troubleshooting Guide*, available from your AdvanTex Dealer, if necessary. If you find kitty litter, sanitary products, excessive grease, or other material that shouldn't be in the tank, talk to the residents of the home and remind them not to flush those things.

Inspect/Clean AdvanTex Filter

Open the AdvanTex Filter pod.

☐ **Odor**

☐ **Biomat**

☐ **Bridging/Ponding**

Check that the odor and appearance of the biomat are normal. Pungent or unusual odor, ponding (excessive liquid), and bridging (excessive solids) are problems that need immediate attention. The *Advanced Service Tips and Troubleshooting Guide* can help you ascertain the cause. You may need to change the timer settings or discuss household habits with the system users. And you may need to clean the filter sheets. (See "Additional Services Rendered.")

☐ **Laterals/Orifices**

Inspect the orifice shields. A clean area around an orifice cover is a sign of a plugged orifice; clean these orifices out before cleaning the laterals.

To clean and flush the manifold, open the flush valves at the ends of the laterals and brush or jet the laterals.

☐ **Pod bottom**

Pull out a few sheets, inspect the pod bottom, and note any excessive buildup of debris. When you're done cleaning the manifold, remove the RSV from the tank, and run the pump for two or three minutes with the flush valves open and the RSV removed to flush debris from the pod's underdrain back into the tank. You can do this while you are performing other tasks. After flushing, close the flush valves and make sure the orifice covers are on more or less straight. Replace the RSV in the tank.

☐ **Intake vent**

Make sure that the ventilation intake is not damaged or blocked, and clean or replace it if necessary.

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Performing Scheduled Field Maintenance (continued)

Inspect/Clean Discharge Pump System

- ☐ Riser/Lid
- ☐ Splice box
- ☐ Float cords
- ☐ Floats
- ☐ Pump

If there is a discharge pump basin, inspect it and its components. Clean floats and pump by hosing them. If you pull the pump, check to make sure the discharge valve is open after reinstalling.

Over time, solids may accumulate in the discharge basin. Use a trash pump to pump these solids into the inlet end of the processing tank.

Inspect/Service Other System Components

- ☐ Disinfection equipment
- ☐ Dispersal laterals/orifices

Follow the manufacturer's instructions to inspect and service other components of the system.

Additional Services Rendered

- ☐ Cleaned textile sheets?

You should not need to clean the textile sheets every year, but it may be necessary now and then. Don't clean them unless the buildup of biomat is bridging across the sheets, because removing too much of the biomat inhibits the system's treatment performance.

If you need to clean the sheets, remove the RSV so that solids can freely drain back to the tank. Then clean the sheets one by one with the AdvanTex Cleaning Wand, a hose, or a backpack pressure washer (at low pressure). Wash debris down into the pod, where it will drain back into the processing tank.

- ☐ Replaced UV items?
- ☐ Replaced/used other items?

Document any equipment replaced and any additional observations.

Final/Safety Inspection

Review the Field Maintenance Report form to ensure all activities have been performed.

- ☐ RSV reinstalled

If you haven't done so already, reinstall the RSV.

- ☐ Manifold reconnected and valves closed

Make sure that the flush valves at the ends of the AX20 laterals are closed.

- ☐ Lids bolted on

Replace all lids and tighten all lid bolts.

WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated, or drowned.*

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Performing Scheduled Field Maintenance (continued)

☐ **Control panel reactivated**

Make sure that all circuit breakers have been switched back on. The panel will automatically return from test mode to normal mode in 30 minutes. To manually return it to normal mode, hold down the alarm button on the front of the panel until the alarm chirps. Close and latch the panel, and lock it if necessary.

Summary/Recommendations

☐ **Treatment system is performing; no further action necessary**

☐ **Call for service**

☐ **Tank needs pumping**

☐ **Other?**

Check-off or document final recommendation(s). Back at the office, schedule any necessary follow-up.

Comments

Record any additional observations from your visit on the *Field Maintenance Report* form, along with information about equipment repaired or replaced.

Fax the completed form to the number on the bottom. The automated system will record the completion of the site's visit and archive an image of the form on advantexservice.com for future reference.

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Unscheduled Field Maintenance Report

AdvanTex® Field Maintenance Report
Unscheduled

Property Owner/Tracking #				Operator
Site Address				Contact Phone
AX Site ID #	County ID #	Pod #	RTU #/UL #	Date of Last Inspection

Dispatcher Comments

Date:_____ Time: _____

Notification of site condition

☐ Made by VeriComm® Monitoring System
☐ Made by Homeowner
☐ Other _____

Site condition at time of call

☐ Alarm ☐ Tank Overflow
☐ Odor ☐ Sewage Backup
☐ Other _____

Field Sampling/Observations

☐ Necessary ☐ Not necessary

NTU (15 ± NTUs)	pH (6-9)	DO (2-6)

Odor of Sample.

Typical ☐ Musty ☐ Earthy ☐ Moldy
Non-typical ☐ Sulfide ☐ Cabbage ☐ Decay

Conditions at site

Alarm On ☐ Yes ☐ No
(If yes, alarm type_____)
Tank Liquid Level ☐ Normal ☐ High ☐ Low
Pump Operational? ☐ Yes ☐ No
Circuit Breakers
Recirc. . . . . ☐ Tripped ☐ On ☐ Off
Discharge. . . . . ☐ Tripped ☐ On ☐ Off
Controls . . . . . ☐ Tripped ☐ On ☐ Off

VCOM® ATRTU Board: (if applicable)

Document the panel status by shading the appropriate inputs and outputs as indicated by the yellow and red LEDs.

Inputs	① ② ③ ④ ⑤ ⑥ ⑦ ⑧
Outputs	① ② ③ ④
Power (Green LED)	☐ On ☐ Off ☐ Flashing

Cause of Malfunction: ☐ Mechanical ☐ Process-Related

_____
_____
_____
_____

Services Rendered:

_____
_____
_____
_____

Parts Used: W = Warranty, B = Billable (✓ appropriate selection)

W	B	Item Number	Description

Notes/Final Recommendations:

☐ System performing; no further action needed ☐ Additional service needed

_____
_____

Final/Safety Inspection:

Lids bolted on? ☐ Yes ☐ No
(If damaged, comment _____)
Control Panel reactivated? ☐ Yes ☐ No
Circuit Breakers:
Recirc: ☐ On ☐ Off Discharge: ☐ On ☐ Off Controls: ☐ On ☐ Off

Time at Site	Travel Time	Total Time

Signature _____

Date _____ **Time** _____

Fax completed form to 1-866-384-7404

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Performing Unscheduled Field Maintenance

Unscheduled Maintenance Procedures

If you receive an alarm call or phone call that requires a visit to an AdvanTex site, download the *Field Maintenance Report: Unscheduled* from www.advantexservice.com. The top of the form should be pre-filled with information about the site. If any information is missing, fill it in.

Depending on the type of problem that caused the alarm, you may not need to check all the boxes — they're just there to reduce the amount of writing you have to do. But do use the notes areas to record any repairs or adjustments you make, and to document anything unusual. These notes may help you on future service calls, and they help Orenco and your Dealer identify patterns of problems.

We recommend that you send a copy of this form to the homeowners after your visit. This reinforces any advice you may give them about proper use of their system. It also reassures them that the VeriComm® monitoring system is working and that you are diligently maintaining their system.

Notification of Site Condition

- ☐ **Made by VeriComm Monitoring System**
- ☐ **Made by Homeowner**
- ☐ **Other** _____

Indicate whether you learned about the problem from the VeriComm system, from the homeowner, or some other way — perhaps from a neighbor.

Site Condition at Time of Call

- ☐ **Alarm**
- ☐ **Tank Overflow**
- ☐ **Odor**
- ☐ **Sewage Backup**
- ☐ **Other** _____

Describe the condition that prompted the alarm.

WARNING: *Do not enter the tank. Entering a tank without proper confined space procedures and equipment can cause serious injury, asphyxiation, or drowning.*

Field Sampling/Observations

- ☐ **Necessary**
- ☐ **Not necessary**

If the cause of the problem is not immediately apparent, use proper techniques (described in the "Performing Scheduled Field Maintenance" section) to sample effluent from the RSV. Do this first so that subsequent activity will not contaminate the sample. Test the sample's clarity, pH, and dissolved oxygen, and record the results on the form. Also check the box that describes the odor of the sample.

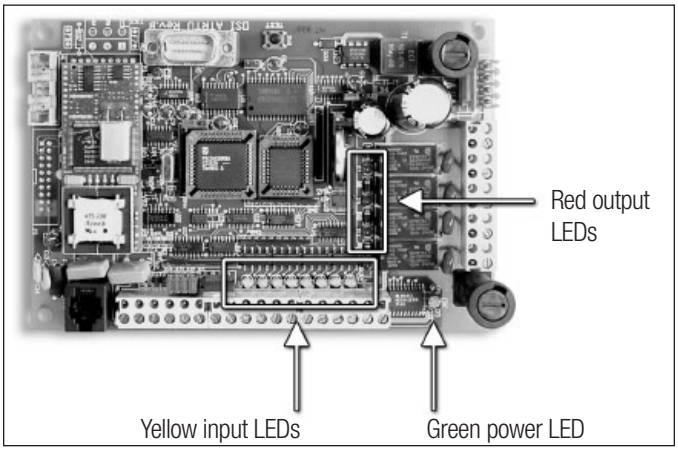
Conditions at Site

Alarm On	☐ **Yes**	☐ **No**	
(If yes, alarm type _____)			
Tank Liquid Level	☐ **Normal**	☐ **High**	☐ **Low**
Pump Operational?	☐ **Yes**	☐ **No**	
Circuit Breakers			
Recirc	☐ **Tripped**	☐ **On**	☐ **Off**
Discharge	☐ **Tripped**	☐ **On**	☐ **Off**
Controls	☐ **Tripped**	☐ **On**	☐ **Off**

Record the status of each part of the system on the form. Use the "Notes" field to describe problems in more detail.

VCOM ATRTU Board (if applicable)

Shade the appropriate circles to indicate which inputs (yellow) and outputs (red) are active on the ATRTU board inside the panel, and record the status of the green power light.



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Performing Unscheduled Field Maintenance (continued)

Cause of Malfunction

☐ Mechanical

☐ Process-Related

When you have found the cause of the malfunction, record whether it is a mechanical problem (such as failure of a float or loosening of a connection) or a problem with the biological processes in the system (such as recirculation ratio, system abuse, or insufficient ventilation). Describe the problem in as much detail as possible in the space provided.

Services Rendered

Describe what you did to correct the problem.

Parts Used

Record any new parts you installed. Check the appropriate box to show whether they are covered under warranty or billable to the customer.

Notes/Final Recommendations

Write down any observations about this incident that will be useful to you, the homeowner, your AdvanTex Dealer, or Orenco.

Final/Safety Inspection

WARNING: *If lid bolts are missing, replace them with spares. If you have no spare lid bolts, fasten the lid with a self-tapping screw, and immediately call your Dealer for replacement bolts. If the lid is unbolted or if the lid or riser are damaged, be sure to securely block access to the tank opening before leaving the site. Open tanks are hazardous, and children or adults who try to enter them may be seriously injured, asphyxiated, or drowned.*

Lids bolted on? ☐ **Yes** ☐ **No**

(If damaged, comment _____)

Control panel reactivated? ☐ **Yes** ☐ **No**

Circuit Breakers:

Recirc: ☐ **On** ☐ **Off**

Discharge: ☐ **On** ☐ **Off**

Controls: ☐ **On** ☐ **Off**

Verify the condition of system components upon leaving the site.

Time/Date/Signature

Record time at site and travel time.

Sign and date the form. Then fax it to the number at the bottom. The bar code at the top will ensure that a PDF of the form will go into the Service Provider's inbox on advantexservice.com, for assignment to the appropriate site.

Make a copy of the form and send it to the homeowner, along with the invoice.

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Change of Service Provider Authorization

AdvanTexService.com

Change of Service Provider
Authorization Form

Property Owner		
Site Address		
Contact Phone	Pod #	RTU #/UL #

Fill this form out completely, have it signed by the Homeowner, and fax to 1-541-459-2884

Previous Service Provider: _____

New Contract Start Date: [ ]

Additional Comments: _____

_____

_____

_____

_____

_____

_____

_____
New Service Provider Company

_____
New Service Provider Signature Date

As the homeowner, you acknowledge that you are not under contract with any other Authorized Service Provider as of the "New Contract Start Date," noted above.

_____
Homeowner Signature Date

Fax completed form to 1-541-459-2884

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Changing Service Providers

Consistent maintenance is important to ensuring the excellent performance of AdvanTex Treatment Systems. So, when a service contract expires, it must be renewed, either with the existing service provider or with another service provider. Our advantexservice.com Web site provides tools to help with this effort.

When a service contract expires, contact the homeowners and offer a renewal. If the homeowners renew the contract, update the information in advantexservice.com.

If the homeowners do not renew the contract within 60 days, notify the Dealer (if the system is still under warranty) and make a note in advantexservice.com. If a service contract is required by law, notify the county or other regulatory jurisdiction as well.

When homeowners do not renew their service contract with their current service provider and select you to be their new service provider, you will need to have access to the site information for that system. Before meeting with the homeowners, you should log onto advantexservice.com and do the following:

- Print the *Change of Service Provider Authorization Form*.
- Fill out the form, including the site information, previous service provider's name, start date of the new contract, and any explanatory comments.
- Have the homeowners sign the form.
- Add your name, company name, and signature and fax the form to Orenco at the number on the bottom.

Once the form is received, you will have access to the site information for that system, so you can schedule the next service call. In addition, the automated system will archive an image of the form on advantexservice.com for future reference.

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Appendix 1: AX20 Timer Settings Worksheet

The following chart shows recommended timer settings for a new system.

RESIDENTS	TIME ON (SEC)	TIME OFF (MIN)	NOTES
2	0.2 min (12 sec)	19.8 min	• Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3 : 1 (Filter recirculation ratio of 4 : 1). • Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.
3 or 4	0.3 min (20 sec)	19.7 min	
5	0.4 min (24 sec)	19.6 min	
6	0.5 min (30 sec)	19.5 min	

As you gain experience with a system, you may conclude that you need to make adjustments, sometimes significant ones. This worksheet is intended to help you determine appropriate start-up timer settings (Pump ON, Pump OFF) for a single-pod AX20 system. Typical values and ranges are provided for each parameter. If you have any questions or if your values fall outside the desired ranges on this worksheet, contact your Dealer.

PARAMETER		TYPICAL VALUES	NOTES
	Number of people	3	Range of 2 to 8 people.
	Water usage per person	50 gpd (190 L/d)	Typical daily average is 50 gal. (190 L) per person.
Q_i	Actual daily flow (total)	150 gpd (570 L/d)	(Number of people) × (water usage per person).
R_b	Return recirculation ratio	3 : 1	You can adjust this ratio (return flow to forward flow) up or down depending on system performance. (Range of 2 to 6.)
R_f	Filter recirculation ratio	4 : 1	
	Total daily flow to AX20	600 gpd (2280 L/d)	(Actual daily flow) × (return recirculation ratio + 1). Must be ≤ 3000 gpd (11,370 L/d). Actual flow should not exceed 500 gpd (1895 L/d). (500 gpd × 6:1 R_b = 3000 gpd)
Q_d	Actual pump dose rate	33.3 gpm (126 L/min)	Determine this value by field-testing or by using Orenco's PumpSelect™. Start at the low end.
T_d	Pump ON cycle time (dose)	0.25 min	Select a value between 0.17 minutes (10 seconds) and 0.75 minutes (45 seconds).
T_r	Pump OFF cycle time (rest)	19.70 min	See Pump OFF equation below.

PUMP OFF EQUATION **EXAMPLE**

Plugging in the above values and rounding results in the following:

$$T_r = \left[\frac{1440 * T_d * Q_d}{(R_b + 1) * Q_i}\right] - T_d$$

$$T_r = \left[\frac{1440 * 0.25 * 33.3}{(3 + 1) * 150}\right] - 0.25 = 19.74 \approx 19.70$$

After you determine your Pump ON and Pump OFF times, double check to make sure your start-up settings fall within the cycle time (CT) range, below. If they don't, make adjustments per the "Note."

ADDITIONAL PARAMETERS		TYPICAL VALUES	NOTES
CT	Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
	Pump cycles per day	72 cycles	1440 min/day ÷ (OFF cycle time + ON cycle time). Must not exceed the pump's maximum rated cycles of 300 cycles per day.
	Gallons per cycle	8.3 gal. (31 L)	With 68 orifices and using the T_d range recommended above, you will maintain the recommended 0.08 to 0.25 gal. (0.45 to 0.95 L) per orifice per dose.

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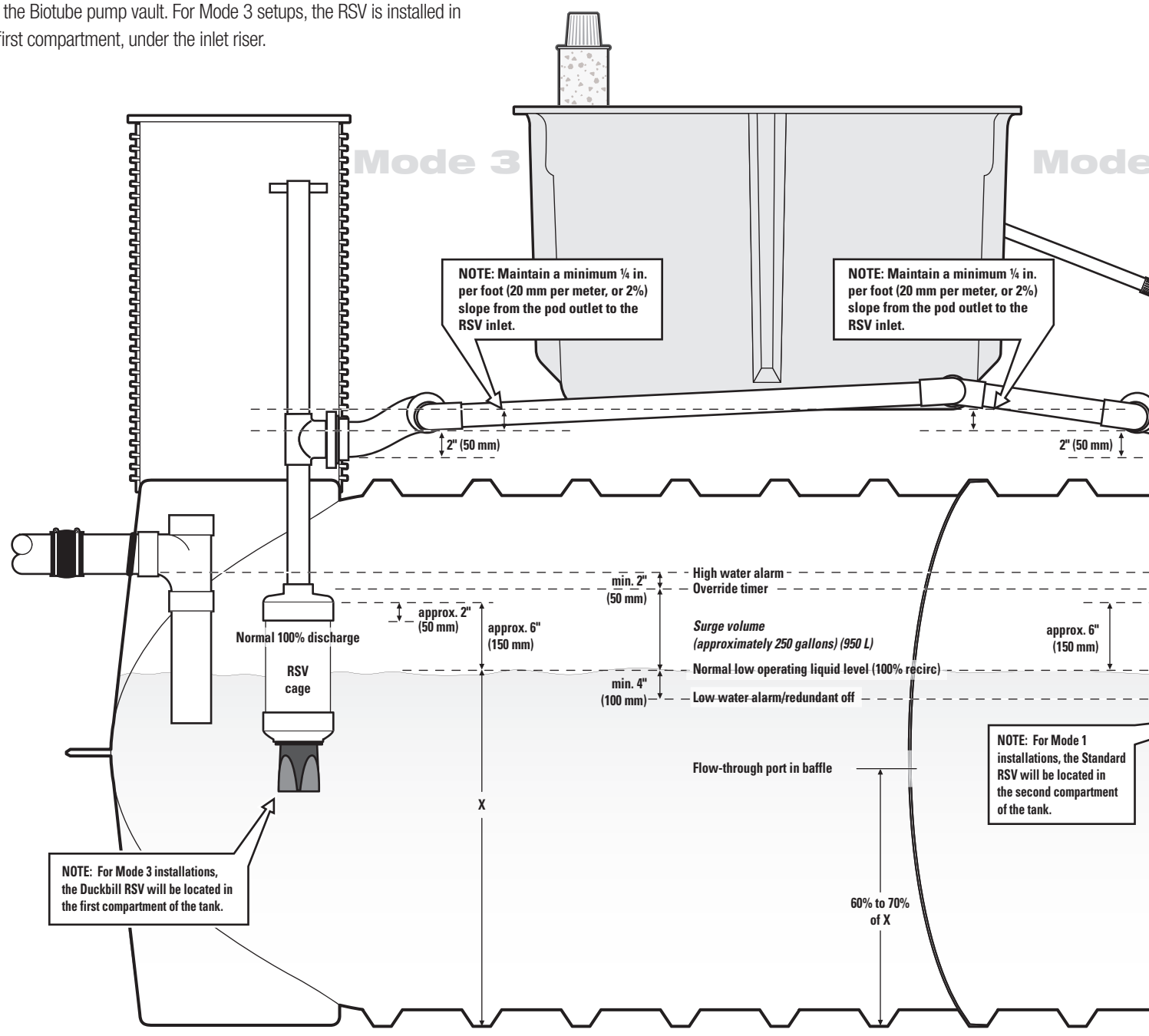
Appendix 2: Float and RSV Settings

Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

This diagram shows how these settings are established for AdvanTex Treatment Systems that use a VeriComm® Control Panel. The diagram shows both a Mode 1 and a Mode 3 setup. For Mode 1 setups, the recirculating splitter valve (RSV) is installed in the second compartment, with the Biotube pump vault. For Mode 3 setups, the RSV is installed in the first compartment, under the inlet riser.



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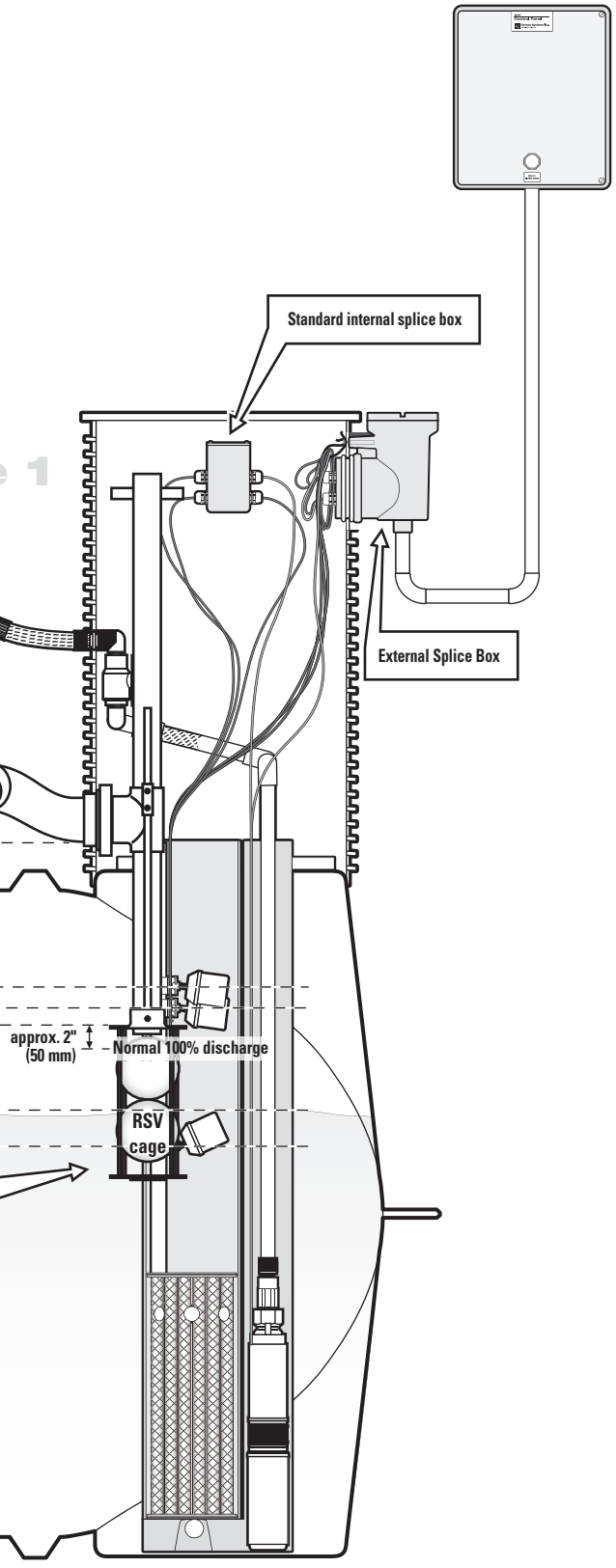
Appendix 2: Float and RSV Settings (continued)



Typical RSV Levels

For stinger pipe lengths up to 24 inches (600 mm) long, the "normal low operating liquid level" will be approximately 5-6 inches (125-150 mm) below the top of the RSV cage. (The normal low operating liquid level is the level at which 100% of the filtrate returns to the tank.) For most residential applications, the recommended surge volume — the volume between the low liquid level and the high water alarm float — is approximately 250 gallons (950 L). For Mode 3 installations, the duckbill model RSV, which has a flexible PVC tube that vents the RSV cage to atmosphere, is required.

Typical Float Levels

Be sure to check the plans for any site-specific or tank-specific float settings. The top float is normally set equal with the tank's invert of inlet. The bottom float should be approximately 4 inches (100 mm) below the normal low operating level.

NOTE: *Before leaving the site, verify that the "low water alarm/redundant off" float is positioned at least 10 inches (250 mm) below the top of the RSV cage.*

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Notes

RESIDENTIAL
O&M
MANUAL

AdvanTex Treatment System AXN Models meet the requirements of ANSI-NSF Standard 40 for Class I Systems.

This AdvanTex Treatment System complies with AN/NZS Standards 1546.1 and 1546.3, as well as the regulatory codes for Queensland, Victoria, Western Australia, NSW, and ACT.

Australian Standard

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www.orenco.com
www.vericomm.net

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Part 2:
Advanced Service Tips and Troubleshooting Guide

O&M MANUAL

Orenco Systems®
Incorporated

Changing the Way the World Does Wastewater®

1-800-348-9843
www.orenco.com
www.vericomm.net

Introduction

As an authorized AdvanTex® Service Provider, you play a crucial role in Orenco's AdvanTex Program.

Orenco has always advocated regular, professional servicing of all onsite systems ... not just during the warranty period but for the life of the system. Regular servicing optimizes the treatment process and protects the property owner's investment. It also ensures that onsite systems protect public health, protect the environment, and are viewed as a reliable, sustainable technology.

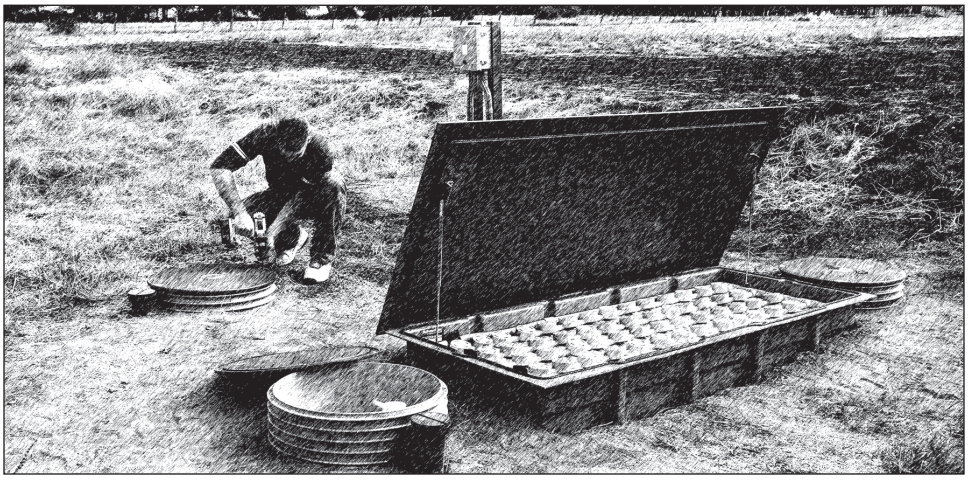
Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive maintenance, and work to keep the system under a continuous service contract. Equally important, we rely on you to keep good service records on the system, creating a "history" of its performance.

To make your job easier, Orenco has created one of the most service-friendly and trouble-free onsite systems on the market. AdvanTex is a packed bed (media) filter. And media filters are the most suitable technology for onsite wastewater treatment because they are reliable and provide consistent, high-quality effluent. We then paired our media filter with a remote telemetry control panel, to allow you to "view" the system right from your computer. And we've provided a Web-based business tool — advantexservice.com — to help you file and retrieve system data automatically, schedule service events, and manage service technicians.

Finally, we've provided classroom and field training, as well as support materials, like this O&M Manual. Please read it thoroughly, and refer to it often.

We're very proud of our AdvanTex Treatment System. Like all our products, it has gone through extensive research, development, and field-testing. Then each component is built to written specifications and subjected to quality review, before shipping. In addition, our AXN models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.

Thank you, in advance, for your knowledge, your conscientiousness, and your good work.



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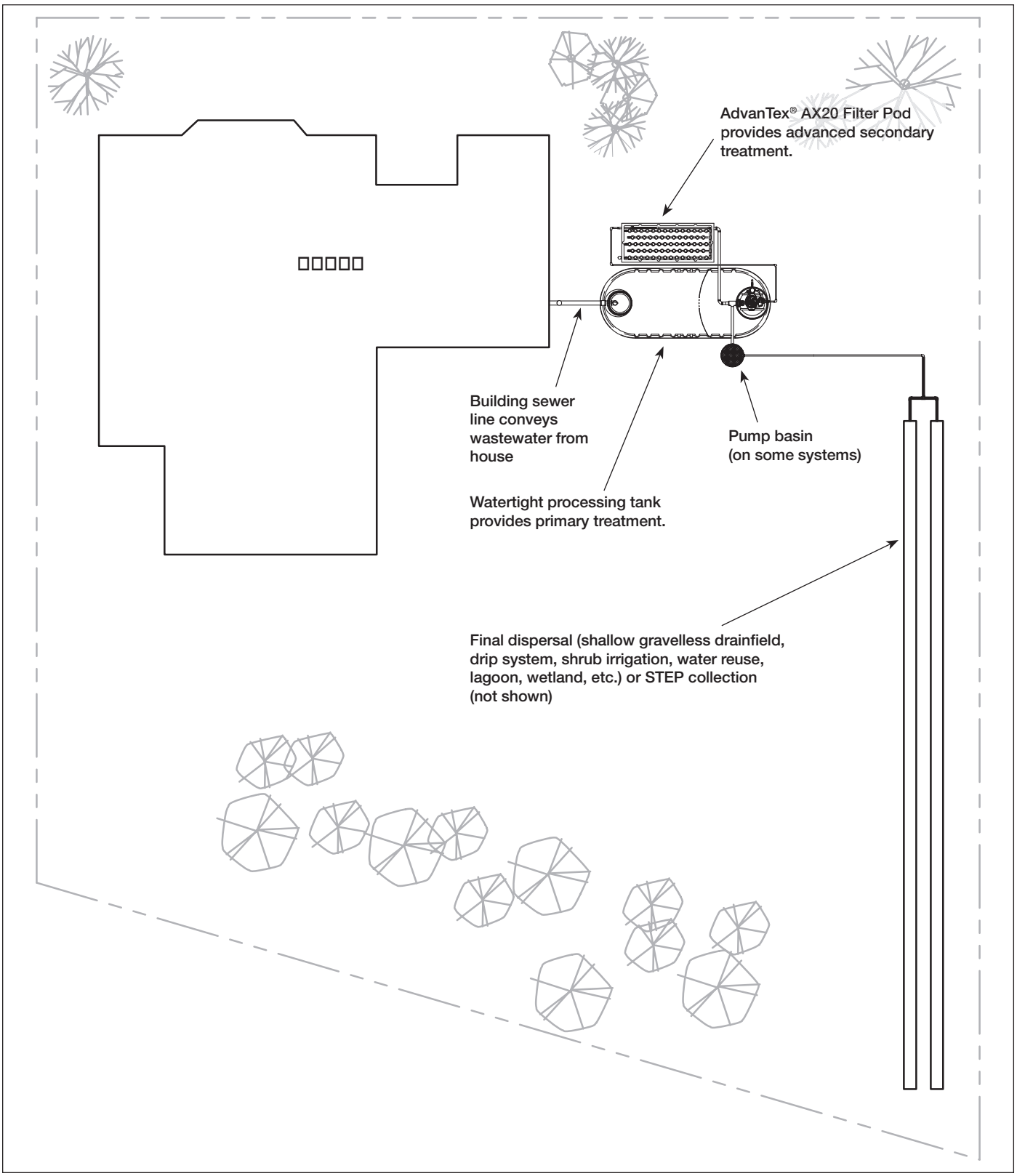
Typical Site Plan for an AdvanTex® Treatment System



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How the AdvanTex Treatment System Works

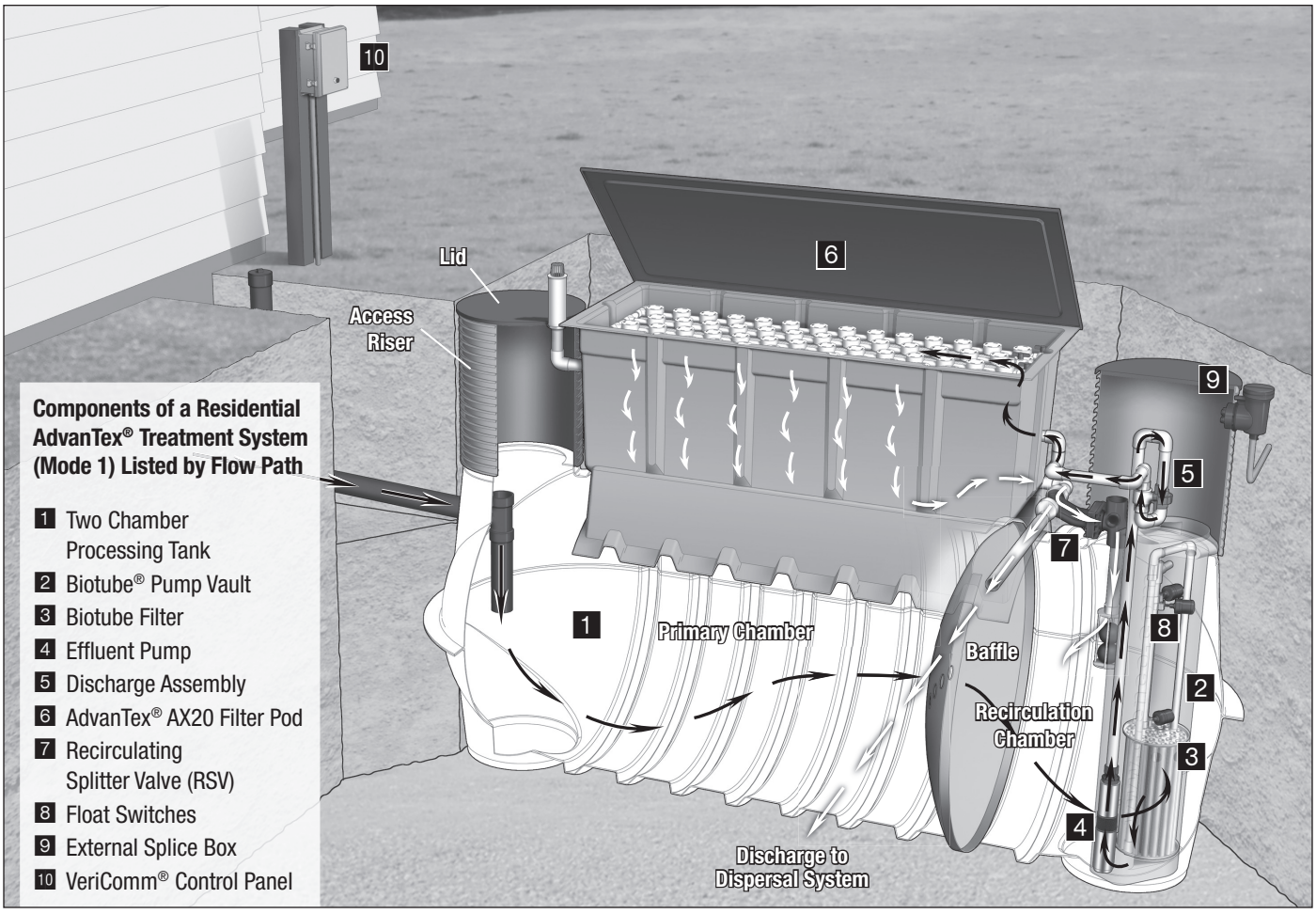
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: a floating scum layer, a bottom sludge layer, and a relatively clear layer of liquid effluent in the middle.

From the secondary chamber, a pump draws liquid effluent through the Biotube® filter and sends it to the AX20 pod. There, the effluent is sprayed over hanging sheets of porous synthetic textile media. Microorganisms live in this moist, oxygen-rich (aerobic) environment. As effluent trickles over and through the sheets, the microorganisms break down the contaminants and eliminate them.

Effluent recirculates between the tank and the AX20 pod. In Mode 1, the most common configuration, the effluent recirculates to the second compartment of the tank. In Mode 3, effluent recirculates to the first compartment. This mode is used where maximum removal of nitrogen from the effluent is required.

After recirculating several times, the effluent is discharged, either directly from the processing tank or after first being collected in a pump basin. Depending on the design for a particular site, the treated effluent may be discharged to a drainfield, an underground drip irrigation system, a constructed wetland, an effluent sewer (STEP) system, or a reuse system. The system may include equipment for ultraviolet (UV) disinfection before ultimate dispersal of the effluent.

Properly designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD_5 and 5 mg/L TSS. This level of treatment is better than what municipal wastewater plants provide. The system can also be configured to reduce nitrogen levels as required locally. When effluent treated in this way is dispersed to the soil, natural processes purify it further, and it eventually returns to the underlying water table, where it can be used again.



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Equipment List

Routine maintenance and troubleshooting require a variety of tools, equipment, and spare parts. We recommend that an Authorized AdvanTex Service Provider have the following items at hand:

For Routine Inspection and Maintenance

- Cordless drill with 3/16-in. Allen wrench for lid bolts on risers and pod
- Extra lid bolts
- Sludge and scum measuring device (e.g., Nasco Sludge Judge® for sludge and Orenco SMUG for scum)
- Hook for raising floats to test them
- Biotube® filter cradle (OM-BIOTUBECRADLE)
- Backpack pressure washer
- Trash pump (and generator, if pump is electric) for removing solids from discharge basin
- AX20 manifold brush (AX-LATERALBRUSH)
- AX20 sheet cleaning wand (AX-CLEANINGWAND)
- Handheld computer (PDA) with Bluetooth® Kit or laptop with null modem cable (optional, to turn pump on and off at a distance from the panel)
- Electrical tester (voltage and amperage)
- Phone line tester (available from RadioShack®)
- Dissolved oxygen (DO) meter or colorimetric ampoules
- Sample bottles with grab sample device
- Turbidity meter
- pH meter or pH test strips
- Test strips for nitrate, ammonia, alkalinity
- Tape measure
- Calculator
- A copy of the *AX20 Installation Instructions* (NIM-ATX-AX-1) and *AdvanTex O&M Manual Part:1 Start-Up and Routine Maintenance* (AIM-OM-ATX-1), for reference

For Repairs

- Adhesive (ADH100, SS140, SS115, SS845)
- Control panel parts (circuit breakers, motor contractors, relays)
- Effluent pumps
- Extension cord
- Flashlight
- Hand tools (pliers, wrenches, screwdrivers, drill bits, hammer, shovel, hand saw, etc.)
- Inspection mirror (e.g., Prototek "Mirror on a Stick")
- Plumber's snake
- PVC cement and primer
- PVC fittings (3/4 in. to 2 in.)
- PVC pipe (3/4 in. to 2 in.)
- Spare parts for downstream components (e.g. drip headworks, UV disinfection unit)
- Waterproof wire nuts
- Wire stripping/crimping tool
- Float switches

For Troubleshooting

- Digital camera
- Watch or timer
- A copy of Part 2 of the AdvanTex O&M Manual: *Advanced Service Tips and Troubleshooting Guide* (AIM-OM-ATX-2)

For Personal Hygiene and Cleanup

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Protective clothing
- Rags
- Rubber gloves

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Factors Affecting the AdvanTex Treatment Process

Properly designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD_5 and 5 mg/L TSS. If treatment performance fails to meet that standard, the cause may be the design, installation, settings, or use of the system — or more likely, a combination of those factors. Here's what happens in each part of the system, and how each of these factors can keep the system from performing as well as it should.

Processing Tank

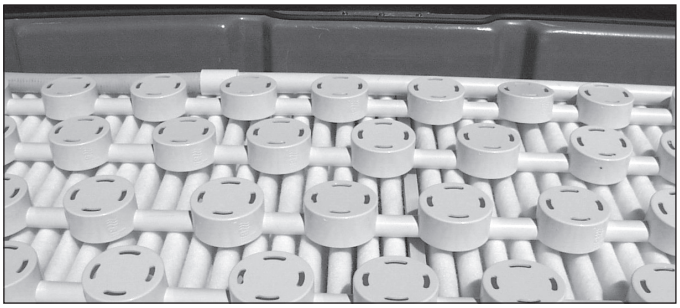
Primary treatment happens in the tank, and several conditions inside the tank affect the ultimate effluent quality. The first is the **incoming wastewater**: its strength (concentration), mass loading (amount of each wastewater component), hydraulic loading (volume), and chemical characteristics. Residential wastewater (raw influent) typically has BOD_5 of 450 mg/L, TSS of 500 mg/L, and total Kjeldahl nitrogen (TKN) of 70 mg/L. Practices in the home may raise the levels of these components and may also introduce harmful chemicals and indigestible solids into the system. Although the AdvanTex system is robust enough to accommodate a houseful of weekend guests or a couple of days of canning, residents must be aware that in the long run, certain habits can harm their septic system or increase the need for system servicing and/or pumping. The Troubleshooting section of this manual lists some household practices to inquire about when a system has problems.

In addition to the composition of a home's effluent, the **size of the tank** and the **volume of the effluent** also affect performance. Residential systems are sized and designed to accommodate the North American average of 50-60 gallons per person per day and are sized for a certain number of residents. A change in the number of residents, or a sudden increase in their water use per capita, can push wastewater through the tank without allowing the minimum 24 hours of retention time required for thorough separation and digestion of wastes.

Finally, the tank and all pipe joints must be **watertight** to prevent both infiltration and exfiltration of liquid. Infiltration of rainwater or groundwater will overload the system, preventing proper stratification in the processing tank and overloading the AdvanTex textile filter. Exfiltration of liquid effluent from the tank can make liquid levels too low for stratification, leading to clogging of the Biotube® effluent filter. Of course, exfiltration also pollutes the soil, and potentially the groundwater.

AdvanTex Textile Filter

The AdvanTex textile filter provides secondary wastewater treatment. The filter is a sturdy, watertight fiberglass basin filled with a nonwoven textile material. This lightweight, highly absorbent media treats a large amount of wastewater in a small space because it has a very large surface area — about five times greater than that of an equivalent volume of sand, for example. Textile also has a greater void volume (for free flow of oxygen) and greater water-holding capacity.



These properties make it an excellent environment for aerobic micro-organisms to live and digest the nutrients in effluent. As effluent from the processing tank percolates through and between the sheets of textile, the microorganisms remove what they need from it, reducing BOD_5 and TSS. Also, the aerobic conditions within the AdvanTex filter are ideal for microbes that convert ammonia to nitrates (nitrification). For sites where maximum denitrification is necessary, AdvanTex filters can be configured in Mode 3, so that the filtrate recirculates back to the high-carbon, low-oxygen environment at the inlet end of the processing tank, which is ideal for microbes that reduce nitrates to nitrogen gas (denitrification). Harmless nitrogen gas is then released back into the atmosphere.

In addition to being affected by **oxygen**, the AdvanTex filter's performance is affected by **mass loading, hydraulic loading, strength,** and **chemical characteristics** of the influent. If the effluent coming from the processing tank is contaminated with harsh chemicals or excessive grease, the biomat of microorganisms will suffer. The graphs on the next page show that low-to-moderate loading rates produce BOD_5 and TSS of <5 mg/L, and higher loading rates produce BOD_5 and TSS in the range of 15-25 mg/L.

About Recirculation Ratio

Maintaining an **appropriate recirculation ratio** is important for proper functioning of the system. Adjusting the frequency and length of the doses of effluent delivered from the tank to the AdvanTex filter optimizes the conditions for the microorganisms.

A recirc ratio that's too high can generate a highly aerobic biomat growth on the pump filter. It also increases alkalinity consumption and dissolved oxygen concentration in the processing tank, which can inhibit denitrification. Conversely, a recirc ratio that's too low can tend to liberate periodic odors during dosing events. The optimum ratio is typically between 2:1 and 6:1.

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Normal Performance of the AdvanTex System

The table below summarizes the typical levels of BOD_5, TSS, and TKN in each part of the AdvanTex system, if proper conditions (described in the preceding section) are met:

Typical Values in the AdvanTex Treatment System

	BOD_5 (mg/L)	TSS (mg/L)	TKN (mg/L)
Raw Influent[1]	450	500	70
Primary Chamber Effluent	150	40	70
Secondary Chamber Effluent[2]	15-40	10-20	[4]
AXN Filtrate[3]	5	5	[4]

[1] Source: Crites and Tchobanoglous. *Small and Decentralized Wastewater Management Systems*, p. 180, 183, 1998. McGraw-Hill. Based on 50 gpcd.

[2] Will vary with recirc ratios and mode configuration. The numbers here represent a recirc ratio between 2:1 and 6:1 and are derived from Orenco and third-party testing in Mode 1.

[3] Actual performance results, based on a six-month accumulative average from NSF (National Sanitation Foundation) testing on the AX20N at 500 gpd, using composite sampling. Performance and servicing frequencies will vary relative to the mass load being treated. Procedures for treating excessively high loads will require engineering review. For more information, please review AdvanTex Design Criteria.

[4] Dependent on treatment system configuration and recirc ratios.

When all parts of the AdvanTex system are operating correctly and the component values in each part are within the limits above, the typical values or properties from field tests of AdvanTex effluent (filtrate) are summarized in the table below.

Typical Values for AdvanTex Effluent (Filtrate)

Parameter	Sampling Method	Typical Values or Properties
Clarity	Visual[1]	Clear (≤15 NTUs)
Odor	Sniff[2]	Non-offensive (musty is OK; rotten egg or cabbage is not OK)
Biotube® filter	Visual	No liquid level differential inside/outside vault, one-year cleaning interval
Oily film	Visual; inside the pump vault	None; no red, blue, green, or orange sheen
Foam	Visual; inside tank	None
pH	Field[3]	6-9
DO	Field[3]	≈2.5-6

If effluent is cloudy or smells pungent or if the biomat on the textile filter appears greasy, waxy, or oily, laboratory tests of the filtrate will aid troubleshooting. Following are the typical values for various lab tests of AdvanTex filtrate.

[1] To check for clarity, service providers can carry a portable turbidity meter or calibrated turbidity standards.

[2] To check for odor, service providers can simply sniff the effluent sample or can use a sulfide measuring packet or an olfactory snifter device.

[3] To check for pH, service providers can use litmus paper, a pocket pH meter, or a benchtop pH meter.

Typical Values for Supplemental Lab Tests

Sampling Parameter	Sampling Method	Typical values[1] (mg/L)	
		Mode 1	Mode 3
BOD_5	Grab	≈10	≈10
TSS	Grab	≈10	≈10
TN	Grab	≈25	≈10-20[2]
G&O	Grab	<1	<1

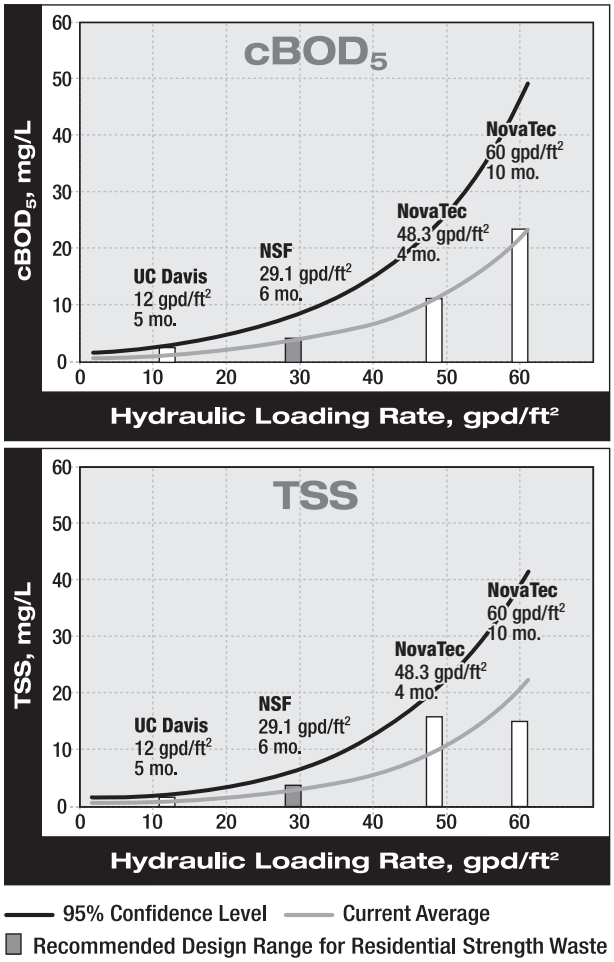
[1] Values are based on testing by Orenco and third parties.

[2] Typical nitrogen reduction ranges from ≈60-70%, with sufficient carbon source and alkalinity.

[3] To check for dissolved oxygen, use a DO meter or DO test kit.

Effluent Quality vs. Hydraulic Loading Rates

ANSI/NSF Standard 40 and Other Third Party Testing Results



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Troubleshooting Effluent Quality

Once you know the typical values for wastewater treatment system performance, you can be proactive and troubleshoot nontypical process indicators, before system performance is affected.

Low Effluent Quality

If your effluent samples are cloudy and color/turbidity is significantly higher than expected (greater than 15 NTU), do the following:

- Check the Biotube® filter for clogging.
- Check to see if the textile filter smells of chemicals (medication, chlorine, etc.) or has a granular or crusty appearance. (For example, a white crystalline crust could signal that water softener discharge or industrial strength detergents have been flushed into the system.)
- Check to see if the recirc ratio is too high or the pump dose time is too long. If the effluent $cBOD_5$ is high and TSS is low, a large amount of soluble $cBOD_5$ has not yet been consumed. That would likely be because the recirc ratio is too low for the influent strength or insufficient start-up time has elapsed. Typical organic reduction within the first 24 hours in residential systems is about 75% or greater. As the biomat begins to develop, greater reductions in the soluble $cBOD_5$ will occur (typically within the first 7-10 days). With a higher influent strength, the soluble $cBOD_5$ would not be readily removed until the biomat on the media is established.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Interview the users about system abuse, especially in the area of harmful chemicals, solvents, strong cleaning agents, or water softener backwash.

Special Note about Water Softeners: *Water softener backwash is extremely high in salts, which can disrupt system performance, especially nitrogen reduction processes. Talk with residents to make sure that no water softener backwash is discharging into the processing tank. Plumbing water softener backwash into the processing tank voids the warranty.*

If none of these troubleshooting steps makes a difference, lab tests may be necessary to determine the cause of the problem. Call Orenco for recommended lab tests or design remedies.

Odor

If the tank or textile filter smells like rotten eggs or cabbage:

- Check dissolved oxygen levels using a DO meter or DO wet test kit.
- Note filtrate DO levels that are <2.5 (less than 2.5) or >6 (greater than 6) mg/L.

Filtrate DO that's <2.5 mg/L indicates insufficient oxygen. If the filtrate DO is <2.5 mg/L:

- Check filter surface for evidence of clogging.
- Check that the pump is working.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Check that the recirc ratio isn't too low; increase if too low.
- Check that influent strength isn't too high (see AdvanTex Design Criteria).
- Check to ensure hydraulic retention time isn't too high.

Filtrate DO that's >6 mg/L indicates excessive aeration. If the filtrate DO is >6 mg/L:

- Check to ensure recirc ratio isn't too high.
- Check to see if influent flows are below normal.
- If influent flows are below normal or recirc ratio is too high, reduce recirc ratio.

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Troubleshooting Other Symptoms

Biotube® Filter Clogging

If a visual inspection of the Biotube® filter for biomass build-up shows the need for cleaning more often than once a year (annual cleaning is typical for recirculating systems), try the following:

- Verify the pump isn't running too long (typically 3 cycles/hour).
- Ensure the recirc ratio isn't too high.
- Verify normal DO levels; if high, reduce recirc ratio.
- Check for below normal influent flows.
- Check influent Grease & Oil and TSS; if excessive, a review of component sizes may be required.

Oily Film

All signs of oil or grease anywhere in the system (in the tank, in the vault, on the effluent filter or textile filter) must be investigated. Ask the system user to identify the probable source:

- Recent change of car oil?
- Canning meat or poultry?
- Excessive use of garbage disposal?
- Excessive use of bath or mineral oils? (Jacuzzi® tub?)
- Excessive use of detergents?

If the system user can't identify the probable source, try the following:

- Sample and test at all process steps, including influent (if possible).
- Label, date, and photograph all samples.
  - When photographing, use standard glass beakers and set samples in front of a common, uniform background
- Check biomat accumulation at AdvanTex Filter.
- Note if biomat is yellowish and wax-like or lard-like. If so, scrape biomat sample for analysis:
  - Photograph/document biomat sample.
  - Send to lab with effluent samples.

Excessive grease and oil (>25 mg/L) is typically a design and management concern with commercial applications.

Foam

Foam rarely occurs in packed bed filters. If you see foam in the textile filter, call Orenco.

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Troubleshooting Nitrogen Reduction

AdvanTex Treatment Systems do an excellent job of reducing nitrogen, especially in the Mode 3 configuration, where total nitrogen (TN)* is typically reduced to 10-15 mg/L, from typical influent total Kjeldahl nitrogen (TKN)** of 70 mg/L. Because many people purchase AdvanTex for its nitrogen-reducing capabilities, and because nitrogen reduction is a complex, many-staged process, it's important to understand the process, its related factors, the signs of effective nitrogen reduction, and how to keep the process optimized.

It's also important to know the TN limits required by the system user's permit. Some regulatory agencies have no requirement; some require a specific percentage reduction of a certain kind of nitrogen (90-95% nitrification of ammonia nitrogen, for example); and some require that TN be reduced to levels at or near drinking water quality at the point of final dispersal. A level of 20 mg/L TN is becoming increasingly accepted by regulators because it's typically achievable without relying on supplemental carbon and alkalinity feeds.

Finally, because influent characteristics greatly affect the amount of nitrogen reduction possible from any given system, it's vital to know the alkalinity of your waste source and the local or regional norms for organic and ammonia nitrogen.

The Process

Appendix 1 describes the nitrification/denitrification cycle in more detail, but a brief description should help you with most troubleshooting. In nitrogen reduction, ammonia is converted to nitrate in an aerobic environment, and then reduced through bacterial action in an anaerobic environment to nitrogen gas, which is released harmlessly to the atmosphere. Optimum nitrogen reduction typically requires the following:

- Adequate alkalinity of approximately 250 mg/L or higher (a lab test shows levels).
- pH of 6-9. Fixed-film microbial processes generally thrive between pH 6 and 9. Treatment problems typically result from rapid changes in pH rather than extreme long-term mean values, although long-term levels can result in less efficient process activity.
- Filtrate DO level of 2.5-6 mg/L, process tank DO level of <1 mg/L.
- Adequate time for the nitrifying bacteria to develop (one to three months).
- Adequate temperature (below 40° F retards the process).
- Good organic removal.

For a thorough description of the nitrogen reduction process, see Appendix 1. In residential wastewater, the ammonia level is typically about 60 mg/L and the TN is typically ≈70 mg/L.

Signs of Effective Nitrogen Reduction

Service providers frequently ask us, "How do I know if my wastewater treatment system is reducing nitrogen?" A thorough description of key indicators is included in Appendix 1. Following is a brief summary:

- Clear, odorless filtrate effluent (a "see and sniff" test is generally considered sufficient).
- Normal-looking biomat on the textile filter (light-brown to dark-brown and gelatinous in texture).

Additional filtrate tests will show ...

- Typically, low BOD_5, low turbidity and high clarity.
- DO of ≈ 2.5-6 mg/L.
- Low ammonia levels (≈<1-3) and relatively high nitrate levels, since nitrification converts ammonia to nitrate.

* Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH_3-N), nitrate nitrogen (NO_3-N), and nitrite nitrogen (NO_2-N).

** Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH_3-N).

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Troubleshooting Nitrogen Reduction (continued)

Troubleshooting Nitrogen Reduction

If you suspect that the system is not meeting expectations for nitrogen reduction, troubleshoot each of the critical factors that contribute to optimum nitrogen reduction, to determine a cause.

Filtrate Alkalinity Too Low — Sufficient alkalinity is required to achieve the desired degree of nitrification for any wastewater treatment system, because it takes 7.14 parts alkalinity to nitrify 1 part ammonia.

If filtrate alkalinity is too low:

- Check the recirc ratio; a high recirc ratio increases alkalinity consumption.
- Check influent TKN or ammonia levels and source alkalinity.

If a large quantity of nitrification is required, it may be necessary to add alkalinity-raising chemicals to the system.

Filtrate pH Too Low — Nitrification is particularly sensitive to pH but tends to thrive at levels between pH 7 and 8. The nitrification process releases hydrogen that consumes alkalinity and causes pH levels to drop. A pH level of <6 retards microbial activity of all kinds, including denitrification, and with a pH level <5.5, nitrification may show signs of degradation. Maintaining an alkalinity of 50 to 80 mg/L in the effluent is typically sufficient to maintain pH levels above 5.5. If the filtrate pH level is too low:

- Check influent alkalinity level (pH drops when too much available alkalinity is consumed).
- Check recirc ratios; reduce if too high.
- Ask system user about chemical discharges into the system, including carpet cleaners, chlorine, and photo developing agents.

Filtrate DO Levels Outside Range of 2.5-6 mg/L — If filtrate DO is too low (indicating insufficient oxygen), the system may release sulfide odors during dosing events, or there may be a more lasting smell within the filter pod. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check air flow through the vent assembly.
- Check the recirc ratio; if it's too low (<2:1), increase as necessary.

If your filtrate DO is too high (indicating excessive aeration), it's likely that excessive recirculation or insufficient hydraulic retention time are factors. Try decreasing the recirc ratio.

High Filtrate Ammonia Levels — Because ammonia is biochemically oxidized to nitrate during nitrification, high ammonia levels are a sign that something is amiss. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check for sufficient aeration (measure DO).
- Ensure no blockage of air flow into textile filter (indicated by thick biomat development or a build-up of grease and oils).
- Ensure no blockage in the manifold, causing ...
  - — Localized hydraulic overloading, saturation
  - — Short circuiting
- Check for sufficient alkalinity; if insufficient, consider supplemental buffering using equipment that automatically adds an alkaline compound to the system. Call Orenco Engineering for assistance, if necessary.

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Troubleshooting Nitrogen Reduction (continued)

Low Filtrate Nitrate Levels — Residential packed bed filters normally yield more than 98% nitrification (conversion of ammonia to nitrate). Therefore, the ammonia levels in the filtrate should be low and the nitrate levels higher. Some denitrification occurs in the packed bed filter, so the normal nitrate level may vary. Be sure you are familiar with the mode of operation, as some AdvanTex modes are configured to produce lower nitrate levels. If it appears that nitrification is dropping off:

- Check the recirc ratio; adjust as necessary (high recirc ratios may drive pH too low for effective nitrification/denitrification, and low recirc ratios may not provide sufficient aeration).
- Verify incoming ammonia levels.
- Check recirc/blend for excessive organic food source (high BOD_5 may cause greater oxygen demand through the filter, reducing nitrification).

Adequate Time and Temperature — Nitrifying bacteria require one to two months to develop, and extremely cold temperatures (below 40° F) retard that process. If the AdvanTex Treatment System has been installed in a very cold climate, nitrification may not "kick in" for several months until warmer temperatures are reached. Typically, a June-September installation provides the necessary temperatures for a 30-60 day nitrification start-up time. Once nitrifiers colonize, they typically continue to nitrify through normal winter conditions. Only in severely cold regions should additional insulation be necessary.

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Appendix 1: More Information about Nitrogen Reduction

Nitrogen removal (or "nitrification/denitrification") is a biochemical process. In nitrification, ammonia is oxidized to nitrate ($2NH_3$ converts to $2NO_3$ + $3H_2O$). This nitrate is then reduced through bacterial action (denitrification) to nitrogen gas, which is released harmlessly to the atmosphere.

During the nitrification process, about 9 parts oxygen are consumed in converting 2 parts ammonia to nitrate. Therefore, depending on the concentration of ammonia, a considerable amount of air may be needed. Other processes, like BOD_5 reduction, may occur simultaneously and further elevate the demand for aeration, especially if the organic level is high. In an abundance of air, all the aerobic or facultative microbes compete for their share of oxygen.

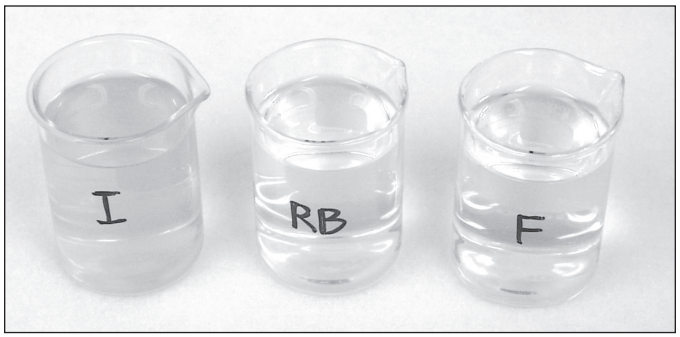
When the organic concentration is high, the microbes that oxidize organic matter, primarily the heterotrophic bacteria, are aggressive and tend to outcompete other microbes for the available free oxygen in solution. Ammonia is oxidized by autotrophic bacteria, which do not have as aggressive a growth rate, so if oxygen is not abundant, nitrification suffers. Consequently, the nitrification process usually lags until the organic concentration is depleted or until sufficient oxygen is present. At a 2.5:1 BOD_5/TKN ratio, the nitrifiers may only make up about 10 percent of the microbial population. At 0.5:1 BOD_5/TKN, the nitrifiers make up about 35 percent of the population.

In a filtering process, the filter column must be deep enough, or the filter media must be efficient enough at filtering organic particles, to deplete organic concentrations to a level in which a sufficient population of nitrifiers will be sustained. The physical (dimensional) features of the filter will vary depending on the media's characteristics — void ratio, moisture holding capacity, and effective surface area per unit volume ratio. Tankage, surge capacity, application rates, and loading characteristics are other design considerations that play a role in the sizing of the filter unit.

Performance Indicators

To judge the nitrogen-reducing performance (or potential) of any wastewater treatment system, be sure to check the following performance indicators:

Clear, Odorless Effluent — Simple, "see and sniff" tests can be performed easily in the field. Effluent from packed bed filters (recirculating textile filters, recirculating sand filters, intermittent sand filters) that are performing well should be clear (with turbidity <20 NTUs) and odorless.



Tests for Ammonia and Nitrate Nitrogen — If the system is oxidizing ammonia to nitrate (nitrifying), lab tests should measure relatively low ammonia levels and relatively high nitrate levels in the filtrate. Because nitrification responds to many and varying conditions within the aerobic treatment processes, *ammonia and nitrate nitrogen levels in the filtrate are the most ideal constituents to watch for any changes in performance.* Start-up times can be plotted, optimum recirc ratios can be gauged, cleaning frequencies can be predicted, and nonvisible clogging or saturation can be detected by watching either of these constituents.

Typical nitrification in single-family residential systems is expected to be in the 98-99% range. Investigate if the process appears to degrade by 5 percentage points or more.

BOD_5 — The nitrification process requires oxygen, which is why nitrification is enhanced when BOD_5 is extremely low. Measures of filtrate BOD_5 should be <15 mg/L, although higher BOD_5 may not necessarily correlate with low levels of nitrification.

Typical influent characteristics are shown on page 8. When BOD_5 is high, there is a greater organic demand for oxygen, which may hamper the nitrogenous demand for oxygen. Increasing the recirc ratio should help establish oxygen balance.

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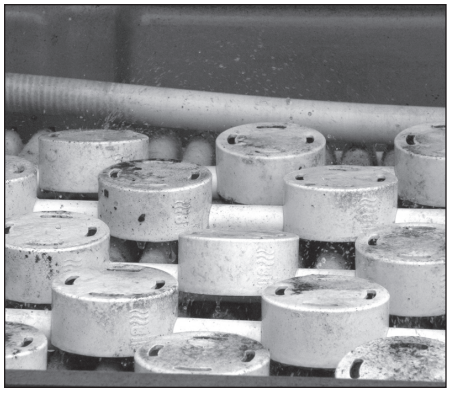
Appendix 1: More Information about Nitrogen Reduction (continued)

Biological Growth on Filter — With "fixed film" treatment systems, biological growth on the filter media is natural. The biomat should appear light-brown to dark-brown in color and gelatinous in texture.

Dissolved Oxygen — Dissolved oxygen also provides critical information with which to diagnose how well a system is performing. Measures of DO should be in the range of 2.5 to 6 mg/L. If the DO level drops, the degree of nitrification will normally drop as well, which could be a sign of blinding or saturated flow conditions — anything that might inhibit free air from flowing into the system. (Nevertheless, it's quite possible to have low filtrate DOs and still have high effluent quality, as measured by BOD_5 and TSS levels.)



pH — For normal residential nitrogen loads, pH is typically maintained between 6 and 8.

Influent Characteristics — Influent characteristics (see page 9) will greatly affect the amount of nitrogen reduction that is possible from any wastewater treatment system. High solids and/or fats and cooking oils increase the oxygen demand and accumulation of material on and within the media, affecting the available oxygen for nitrification.

Alkalinity — The nitrification process releases hydrogen ions into solution, which tends to lower the pH level. Alkalinity is essential for nitrification. For each part ammonia that is nitrified, 7.14 parts alkalinity are consumed (buffering the acidity caused by the release of hydrogen ions). Consequently, if the degree of nitrification is less than expected, it could simply be a lack of sufficient alkalinity to support more. Typical residential nitrification requires alkalinity above about 250 mg/L for recirculating processes and double that for single-pass processes.

Many wastewater streams do not have sufficient alkalinity to support complete nitrification. In this case, nitrification may deplete the alkalinity, and pH may drop to a level that retards the microbial activity (<6). Recirculating the effluent helps, since half the alkalinity can be restored in the recirc or process tank, wherever denitrification occurs (and adjusting the recirc ratios may also bring the pH back to preferred operating levels). But wastewater streams that are alkalinity-starved can't provide for 100% nitrification.

The use of low flush fixtures can reduce nitrification performance. Low flush fixtures tend to reduce hydraulic loads, which causes elevation of wastewater constituents (i.e., higher concentrations of BOD_5, TSS, TKN, etc.). In this case, the available alkalinity in the water supply may not be adequate to accomplish the full level of nitrification desired.

These constraints exist for all wastewater treatment operations, regardless of whether the operation involves a suspended growth contact stabilization process or an attached growth packed bed filter. Packed bed systems will perform better, especially if they have a large attached growth surface area per unit volume ratio, because the micro-sites near the attached side of the biomat, where denitrification typically occurs, return some of the alkalinity. Textile packed bed filters, because of their large surface area per unit volume ratio, tend to perform even better.

Nevertheless, additional buffering may be necessary to accomplish the level of nitrification desired. In low alkalinity conditions, pH adjustment can be made with the addition of quicklime or hydrated lime, soda ash, or caustic. If the alkali is to be introduced at a process point preceding sedimentation zones, such as in the tank, lime would be preferred. Soda ash and caustic both contain sodium, which is a dispersant and will impede settling of solids in the tank.

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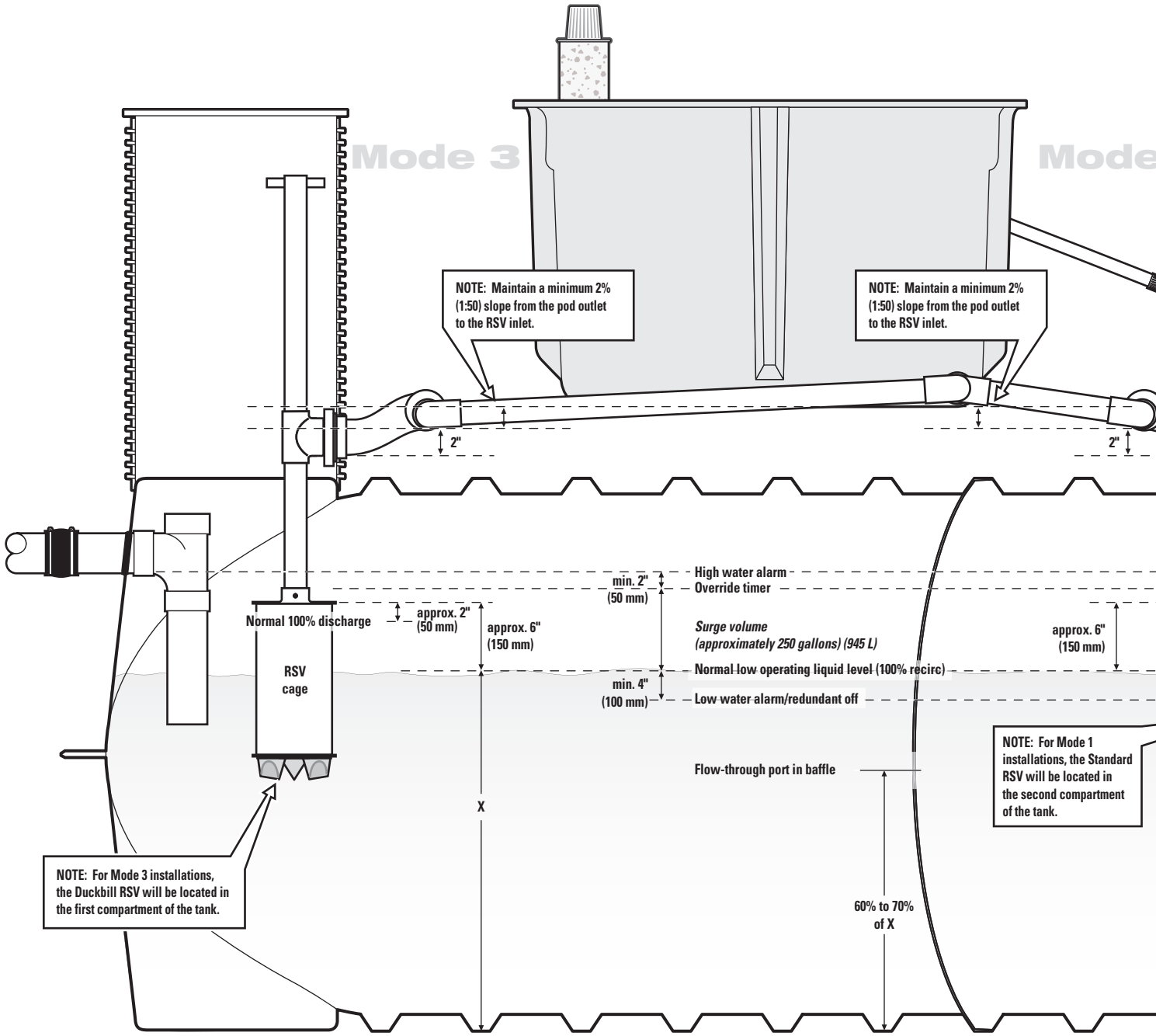
Appendix 2: Float and RSV Settings

Orenco will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

This diagram shows how these settings are established for AdvanTex Treatment Systems that use a VeriComm® Control Panel. The diagram shows both a Mode 1 and a Mode 3 setup. For Mode 1 setups, the recirculating splitter valve (RSV) is installed in the second compartment, with the Biotube pump vault. For Mode 3 setups, the RSV is installed in the first compartment, under the inlet riser.



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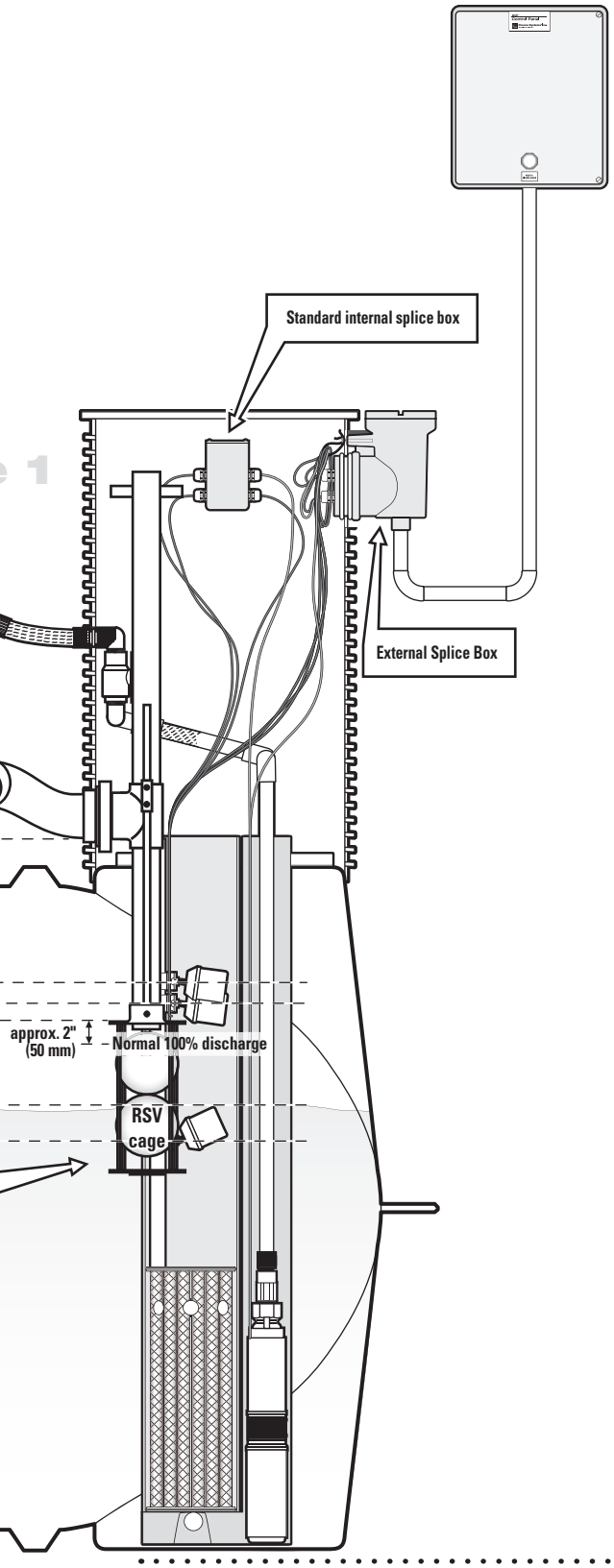
Appendix 2: Float and RSV Settings (continued)



Typical RSV Levels

For stinger pipe lengths up to 24 in. (610 mm) long, the "normal low operating liquid level" will be approximately 5-6 in. (127-152 mm) below the top of the RSV cage. (The normal low operating liquid level is the level at which 100% of the filtrate returns to the tank.) For most residential applications, the recommended surge volume — the volume between the low liquid level and the high water alarm float — is approximately 250 gallons (948 L). For Mode 3 installations, the duckbill model RSV, which has a flexible PVC tube that vents the RSV cage to atmosphere, is required.

Typical Float Levels

Be sure to check the plans for any site-specific or tank-specific float settings. The top float is normally set equal with the tank's invert of inlet. The bottom float should be approximately 4 in. below the normal low operating level.

NOTE: *Before leaving the site, verify that the "low water alarm/redundant off" float is positioned at least 10 in. (254 mm) below the top of the RSV cage.*

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Appendix 3: Timer Settings

The following chart shows recommended timer settings for a new system.

RESIDENTS	TIME ON (SEC)	TIME OFF (MIN)	NOTES
2	10 sec (0.17 min)	20.00	• Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3 : 1 (Filter recirculation ratio of 4 : 1). • Override OFF cycle time is set at one-half of the OFF cycle time. Override ON cycle time is set the same as the ON cycle time.
3	15 sec (0.25 min)	19.75	
4	20 sec (0.33 min)	19.45	
5	25 sec (0.42 min)	19.70	
6	30 sec (0.50 min)	19.50	

As you gain experience with a system, you may conclude that you need to make adjustments, sometimes significant ones. This worksheet is intended to help you determine appropriate start-up timer settings (Pump ON, Pump OFF) for a single-pod AX20 system. Typical values and ranges are provided for each parameter. If you have any questions or if your values fall outside the desired ranges on this worksheet, contact your Dealer.

PARAMETER		TYPICAL VALUES	NOTES
	Number of people	3	Range of 2 to 8 people.
	Water usage per person	50 gpd (190 L/d)	Typical daily average is 50 gal. (190 L) per person.
Q_i	Actual daily flow (total)	150 gpd (570 L/d)	(Number of people) x (water usage per person).
R_b	Return recirculation ratio	3 : 1	You can adjust this ratio (return flow to forward flow) up or down depending on system performance. (Range of 2 to 6.)
R_f	Filter recirculation ratio	4 : 1	
	Total daily flow to AX20	600 gpd (2280 L/d)	(Actual daily flow) x (return recirculation ratio + 1). Must be ≤ 3000 gpd (11,370 L/d). Actual flow should not exceed 500 gpd (1895 L/d). (500 gpd x 6:1 R_b = 3000 gpd)
Q_d	Actual pump dose rate	33.3 gpm (126 L/min)	Determine this value by field-testing or by using Orenco's PumpSelect™. Start at the low end.
T_d	Pump ON cycle time (dose)	0.25 min	Select a value between 0.17 minutes (10 seconds) and 0.75 minutes (45 seconds).
T_r	Pump OFF cycle time (rest)	19.75 min	See Pump OFF equation below.

PUMP OFF EQUATION **EXAMPLE**

Plugging in the above values and rounding results in the following:

$$T_r = \left[\frac{1440 \cdot T_d \cdot Q_d}{(R_b + 1) \cdot Q_i}\right] - T_d$$

$$T_r = \left[\frac{1440 \cdot 0.25 \cdot 33.3}{(3 + 1) \cdot 150}\right] - 0.25 = 19.74 \approx 19.75$$

After you determine your Pump ON and Pump OFF times, double check to make sure your start-up settings fall within the cycle time (CT) range, below. If they don't, make adjustments per the "Note."

ADDITIONAL PARAMETERS		TYPICAL VALUES	NOTES
CT	Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
	Pump cycles per day	72 cycles	1440 min/day ÷ (OFF cycle time + ON cycle time). Must not exceed the pump's maximum rated cycles of 300 cycles per day.
	Gallons per cycle	8.3 gal. (31 L)	With 68 orifices and using the T_d range recommended above, you will maintain the recommended 0.08 to 0.25 gal. (0.45 to 0.95 L) per orifice per dose.

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Appendix 4: Glossary

Alkalinity: The amount of ions available in the filtrate to react with hydrogen ions. Although pH paper or a pH meter provides a quick field measure of the overall balance of acidity vs. alkalinity in the system and is useful for detecting changes that may cause problems, quantitative determination of alkalinity (measured in mg/L) is done in a lab.

BOD: Biological Oxygen Demand, a measure of the amount of organic material in wastewater. cBOD means carbonaceous BOD; the terms are often casually used interchangeably. $cBOD_5$ means "five-day cBOD" and is a lab test in which the sample is incubated for five days.

DO: Dissolved oxygen, in mg/L. It can be measured in the field using a DO meter or colorimetric kit, or in a lab.

G&O: Grease and oil, in mg/L, measured in a lab.

NTU: Clarity and color of wastewater can be measured in nephelometric units (NTU). Clarity of a sample in a glass container can be compared by eye against a prepared sample. To obtain a quantitative measure of turbidity, a turbidity meter can be used in the field or in a lab.

pH: A measure of the acidity or alkalinity of wastewater on a scale from 0 (acid) to 14 (alkaline), with 7 being neutral. pH can be measured in the field using pH test strips or a pH meter.

TN, TKN: Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH_3-N), nitrate nitrogen (NO_3-N), and nitrite nitrogen (NO_2-N). Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH_3-N).

TSS: Total suspended solids, in mg/L, measured in a lab.

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Notes

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