

**NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SECTION
ON-SITE WATER PROTECTION BRANCH**

INNOVATIVE WASTEWATER SYSTEM APPROVAL
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Innovative Wastewater System Approval Number: IWWS 2004-03-R5

Issued To: Orenco Systems, Inc
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For: AdvanTex[®] Treatment Systems

Approval Date: April 6, 2005
June 29, 2007
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December 31, 2024 Updated for 18E and renewed for 2025

In accordance with G.S. 130A-343 and 15A NCAC 18E, Section .1700, an application by Orenco Systems, Inc, for a renewal of the approval for their advanced pretreatment systems, AX-20 and AX-100, has been reviewed and found to meet the requirements of an Innovative system when the following conditions are met.

I. General

A. Scope of this Innovative Approval

1. Design, installation, use, and operation and maintenance requirements for AX-20 and AX-100 systems meeting TS-I and TS-II effluent standards pursuant to 15A NCAC 18E .1201(a), Table XXV.
2. Operation, maintenance, and monitoring requirements for AX-20 and AX-100 systems and associated dispersal systems to ensure the treatment performance standards are met.

- B. This Innovative Approval is applicable to wastewater systems treating domestic strength effluent, as defined in 15A NCAC 18E .0402(a), Table III, utilizing AX-20 and AX-100 systems that have a design daily flow less than or equal to 3,000 gallons per day (gpd).

Use of AX-20 and AX-100 systems for facilities with high strength effluent, as defined in 15A NCAC 18E .0402(a), Table III or industrial process wastewater, shall be proposed by Orenco Systems, Inc, and a North Carolina Professional Engineer (PE) to the Department for review and approval on a case-by-case basis, prior to permitting by the local health department (LHD). The system design shall include the proposed untreated wastewater strength in BOD₅, COD, TN, TSS, and fats, oils, and grease, the expected organic loading rate in pounds of BOD or N, the hydraulic loading rate on the pretreatment system, and the calculations, references, and any other needed information to support the proposed design.

- C. Any site utilizing these systems shall have wastewater with sufficient alkalinity to facilitate biological treatment processes. The influent shall not have a pH or toxins that significantly inhibit microbial growth.
- D. Use of AX-20 and AX-100 systems that have a design daily flow greater than 3,000 gpd may be permitted after approval by the Department on a case-by-case basis in accordance with 15A NCAC 18E .0302(e) or G.S. 130A-336.1.

II. System Description

I NEED A SYSTEM DESCRIPTION FROM YOU HERE.

III. Siting Criteria

The AX-20 and AX-100 systems and associated dispersal fields shall be sited and sized in accordance with 15A NCAC 18E Section .1200 for TS-I and TS-II systems. Drip irrigation systems used with AX-20 and AX-100 systems shall be sited and sized in accordance with 15A NCAC 18E .1204 and the manufacturer specific drip approval. The AX-20 and AX-100 systems and associated dispersal fields shall meet all applicable horizontal setback requirements in accordance with 15A NCAC 18E Section .0600 or .1202 and be located to prevent surface and subsurface water inflow and infiltration.

IV. Dispersal Field System Sizing

The dispersal field system sizing criteria shall be based upon the long-term acceptance rate specified in the appropriate portion of the rules or the Provisional, Innovative, or Accepted system approval for the type of dispersal system to be used.

V. Special Site Evaluation

A special site evaluation may be required based on the proposed dispersal system. Refer to 15A NCAC 18E .0510(c) for when a special site evaluation is required.

VI. Design Criteria

- A. The system consists of a septic tank, a recirculation tank, and AdvanTex fixed-film media pod(s) as specified in Table I below.

Design Flow (gallons per day)	Minimum Septic Tank Size* (gallons)	Minimum Recirculation Tank Size (gallons)	Minimum AdvanTex Units**
≤ 500	1,000	1,000	1 AX20
501 - 600	1,500	1,000	2 AX20
601 - 750	2,000	1,000	2 AX20
751 – 1,000	2,500	1,500	2 AX20
1,001 – 1,500	3,750	2,000	3 AX20
1,501 – 2,000	5,000	2,500	4 AX20 Dual Bulb UV
2,001 – 2,500	6,250	3,000	1 AX100 Dual Bulb UV
2,501 – 3,000	7,500	3,500	2 AX100 Dual Bulb UV

* Multiple tanks, in series, may be used for systems larger than 600 gpd.

** Single-Bulb UV system shall be provided after the AdvanTex units for TS-II systems with flows of 1,500 gpd or less; dual-bulb UV system shall be provided after the AdvanTex units for TS-II systems with flows of 1,501 to 3,000 gpd.

1. All tanks shall be approved by the Department and Orenco Systems, Inc. specifically for the use with AdvanTex Treatment systems. All tanks, septic and recirculating, will have an inlet sanitary tee that is visible and accessible from the riser opening.
2. The septic tank shall be equipped with a Department approved Orenco effluent filter on the outlet end.
3. The recirculation tank will contain the recirculating splitter valve and the Biotube screened pump vault.
4. A drainback configuration without a pump check valve is required for the force main.
5. The recirculating pumps are Orenco 4-inch turbine effluent pumps. The pumps that accompany the different configurations are:

# of AdvanTex Filter Units	Type of AdvanTex Filter Unit	# of Recirc Pumps	Pump Nominal Flow Rate (gpm)	Horse Power	Voltage
1	AX20	1	30	1/2	115V or 230V
2	AX20	1	50	1/2	115V or 230V
3	AX20	1	75	1/2	115V or 230V
4	AX20	2 (duplex)	50	1/2	115V or 230V
1	AX100	2 (duplex)	50	3/4	115V or 230V
2	AX100	2 (duplex)	50	3/4	115V or 230V

6. The AdvanTex pod is equipped with a set of vertical geotextile sheets with low pressure pipe wastewater distribution above the sheets. The low-pressure pipe distribution operates at 3 to 5 feet of pressure head. The pods may be placed above the tanks but shall not obstruct the tank accesses. Two air vents for the pod are required, one is located on the pod and the other is located on the discharge cleanout.

7. Filtrate from the AdvanTex pod flows by gravity into either the recirculation tank or the ultraviolet (UV) disinfection system dependent upon the recirculation tank level. UV piping shall always be installed, but controls, ballast, wiring, and bulbs shall only be required to be installed for TS-II systems.
8. As an option to enhance nitrogen removal for TS-II systems, a portion of the nitrified wastewater may be diverted back to the septic tank where conditions are most optimal for denitrification. The daily volume of nitrified wastewater delivered back to the septic tank shall be determined on a case-by-case basis by the designer authorized in writing by Orenco Systems, Inc (authorized designer) for new systems or the operator authorized in writing by Orenco Systems, Inc (authorized operator) for existing systems, and shall not exceed 50% of the daily volume pumped to the AdvanTex filters.
 - a. For existing systems, the authorized designer shall notify the LHD of the proposed modifications to the system, including an explanation of why the modifications are being proposed and a drawing showing how the wastewater will be diverted back to the septic tank. The authorized operator shall then coordinate with the LHD for scheduling site visits prior to, during, and after system modification.
 - b. For existing systems, the percentage returned to the septic tank may be required to be reduced below the designed percentage if effluent CBOD₅ sampling and testing per Section VIII.F.2 indicates that effluent CBOD₅ levels are not in compliance with 15A NCAC 18E .1201(a), Table XXV.
 - c. Acceptable methods for diverting wastewater back to the septic tank for new and existing systems shall include the following:
 - i. A stub connection at the recirculating pump hose and valve assembly to divert a portion of each dose to the septic tank. A flow control disk with appropriately sized orifice will be placed in a union in the septic tank return line to control the proportion of flow returned to the septic tank. A pressure monitoring port, a tee with a threaded fitting to mount a standpipe or tube, will be placed in the septic tank return line preceding the flow control disk. A standpipe or tube mounted in the port can be used to measure pressure at the flow control disk. The measured pressure allows the actual rate of septic tank return flow through the flow control disk orifice to be calculated. A gate valve will be placed in the line upstream of the pressure monitoring port, to allow further adjustment of the return flow delivered to the septic tank.
 - ii. A stub connection at the recirculating pump hose and valve assembly to divert a portion of each dose to the septic tank, with a gate valve in the piping where it returns to the septic tank, to control the percentage of each dose diverted to the septic tank. The operator shall set the valve to obtain the desired percentage split and verify the return flow to the septic tank by direct measurement.
 - iii. A split filter pod with a baffle placed in the floor to divide the pod into two separate compartments, one draining to the septic tank, and the other to the recirculating splitter valve, through separately plumbed outlets. The removable baffle shall be placed at the bottom of the pod such that a 50:50 split or smaller percentage split to the septic tank is obtained, as determined by the system designer. The location of the baffle wall and percentage split can be adjusted as determined to be needed based on demonstrated system performance.
9. The UV system shall be rated for the appropriate discharge rate from the AdvanTex unit. Audible and visible alarms for bulb failure will be provided.

10. The UV disinfection system will be one of the following:
 - a. 0-1,500 gpd: "UV The Disinfector" or the Salcor 3G, or the Orenco UV Unit.
 - b. 1,501-3,000 gpd: Dual Bulb "UV The Disinfector", or Salcor 3G (two units), or Orenco UV Unit (two units).
 - c. Other UV systems specifically approved by the Department and Orenco Systems, Inc
11. AdvanTex Treatment systems will utilize the TCOM or VeriComm[®] telemetry control panel. The control panel is in a NEMA 4X enclosure and shall be located within 30 feet of the recirculation tank. Separate control and alarm circuits will be provided. The Telemetry Control Panel shall be connected to an active phone line capable of dialing a 1-800 number. The operator of the system must be able to access the panel directly on site and shall be available, with 24-hour notice, to the LHD in the event that the LHD needs to access the control panel.
12. All access riser hatches shall be secured by approved tamper-resistant stainless-steel bolts supplied by the manufacturer. Riser construction, attachment to tanks and security systems shall be pre-approved by the Department in accordance with the Orenco Systems, Inc approvals for septic tank and pump tank risers, as applicable.
13. Buoyancy calculations shall be completed by a PE for AdvanTex AX-100 pods, associated tankage, and/or the UV basin if they intersect the seasonal high-water table. Additional concrete ballast may be required. In addition, the instructions for anti-floatation in the AdvanTex Treatment System Installation Manuals shall be followed. Orenco Systems, Inc, can submit a pre-engineered anti-buoyancy design by a PE for approval by the Department that could be used instead of site-specific anti-buoyancy designs for sites that meet the limitations of the pre-engineered design.
14. The panel controlling the dispersal field dosing pumps shall be provided by Orenco Systems, Inc and be designed to meet the daily, 7-day, and 30-day monitoring requirements of 15A NCAC 18E .1701(a)(2)(I), unless the dispersal field panel is provided by a distribution system manufacturer other than Orenco Systems, Inc. If so, the other manufacturer's panel shall meet these same monitoring requirements, and its alternate use for this purpose shall have the concurrence of Orenco Systems, Inc. and the authorized designer.
15. A spigot or sampling port shall be placed on the force main from the final dosing tank to provide for effluent sampling
16. The 7-day and 30-day readings will be stored in the VeriComm control panel records. The authorized operator will be able to access this information when they are at the site. The VeriComm panel, TCOMM Telemetry control panel, or approved equal shall be used for pressure manifolds, low pressure pipe systems, and drip irrigation systems.

B. AdvanTex Treatment systems shall be designed by either an authorized designer or a PE.

VII. Installation and Testing

- A. A preconstruction conference shall be required to be attended by the following, as applicable: authorized designer, Authorized On-Site Wastewater Evaluator (AOWE), PE, installer authorized in writing by Orenco Systems, Inc (authorized installer), Orenco Systems, Inc licensed distributor, and LHD prior to beginning installation of the AX-20 or AX-100 system.

- B. AX-20 and AX-100 systems shall be installed according to directions provided by Orenco Systems, Inc.
- C. All individuals or companies installing AX-20 and AX-100 systems shall be in possession of all necessary permits and licenses before attempting any portion of a new or repair installation. The company or individual must be a Level IV installer and authorized in writing by Orenco Systems, Inc.
- D. Watertightness of the septic and pump tanks shall be demonstrated by a leak test in accordance with one of the following:
 - 1. 24-hour water leak test conducted at the installation site. A water level change of one-half inch or more over twenty-four hours, or visual observation of leakage shall be cause for failure of the watertightness test; or
 - 2. one of the testing methods in 15A NCAC 18E .0805(b).
- E. The authorized installer, PE, AOWE, or authorized designer, and the authorized operator shall conduct a final inspection and start-up of the AX-20 or AX-100 system and all associated system components. The LHD will attend and observe the final inspection and start-up.
- F. Specified site preparation steps and construction specifications for the dispersal system shall be strictly adhered to, including specified depth of trenches in relation to site limiting conditions, cover material specifications if needed, trench installation method, etc.

VIII. Operation, Maintenance, Monitoring, and Reporting

- A. AX-20 and AX-100 systems shall be classified, at a minimum, as a Type Va system in accordance with 15A NCAC 18E .1301(b), Table XXXII. Management and inspection shall be in accordance with 15A NCAC 18E, Section .1300.
- B. All AX-20 and AX-100 systems require an operation and maintenance agreement between the system owner and Orenco Systems, Inc, its authorized representative, or with an authorized operator in accordance with 15A NCAC 18E .1302(c). The authorized operator must have proper equipment and training to access and program the control panels on site. The authorized operator shall be:
 - 1. a North Carolina certified subsurface operator (Operator in Responsible Charge); and
 - 2. either an employee of Orenco Systems, Inc, or authorized in writing by Orenco Systems, Inc.
- C. All AX-20 and AX-100 systems shall be operated and maintained according to the latest version of Orenco Systems, Inc, USA O&M manual.
- D. At each AX-20 and AX-100 system inspection, the authorized operator shall follow service procedure steps identified in the Orenco System, Inc, O&M Manual and, at a minimum, observe, monitor, and record the following:
 - 1. Wastewater level in all the tanks;
 - 2. Sludge and scum levels in the septic tank and sludge level and grease presence in pump tank;

3. Clogging of effluent filter in Biotube® pump package in the recirculation tank;
 4. Watertightness of tanks, risers and pipe connections at the tanks;
 5. Operation of pumps, floats, valves, electrical controls, and alarms;
 6. Pumping frequency from pump impulse counters and elapsed run time meters;
 7. Dispersal field pump delivery rate (drawdown test), determination of the average pump run time, and dispersal field dosing volume;
 8. Any structural damage, accessibility issues, adequate ventilation, excess odors, ponding of effluent, insect infestations, vegetative growth over the dispersal field, or surfacing of effluent in the dispersal field area;
 9. Sample of AdvanTex Treatment system effluent collected from the sampling point to check for effluent clarity and odor and a sample of influent, as required;
 10. Pump cycle and run time meters and any water meter readings;
 11. Current set-up for TS-II nitrogen removal enhancement (percent returned to septic tank), and recommendation for modifications (if needed); and
 12. System operating conditions, from the review of VeriComm or TCOMM stored data for indication of flow variances, clogging of filter distribution system, or other abnormal conditions.
- E. The authorized operator shall conduct any other measurements, monitoring, maintenance activities, and observations as specified in the Operation Permit (OP) and recommended by the manufacturer.
- F. Sampling
1. All sampling shall be done in accordance with 15A NCAC 18E .1302 and .1709. AX-20 and AX-100 systems shall be sampled annually when the design daily flow is less than or equal to 1,500 gpd. Systems with design daily flows greater than 1,500 gpd and less than or equal to 3,000 gpd shall be sampled twice a year.
 2. Effluent for all systems shall be tested for BOD₅, TSS, and NH₃. Systems designed to meet the TS-II standard shall also have the effluent analyzed for TN (TKN and NO₃-N). Sampling is not required for fecal coliforms when the site is found to be compliant with all other constituents in Table XXV of 15A NCAC 18E .1201(a).
 3. Influent samples, if needed, shall be taken from the influent chamber of the treatment system.
 4. Effluent samples shall be collected from the disinfection unit inside the third compartment of the unit or a tap on the dispersal field force main. The tap should be located before the spin filter for drip systems.
- G. Notification and Performance of Maintenance and Repairs
1. The authorized operator shall alert Orenco Systems, Inc, the LHD, and the system owner within 48 hours of needed maintenance or repair activities including, but not limited to landscaping, tank sealing, tank pumping, pipe or control system repairs, media or aerator replacement, and/or adjustments to any other system component.
 2. The authorized operator shall notify the system owner, Orenco Systems, Inc, and the LHD whenever the pump delivery rate efficiency or average pump run times are not within 25 percent of the initial measurements conducted prior to system start-up.

3. System troubleshooting and needed maintenance shall be provided to maintain the pump delivery rate and average pump run time within 25 percent of initial measurements conducted during system start-up.
4. Tank compartments will be pumped as needed upon recommendation of the authorized operator and in accordance with the AX-20 and AX-100 system Operation and Maintenance instructions.
5. The tanks shall be pumped by a permitted septage management firm, and the septage handled in accordance with 15A NCAC 13B .0800.
6. All maintenance activities shall be logged and recorded in the authorized operator reports provided to the system owner, Orenco Systems, Inc, and the LHD.

H. Reporting

The authorized operator shall provide a written report to the system owner, Orenco Systems, Inc, and the LHD within 30 days of each inspection. At a minimum, this report shall specify:

1. The date and time of inspection;
2. System operating conditions measured and observed according to VIII.D and VIII.E;
3. Results from laboratory analyses of effluent samples, and influent samples as needed;
4. Maintenance activities performed since the last inspection report;
5. An assessment of overall system performance;
6. A list of any improvements or maintenance needed;
7. 7- and 30-day readings as required in 15A NCAC 18E .1702(a)(2)(l);
8. A determination of whether the system is malfunctioning, and the specific nature of the malfunction; and
9. Any changes made in system settings based on recommendations of the manufacturer.

IX. Responsibilities and Permitting Procedures

- A. Prior to the installation of an AX-20 or AX-100 system at a site, the owner shall submit an application or Notice of Intent (NOI) to the LHD for the proposed use of this system. Improvement Permits (IP) or Construction Authorizations (CA) issued by the LHD shall have a soil and site evaluation conducted either by the LHD, LSS, or Authorized On-Site Wastewater Evaluator (AOWE). The NOI shall include a soil and site evaluation conducted by an LSS.
- B. The IP, CA, and NOI shall contain all the conditions the site approval is based upon, including the proposed used of the Innovative system. The OP will include all conditions specified in the IP and CA. The Authorization to Operate (ATO) should include all the conditions specified in the NOI.
- C. When a special site evaluation is required pursuant to 15A NCA 18E .0510, an evaluation and written, sealed report from a Licensed Soil Scientist (LSS) regarding the site shall be provided to the LHD. The report shall contain the information specified in 15A NCAC 18E .0510(d). The LHD may request the assistance of their Regional Soil Scientist in evaluating this report prior to permit issuance.

- D. AX-20 and AX-100 systems shall be designed by either an authorized designer, AOWE, or a PE. Systems over 1,000 gpd, or as required in accordance with 15A NCAC 18E .0303(a) shall be designed by a PE.
- E. Prior to the LHD issuing a CA for an AX-20 and AX-100 system, a design submittal prepared by an authorized designer, AOWE, or PE shall be submitted. The design submittal shall include the information required in 15A NCAC 18E .0305.
- F. It is recommended that local authorized environmental health specialists attend a design training session offered by the manufacturer or the authorized representative prior to permitting the system. Also, at the request of the LHD, a Regional Engineer will review designs.
- G. For sites required to be evaluated by an LSS or Licensed Geologist (LG), see Section V and IX.C, the LHD, AOWE, or PE may specify as a condition of the IP and CA that an LSS or LG oversee critical phases of the dispersal field installation and certify in writing that the installation was in accordance with their specified site and installation requirements prior to the OP or ATO issuance.
- H. The authorized operator shall be present during the final inspection of the system prior to the issuance of the OP or ATO.
- I. The LHD shall issue the OP after the following:
 - 1. Field verification of installation completion;
 - 2. Receipt of written documentation from the authorized designer, AOWE, or PE that the system has been designed, installed, and is operating in accordance with the approved plans; and
 - 3. All necessary legal documents have been completed, including the contract between the system owner and the authorized operator.

The LHD shall issue the OP for an (a2) and (a5) application after all necessary legal documents have been completed, including the contract between the system owner and the authorized operator.

The ATO shall be submitted to the LHD in accordance with G.S. 130A-336.1 and G.S. 130A-336.2.

X. Repair of Systems

The provisions of 15A NCAC 18E .1302 shall govern the use of the AX-20 and AX-100 system for repairs to existing malfunctioning wastewater systems.

Approved By: _____ Date: _____