

**NORTH CAROLINA DEPARTMENT
OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL HEALTH
ON-SITE WATER PROTECTION SECTION**

INNOVATIVE WASTEWATER SYSTEM APPROVAL
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INNOVATIVE WASTEWATER SYSTEM NO: IWWS 2004-3-R4

Issued To: Sam Carter, Government Relations Manager
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For: AdvanTex[®] Treatment Systems

Approval Date: April 6, 2005
June 29, 2007
December 7, 2007
July 18, 2008
May 9, 2011

In accordance with General Statute 130A-343, 15A NCAC 18A .1969 and .1970, a proposal by Orenco Systems, Inc. for an updated approval of subsurface wastewater systems utilizing the AdvanTex Treatment systems has been reviewed, and found to meet the standards of an Innovative system when all of the following conditions are met:

I. General

A. Scope of this Innovative Approval

1. Use, design, and construction requirements for the AdvanTex Treatment systems (AX20 and AX100) to meet TS-I or TS-II effluent quality standards pursuant to Rule 15A NCAC 18A .1970.
2. Operation, maintenance, and monitoring requirements of the AdvanTex Treatment systems and associated subsurface systems to ensure the treatment performance standards shall be met.

- B. This Innovative System Approval is applicable to domestic strength sewage systems (non-industrial wastewater) utilizing AdvanTex Treatment systems that have a design flow not exceeding 3,000 gallons per day (gpd).

Use of AdvanTex Treatment systems for facilities with an influent waste strength that exceeds domestic septic tank quality effluent standards pursuant to Rule 15A NCAC 18A .1970(b) may be proposed by Orenco Systems, Inc and a North Carolina Professional Engineer 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 must include the proposed raw wastewater strength (BOD₅, COD, TN, TSS, fats, oils and grease, etc.), the expected organic loading rate (in pounds of BOD), and 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 sufficient alkalinity to perform the proper amount of nitrification. The influent shall not have a pH or toxins that significantly inhibit microbial growth.
- D. Use of AdvanTex Treatment systems that have a design flow exceeding 3,000 gpd may be permitted after approval by the Department, on a case-by-case basis, in accordance with the Large Systems State Review/Approval Process (Rule 15A NCAC 18A .1938).

II. Advanced Treatment Performance Standards (TS-I and TS-II)

AdvanTex Treatment systems are designed, installed, operated and maintained to meet TS-I or TS-II effluent standards in accordance with Rule .1970. Refer to Rule .1970(a) Table VII - Effluent Quality Standards for Advanced Pretreatment Systems for treatment performance levels.

III. Siting Criteria

AdvanTex Treatment systems and associated drainfields shall be sited and sized in accordance with Rule .1970 for TS-I or TS-II systems. Drip irrigation systems used with AdvanTex Treatment systems, shall be sited and sized in accordance with the manufacturer specific drip approval.

IV. Design Criteria

- A. The system consists of a septic tank, a recirculation tank, and AdvanTex fixed-film media pod(s) as specified in Table 1 below. See Attachment A for example drawings of unit configurations.

Table 1			
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. As part of this approval, 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, appropriately sized 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 forcemain.
5. The recirculating pumps are Orenco 4-inch turbine effluent pumps. The pumps that accompany the different configurations are:

<u># of AdvanTex Filter Units</u>	<u>Type of AdvanTex Filter Unit</u>	<u># of Recirc Pumps</u>	<u>Pump Nominal Flow Rate (gpm)</u>	<u>Horse Power</u>	<u>Voltage</u>
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 system designer (for new systems) or the ORC (for existing systems), and shall not exceed 50% of the daily volume pumped to the AdvanTex filters.
 - a. For existing systems, the ORC 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 Operator in Responsible Charge (ORC) shall than coordinate with the LHD for scheduling site visits (as needed) 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 currently designed percentage) if effluent CBOD₅ sampling and testing per Section VI.F.2 indicates that effluent CBOD₅ levels are not in compliance with Rule .1970(o)(1)(D).
 - 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 stand pipe or tube) will be placed in the septic tank return line preceding the flow control disk. A stand pipe 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 (optional for TS-I, required for TS-II) 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 (2 units), or Orenco UV Unit (2 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 North Carolina professional engineer for AdvanTex AX100 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 NC Professional Engineer 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 drainfield dosing pumps shall be provided by the Orenco Systems, Inc. and be designed to meet the daily, 7-day, and 30-day monitoring requirements of Rule .1970, unless the drainfield 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 system 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 ORC 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, LPP systems, and drip irrigation systems.

- B. AdvanTex Treatment systems shall be designed by either an Orenco Systems, Inc. certified designer or a North Carolina Professional Engineer.

V. Installation and Testing Procedures

- A. A preconstruction conference shall be required to be attended by the system designer, Orenco certified installer, and LHD, prior to beginning construction of the AdvanTex Treatment system.
- B. The AdvanTex Treatment system shall be located in compliance with the horizontal setback requirements of Rule .1950(a) and Rule .1970 and shall be located to prevent surface/subsurface water inflow/infiltration. The drainfield horizontal setback requirements are in accordance with Rule .1970, as appropriate for TS-I or TS-II systems.
- C. All AdvanTex Treatment systems shall be installed according to directions provided by the manufacturer in the "Installation Manual" and instructions found on Orenco Systems, Inc. CAD drawings of each system. Additionally, all AdvanTex Treatment systems and components used with, but not manufactured by Orenco Systems, Inc., shall be installed in accordance with all applicable regulations and manufacturer instructions.
- D. All individuals/companies installing AdvanTex Treatment systems shall be in possession of all necessary permits and licenses before attempting any portion of a new or repair installation. The company/individual must be a Level IV installer and Orenco Systems, Inc, certified.
- E. Watertightness of the tanks and any dosing tanks shall be demonstrated by a 24-hour leakage test conducted at the installation site after being installed below ground and prior to backfilling. A water level change of 1/2 inch or more within a 24" riser over 24 hours, or visual observation of leakage shall be cause for failure of the watertightness test. Initial water level shall be 2" above the riser/adaptor seam.
- F. For TS-II systems designed to have nitrified wastewater returned to the septic tank, the distribution of flow to the AdvanTex pod(s) and to the septic tank shall be measured during start-up and set to be in accordance with the system design with start-up settings recorded.
- G. The Orenco Systems, Inc. certified Operator in Responsible Charge (ORC) shall startup the AdvanTex unit for each installation and shall provide an installation and startup acceptance letter to the LHD prior to issuance of the operation permit.

- H. Specified site preparation steps and construction specifications for the ground absorption 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.
- I. Prior to Operation Permit issuance, the final Health Department construction inspection shall include at least the following checks:
 - 1. Observation of the system watertightness testing.
 - 2. Testing the controls and alarm settings.
 - 3. Recording all pump model numbers and time clock settings.
 - 4. Checking to ensure the two air vents on the pod are installed and functional.
 - 5. Checking the pressure head on the pod wastewater distribution system.
 - 6. Checking that return flow to the septic tank has been set per design and recorded, when applicable.
 - 7. Confirming that the riser hatches have tamperproof bolts, and/or riser lock ring.

VI. Operation, Maintenance and Testing

- A. AdvanTex Treatment systems shall be classified, at a minimum, as a Type Va system in accordance with Table V(a) of Rule. 1961(b). Management and inspection shall be in accordance with Rules .1961 and .1970.
- B. All Orenco AdvanTex Treatment systems require an operation and maintenance agreement between the system owner and Orenco Systems, Inc. or its authorized representative, as per Rule .1970. The system shall be inspected by a certified subsurface operator. The certified operator shall be either an employee of Orenco Systems, Inc. or authorized in writing by Orenco Systems, Inc. to operator and maintain the system. The operator must have proper equipment and training to access and program VeriComm or TCOMM Control panels on site.
- C. All AdvanTex Treatment systems shall be maintained according to the latest revision of the AdvanTex Operation and Maintenance Manual as published by Orenco Systems, Inc.
- D. At each AdvanTex Treatment system inspection, the ORC shall, 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. Drainfield pump delivery rate (drawdown test), determination of the average pump run time, and drainfield dosing volume.
 - 8. Any structural damage, accessibility issues, adequate ventilation, excess odors, ponding of effluent, insect infestations, vegetative growth over the drainfield, or surfacing of effluent on the drainfield 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).

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 ORC shall also conduct additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by the manufacturer.
- F. Sampling and Testing
1. All sampling shall be done in accordance with Rule .1970(n)(3) and (5). AdvanTex Treatment systems shall be sampled annually (semi-annually for systems with design flow of 1,501 to 3,000 gpd).
 2. All systems shall be tested for effluent CBOD₅ and NH₄-N and shall be tested in the field for turbidity. Systems specified to meet the TS-II standard shall have the effluent analyzed for TN (TKN and NO₃-N) and the influent analyzed for TKN. Systems specified to meet the TS-II standard with design flows of 1,501 to 3,000 gpd shall also have the effluent analyzed for fecal coliform.
 3. Additional sampling of effluent or influent may be determined to be necessary by the ORC during a system inspection to assist with troubleshooting or to verify system performance.
 4. Effluent samples for drip disposal systems or other pressurized dispersal systems shall be collected from a tap on the drainfield forcemain (prior to spin filters for drip systems). The preferred location of the tap is in the pump tank discharge assembly. The sampling shall not commence until at least 30 seconds of continuous discharge through the sample tap has occurred.
 5. Influent samples shall be taken from the inlet sanitary tee into the recirculation tank.
- G. Notification and Performance of Maintenance and Repairs
1. The ORC 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 replacement, and/or adjustments to any other system component.
 2. The ORC shall notify the system owner, the Orenco North Carolina authorized representative, and the LHD whenever the pump delivery rate efficiency and/or average pump run time are not within 25% of initial measurements conducted prior to system startup.
 3. System troubleshooting and needed maintenance shall be provided to maintain the pump delivery rate and average pump run time within 25% of initial measurements conducted during system startup.
 4. The septic tank will be pumped as needed upon recommendation of the ORC and in accordance with the AdvanTex Treatment System Operation & Maintenance Manual for preferred pumping intervals. However, at a minimum, the septic tank will be pumped whenever the solids level exceeds 25% of the tank's total liquid working capacity or the scum layer is more than 4 inches thick.
 5. The tanks shall be pumped by a properly permitted septage management firm, and the septage handled in accordance with 15A NCAC 13B .0800.
 6. The ORC shall notify the LHD and system owner in writing whenever repairs are indicated. All maintenance activities shall also be recorded in the ORC reports provided to the LHD.
- H. Reporting
1. The ORC shall provide a completed written report to the system owner and the LHD within 30 days of each inspection. At a minimum, this report shall specify:
 - a. The date and time of inspection,

- b. System operating conditions observed according to Section VI.E,
- c. System operating conditions measured according to Section VI.E and VI.F,
- d. Results from any laboratory analysis of any influent and effluent samples,
- e. Maintenance activities performed since the last inspection report,
- f. An assessment of overall system performance,
- g. A list of any improvements or maintenance needed,
- h. A determination of whether the system is malfunctioning, and the specific nature of the malfunction,
- i. Any changes made in system settings, based on recommendations of the manufacturer, and
- j. A summary report of data retrieved from the VeriComm or TCOMM panel verifying actual flow and operating conditions.

VII. Responsibilities and Permitting Procedures

- A. Prior to the installation of an AdvanTex Treatment system at a site, the owner or owner's agent shall fill out an application at the LHD for the proposed use of this system. The LHD shall issue an Improvement Permit or an Authorization to Construct or amend a previously issued Authorization to Construct allowing for the use of an AdvanTex Treatment system.
- B. The Improvement Permit and Authorization to Construct shall contain all conditions the site approval is based upon, including the proposed use of the Innovative system. The operation permit will include all conditions as specified in the Improvement Permit and Authorization to Construct.
- C. When a special site evaluation is required pursuant to Rule .1970(p)(1) or a drip approval, an evaluation and written, sealed report from a Licensed Soil Scientist regarding the site shall be provided to the LHD. The report shall contain the information specified in Rule .1970(p)(2) and "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs". The LHD may request the assistance of their Regional Soil Scientist in evaluating this report prior to Improvement Permit issuance.
- D. The AdvanTex Treatment system shall be designed by one of the following: an Orenco Systems, Inc. authorized designer or a North Carolina Professional Engineer.
- E. Prior to the issuance of an Authorization to Construct for an AdvanTex Treatment system, a design submittal prepared by an authorized designer or North Carolina Professional Engineer shall be submitted for review and approval by the LHD. The design submittal shall include the information specified in "Requirements for Submittals of Soil Reports and Pretreatment and/or Dispersal System Designs".
- F. A North Carolina Professional Engineer is required for all systems exceeding 1,000 gpd or as otherwise required for a drip system. All design submittals shall be accompanied by a letter from Orenco Systems Inc. or its North Carolina authorized representative.
- G. It is recommended that local authorized environmental health practitioners attend a design training session offered by the manufacturer/authorized representative prior to permitting the system. Also, at the request of the LHD, a Regional Engineer will review the design.

- H. The Orenco Systems, Inc. authorized installer and authorized designer must certify in writing that the system was installed in accordance with the approved design prior to Operation Permit issuance.
- I. A North Carolina Professional Engineer shall certify in writing that a system required to be designed by an engineer was installed in accordance with the approved plans and specifications prior to Operation Permit issuance.
- J. For sites required to be evaluated by a Licensed Soil Scientist or Professional Geologist (see Section VII.C), the health department may specify as a condition on the Improvement Permit and Authorization to Construct that a Licensed Soil Scientist or Professional Geologist oversee critical phases of the drainfield installation and certify in writing that the installation was in accordance with their specified site/installation requirements prior to the Operation Permit issuance.
- K. The ORC shall be present during the final inspection of the system prior to the issuance of the operation permit. The ORC shall be certified both as a NC Subsurface Operator and an authorized AdvanTex Treatment system Operator.
- L. On an annual basis, Orenco Systems Inc., shall provide a report to the On-Site Water Protection Section including the number and location of new system installations during the previous year, and effluent data and operator reports for each operational AdvanTex Treatment system installed in North Carolina under this Innovative Approval. These reports shall provide information to the Department based upon the monitoring data and observations made from the Innovative systems installed pursuant to this Approval. This should include an assessment of system performance in relation to the established treatment performance standards; an assessment of physical and chemical properties of the materials used to construct the system, in terms of strength, durability, and chemical resistance to loads and conditions experienced; recommended areas of applicability for the system; and any conditions and limitations related to the use of the system.

VIII. Repair of Systems

The provisions of 15A NCAC 18A .1961 (c) shall govern the use of the AdvanTex Treatment system for repairs to existing malfunctioning wastewater systems.

Approved By: _____ Date: _____