

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

CONTROLLED DEMONSTRATION WASTEWATER SYSTEM APPROVAL
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CONTROLLED DEMONSTRATION NO. CDWS 2013-01

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For: Biotube[®] ProPak[™] Pump Package Effluent Pumping Systems for Use in Combined
Septic/Pump Tanks

Approval Date: October 31, 2013

In accordance with General Statute 130A-343 and 15A NCAC 18A .1969, a proposal by Orenco Systems, Inc., Sutherlin, OR for approval of the Biotube[®] ProPak[™] Pump Package for use in combined septic/pump tanks has been reviewed and the system has been found to meet the standards of a Controlled Demonstration system when all of the following conditions are met.

I. General

- A. Scope of this Controlled Demonstration Approval includes:
 - 1. Use, design, and construction requirements for the Biotube[®] ProPak[™] Pump Package system.
 - 2. Operation, maintenance, and monitoring of the Biotube[®] ProPak[™] Pump Package system.
 - 3. Proposal for evaluation of this Controlled Demonstration system.

- B. This Controlled Demonstration is limited to 50 residential systems with daily design flows up to 720 gallons per day (six bedrooms). The intent of this Controlled Demonstration is to gain field experience sufficient to qualify this system for Innovative Approval, pursuant to Rule .1969(g).

II. System Description

- A. This Controlled Demonstration system approval is for a septic tank effluent pumping system that includes a pump vault with associated pumping equipment, placed in the outlet end of a two-compartment septic/pump tank with liquid levels hydraulically shared between the two compartments.

- B. The pump vault is equipped with internal effluent filter cartridges that protect downstream treatment components including the soil absorption system, by preventing solids larger than 1/16-th inch from leaving the tank.
- C. The approved pumping systems include the following components:
- Pump vault with Orenco Biotube filter cartridges
 - Orenco 4” turbine “high head” effluent pump with stainless steel motor parts
 - Float switch assembly
 - Control panel
 - Discharge plumbing assembly
 - External splice box
- D. The filter cartridges are constructed of an array of small-diameter filter tubes, a design that maximizes the filter surface area to volume ratio. The filter tube array is mounted between end pieces made of PVC. The filter tubes are a meshwork design (not slotted), constructed of polypropylene. To comply with G.S.130A-335.1(a)(2), filter cartridges for systems permitted under this approval shall be constructed with openings approximately 1/16-inch in diameter.
- E. Biotube ProPak pump packages feature a molded polyethylene Biotube Pump Vault Unit (PVU) that houses the 4” turbine effluent pump, and contains a Biotube filter cartridge, float switch assembly, and discharge plumbing assembly. The pump vault is designed so that the filter cartridge can be removed for cleaning without pulling the pump or vault out of the tank. Effluent enters through inlet holes around the perimeter of the PVU, then flows through the filter cartridge and down through the vault base to the pump, which resides in an external flow inducer compartment molded into the PVU. The PVU is suspended from the tank access opening on PVC support pipes, or may rest on the bottom of the tank depending on the tank dimensions.
- F. For this Controlled Demonstration, each Biotube Propak pump vault will be equipped with a 12-inch diameter, 18-inch tall Biotube filter cartridge providing 14.5 ft² of total filter surface area and 4.4 ft² of open flow area.
- G. Biotube filter cartridges have a flow area equal to approximately 30 percent of the total filter surface area. The filter flow area is defined as the combined area of all the openings in the filter surface.
- H. The manufacturer shall warranty the pump against material and workmanship defects for a period of at least 5 (five) years.

III. Siting Criteria

The Orenco Biotube® ProPak™ Pump Package Effluent Pumping System and associated drainfields shall be sited and sized in accordance with the 15A NCAC 18A .1900.

IV. System Sizing

The system sizing criteria shall be based upon the long term acceptance rate specified in the appropriate portion of the rules or Innovative and Experimental approval for the type of ground absorption system to be used.

V. Special Site Evaluation

A special site evaluation is not required for the system unless a requirement of an Innovative and Experimental approval for the type of ground absorption system to be used.

VI. Design Criteria

- A. The Controlled Demonstration shall be limited to residential systems with a maximum of 6 bedrooms (design flow of 720 gallons per day).
- B. Septic/pump tanks in which effluent pumping systems are installed pursuant to this Controlled Demonstration approval shall be tanks that have been approved by the Department for use as septic tanks pursuant to 15A NCAC 18A.1953, and shall comply with minimum standards for design and construction of septic tanks pursuant to Rule .1954, except that an effluent filter shall not be required because the pump vault filter cartridge is intended to provide an equivalent function. A list of approved tank manufacturers and models selected and approved by Orenco for use under this Controlled Demonstration approval is incorporated as an attachment to this approval.
- C. The following minimum tank capacities shall apply:
 1. No tank shall be used that has an approved nominal septic tank capacity less than 1,500 gallons. (The nominal septic tank capacity is specified by the tank manufacturer, and typically corresponds to the approximate liquid volume when the tank is used as a conventional septic tank with gravity discharge.)
 2. A minimum approved nominal septic tank capacity of 2,000 gallons shall be used for any system designed for residences with 5 or 6 bedrooms, or with 4 bedrooms in Group IV soils with a Long Term Acceptance Rate (LTAR) of less than 0.3 gpd/ft² for conventional systems, less than 0.25 gpd/ft² for conventional systems with 25% drainfield area reduction, less than 0.3 gpd/ft² for conventional systems with 50% drainfield area reduction using T&J panels, or less than 0.2 gpd/ft² for any low-pressure pipe (LPP) distribution system.
 3. A minimum of 24 hours of emergency storage capacity in the septic/pump tank is required. The available freeboard space in both compartments of the tank (from the high-level alarm activation level up to the tank ceiling) shall be considered emergency storage space. Additional emergency storage may be needed in situations where operator response time may be more than 12 hours.
 4. The minimum liquid capacity of the septic/pump tank (defined as the combined volume of both compartments below the pump OFF level) shall meet or exceed the requirements for septic tanks as required in 15A NCAC 18A.1952(b).
 5. In addition to the above specified minimum emergency storage and minimum liquid capacities, the tank shall provide sufficient additional capacity to contain the minimum dose volumes per Rule .1952(a), or Rule .1957(a)(6)(B) for low-pressure pipe systems.
- D. The pump vault inlet holes shall be positioned in the clear zone (typically 60-80% of the minimum liquid level).
- E. The maximum drawdown during a dosing event shall not exceed 20% of the tank's liquid capacity.

- F. The pump controls shall be set so that the minimum liquid (pump-off) level is at least eight inches above the top of the flow-through ports in the tank partition, to minimize any potential for carryover of scum to the second compartment.
- G. Two watertight, approved manholes or risers, with secure cover, shall be provided in the tank top, one at the tank inlet and one providing access to the pump compartment. The tank inlet opening shall be a minimum of 17 inches in diameter or 15 inches by 15 inches; the pump tank access opening shall be a minimum of 21 inches by 21 inches or 24 inches in diameter. The openings shall extend to at least six inches above finished grade. The outlet-end manhole shall be located to allow maintenance of the pump vault.
- H. All systems must be equipped with a pump cycle counter, pump elapsed time meter, and high water alarm event counter.
- I. For LPP dispersal systems, the system shall conform to all design requirements of 15A NCAC 18A .1957(a) except that lateral lines may use 1/8-inch diameter orifices throughout the pressure distribution network. In addition, for LPP systems the design pump flow rate shall be sufficient to deliver at least 5 (five) feet of static pressure head at the distal end of all lateral lines. LPP system orifices shall be protected by orifice shields or other means such as sleeving.
- J. A reserve area will be set aside with sufficient space for placement of a separate pump tank if the Controlled Demonstration system must be replaced with a conventional two-tank system.
- K. The manufacturer will provide design guidance to aid designers in tank sizing, float settings, pump vault selection, and LPP system design to assure equal distribution of effluent in the drainfield.

VII. Installation and Testing

- A. A pre-construction conference shall be required to be attended by the system designer, Orenco manufacturer's representative, Orenco certified installer, and local health department (LHD), prior to beginning construction of the Biotube[®] ProPak[™] Pump Package effluent pumping system.
- B. All Biotube[®] ProPak[™] Pump Package effluent pumping system 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 Biotube[®] ProPak[™] Pump Package effluent pumping system and components used with, but not manufactured by Orenco Systems, Inc., shall be installed in accordance with all applicable regulations and manufacturer instructions.
- C. All individuals/companies installing Biotube[®] ProPak[™] Pump Package effluent pumping system shall be in possession of all necessary permits and licenses before attempting any portion of a new or repair installation. The company/individual must at a minimum be a Level II installer (or higher if required based on the ground absorption system being used, for example an LPP requires a Level III installer) and Orenco Systems, Inc. certified.

- D. Watertightness of the tanks shall be tested by either of the following protocols: 24-hour hydrostatic test or a vacuum test.
1. Hydrostatic Test^{1, 2}
 - a. Temporarily seal the inlet and outlet pipes.
 - b. Fill tank with clean water to a point at least two inches above the pipe connections or the seam between the tank and the riser, whichever is highest.
 - c. Measure the water level.
 - d. Allow the tank to sit for 24 hours.
 - e. Re-measure the water level.
 - f. If the water level change is ½-inch or less or one percent of the liquid tank capacity, the tank passes the leak test.
 - g. If the water level change is greater than ½-inch, any visible leaks can be repaired and the tank may be topped off with water and allowed to sit for a minimum of one hour.
 - h. The tank passes the leak test if there are no visible leaks (flowing water or dripping in a steady stream) and no measureable drop in water level after one hour. Otherwise, the tank fails the leak test.
 2. Vacuum Test³
 - a. Temporarily seal the inlet and outlet pipes.
 - b. A vacuum of four (4) inches of mercury should be pulled on the tank and held for five (5) minutes.
 - c. During the testing, the tank manufacturer or their representative can seal the tank if it is found to be leaking.
 - d. If the tank is repaired, the vacuum must be brought back up to four inches and held for five minutes.
- E. 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.
- F. Prior to Operation Permit issuance, the designer of record and the manufacturer or manufacturer's representative shall provide an acceptance letter to the LHD verifying satisfactory installation and start-up measures.

VIII. Operation, Maintenance, Monitoring, Sampling, Evaluation, and Reporting

- A. Biotube[®] ProPak[™] Pump Package effluent pumping systems shall be classified, at a minimum, as a Type IIIb system in accordance with Table V(a) of Rule .1961(b). Management and inspection shall be in accordance with Rule .1961.
- B. All Biotube[®] ProPak[™] Pump Package effluent pumping systems shall be maintained in accordance with manufacturer's recommendations. The septic tank will be pumped as needed and in accordance with the Orenco Systems, Inc. operation and maintenance instructions. 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 four inches thick.

¹ Victor D'Amato and Ishwar Devkota, *Development of Prefabricated Septic and Pump Tank Construction and Installation Standards for North Carolina*.

² National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

³ National Precast Concrete Association, *Best Practices Manual Precast Concrete On-Site Wastewater Tanks*, Second Edition, October 2005, 24.

C. Evaluation Protocol

1. The manufacturer shall enter into a contract for an evaluation of the performance of the controlled demonstration wastewater system with an independent laboratory, consultant, or other entity (together hereinafter referred to as "independent evaluator") that has expertise in the evaluation of wastewater systems and that is approved by the Department. The performance evaluation shall consist of two basis phases: data collection and a final evaluation report. The manufacturer may elect to use one or more separate independent evaluators for quality assurance of data collection (including sampling and site/system monitoring) and lab analysis, subject to Department approval. In such case the independent evaluator compiling the final report shall verify the quality assurance and proper methodology for all data collected and analyzed as part of this study. For purposes of this study, quality assurance during the collection of site and system data requires reasonably thorough documentation (such as written checklists and date stamped photography) and the presence of either an independent evaluator or a state or local regulatory official. Qualified system installers and operators in responsible charge (ORCs) may qualify as independent evaluators for purposes of data collection, subject to quality assurance requirements and Department approval.
2. The first 39 installed systems shall be evaluated prior to Orenco applying to the On-Site Water Protection Branch for reclassification to Innovative Approval. The 39 test systems must include at least 14 systems with delivery rates less than 20 gpm, 14 systems with delivery rates between 20 and 30 gpm, and 10 systems with delivery rates between 31 and 40 gpm. Up to 11 additional systems may be installed as reserve sites, to allow for the possibility that some systems may, by mutual agreement between Orenco and the On-Site Water Protection Branch, be deemed unsuitable as test sites (for example, due to atypical usage or other anomalies). No more than 3 of the reserve units installed may have delivery rates greater than 30 gpm, unless authorized by the On-Site Water Protection Branch.
3. The Controlled Demonstration study evaluation period shall be determined by the startup date of the 39th primary test system installed and shall run for an additional 12 months from that date, so that every primary test system is operational for a minimum of 12 months. In the event that any reserve installation is required to be included as a substitute for a primary system, the 12 month minimum shall not apply, but any reserve installation shall be operational for a minimum of 3 months before sampling.
4. The installer shall obtain written permission from the system owner prior to installation, to allow access to the system for sampling and monitoring purposes. At startup, the installer and independent evaluator shall record the startup date, and pump elapsed time and pump cycle counts, shall conduct a drawdown test to measure the pump delivery rate, and shall measure residual head at the distal end of each lateral or at the pressure manifold.

D. Sampling and Evaluation Requirements

1. The independent evaluator responsible for final reporting and On-Site Water Protection Branch shall be notified in advance of all proposed sampling site locations and date.
2. All systems installed subject to this Controlled Demonstration approval shall be sampled at least once and analyzed for BOD₅ and Total Suspended Solids (TSS). Samples will be pump vault effluent samples. Samples will be collected by an independent licensed operator in consultation with the independent evaluator designated by Orenco with the approval of the On-Site Water Protection Branch.
3. Samples will be taken after the system has been in operation and use for at least 12 months. In the event that any reserve installation is required to be included as a substitute for a primary system, the 12 month minimum shall not apply. The reserve installation shall be operational for at least three months before sampling.

4. Chain of custody shall be documented for all samples, and analytical results will be reported to the On-Site Water Protection Branch.
5. Effluent samples shall be pump vault effluent collected from a sampling tap on the drainfield force main. The preferred location of the tap is in the pump tank discharge assembly. The effluent sample shall be taken after the pump has run for 30 continuous seconds through the discharge assembly. The sampling tap must also be purged prior to the sample being taken.
6. The licensed operator will record the pump elapsed time meter, pump cycle counter, and high water alarm event counter readings at the time of sample collection.
7. A total of three visits shall be made to each site of the 39 sites evaluated: at start-up, after the system has been in use for at least three months but no more than nine months, and the final visit after the system has been in operation for at least 12 months.
8. When the samples are collected during the interim visit and at the conclusion of the 1-year evaluation period, the licensed operator designated in paragraph D.2 above will visit each installed system and take the following actions:
 - a. Measure and record the static pressure head at the distal end of LPP laterals or at the pressure manifold as applicable.
 - b. Measure and record sludge and scum levels in each compartment of the septic/pump tank.
 - c. Determine whether the filter cartridges need cleaning. The determination will be made by allowing the pump to run for about 30 seconds, then observing the difference between liquid levels inside and outside the pump vault. If the difference is more than 2 (two) inches, the ORC will clean the filter cartridges. The ORC will record the observations and whether the filter cartridges required cleaning.
 - d. Conduct a drawdown test to verify that the pump delivery rate is approximately the same as when originally measured at startup.
 - e. Record the pump elapsed time meter, pump cycle counter, and high water alarm event counter readings at the beginning (before activating the pump) and at the conclusion of the site visit.
 - f. Record any and all maintenance performed during the visit.
 - g. If a water meter is present, take water meter readings. A water meter is not required to be installed for this system but is strongly encouraged.
 - h. Fill out the Orenco ProPak Inspection Form.
9. The BOD₅ and TSS data from the 39 test sites will be evaluated by averaging the results and comparing with a "control" data set obtained from the On-Site Water Protection Branch, representing effluent data from septic tanks installed in North Carolina, equipped with effluent filters. The Controlled Demonstration testing will be accepted as satisfactory if the average of the collected sampling data does not exceed the control data mean plus 20% (307 mg/L for BOD and 58.6 mg/L for TSS).

E. Reporting Requirements

1. Interim reports are due by January 31 and July 31 of each year, and shall include all data gathered through December 31 and June 30 of the previous six-month period respectively. These reports shall be provided to the Department based upon the monitoring data and observations made from the Controlled Demonstration systems installed pursuant to this approval.
2. A final written evaluation report summarizing the sampling and monitoring results shall be developed by an independent evaluator, approved by both the North Carolina On-Site Water Protection Branch and Orenco Systems, and submitted along with any recommendations for changes as identified during the demonstration period. Copies of all field reports shall be submitted with the final report.

IX. Responsibilities and Permitting

- A. Orenco will make available a computer-based design application (ProPak Select Design Tool for North Carolina). Program will be modified to include recommendations made by the On-Site Water Protection Branch.
- B. Each system design shall be reviewed and accepted by an Orenco-authorized designer, who has been trained by Orenco to use the ProPak Select Design Tool for North Carolina, and authorized by Orenco in writing on the basis of such training.
- C. Orenco shall review and approve each system's tank and overall design on a project specific basis during this Controlled-Demonstration. Also, at the request of the LHD, a Regional Engineer will review the design.
- D. Orenco shall identify qualified service persons for each region where systems are installed and provide contact information to homeowners to minimize response time for service calls.
- E. Prior to the installation of a Biotube[®] ProPak[™] Pump Package effluent pumping systems 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 Authorization to Construct or amend a previously issued Authorization to Construct allowing for the use of a Biotube[®] ProPak[™] Pump Package effluent pumping systems.
- F. The Improvement Permit and Authorization to Construct shall contain all conditions the site approval is based upon, including the proposed use of the Controlled Demonstration system. The operation permit will include all conditions specified in the Improvement Permit and Authorization to Construct.
- G. Training by the manufacturer shall be provided, upon request, to local health departments to facilitate proper review, inspection, and permitting of these systems. 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.

X. Repair of Systems

The provisions of 15A NCAC 18A .1961(l) shall govern the use of Biotube[®] ProPak[™] Pump Package Effluent pumping systems for repairs to existing malfunctioning wastewater systems.

Approved by: _____ Date: _____