# WASTEWATER TECHNOLOGY

**NSF/ANSI Standard 245 - *Wastewater Treatment Systems – Nitrogen Reduction***

**Final Report:**

**Orenco Systems, Inc**
**AX20RTN-UV**
**14/03/055/0030**

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# Evaluation Report:
# AX20RTN-UV - Wastewater Treatment System

## Under the provisions of NSF/ANSI Standard 245
## Wastewater Treatment Systems – Nitrogen Reduction

**May 2015**

## EXECUTIVE SUMMARY

Testing of the Orenco Systems, Inc AX20RTN-UV was conducted under the provisions of NSF/ANSI Standard 245 for Residential Wastewater Treatment Systems (April 2013 revision). NSF/ANSI Standard 245 was developed by the NSF Joint Committee on Wastewater Technology.

The performance evaluation was conducted at the Massachusetts Alternative Septic System Test Center (MASSTC) located at Otis Air National Guard Base in Bourne, Massachusetts. Sanitary sewage from the base residential housing was used for the testing. The evaluation consisted of sixteen weeks of dosing at design flow, seven and one half weeks of stress testing and an additional two and one half weeks of dosing at design flow. Sampling started in the summer and continued through fall and winter, covering a range of operating temperatures.

Over the course of the evaluation, the average influent Total Nitrogen was 52 mg/L, ranging between 35.5 and 75.1 mg/L. The AX20RTN-UV produced an average effluent Total Nitrogen of 24 mg/L, which resulted in a 55% reduction in the influent Total Nitrogen.

The AX20RTN-UV produced an effluent that successfully met the performance requirements established by NSF/ANSI Standard 40 for Class I effluent:

> The maximum 7-day arithmetic mean was 14 mg/L for $CBOD_5$ and 12 mg/L for total suspended solids, both below the allowed maximums of 40 and 45 mg/L, respectively. The maximum 30-day arithmetic mean was 13 mg/L for $CBOD_5$ and 7 mg/L for total suspended solids, both below the allowed maximums of 25 mg/L and 30 mg/L, respectively.

The effluent pH during the entire evaluation ranged between 6.1 and 7.5, within the required range of 6.0 to 9.0. The AX20TRN-UV met the requirements for noise levels (less than 60 dbA at a distance of 20 feet), color, threshold odor, oily film and foam.

At the request of Orenco Fecal Coliform was tested on the influent and effluent throughout the 6 month test period. Over the course of the evaluation, the average influent Fecal Coliform concentration was 9.18E+06 MPN per 100 ml, ranging between 3.60E+05 and 7.80E+07. The average effluent Fecal Coliform concentration was 13 MPN per 100 ml, ranging between <2 and 1400. Fecal Coliform is not included in any NSF/ANSI Standards, however this data is reported for informational purposes only.

# PREFACE

Performance evaluation of nitrogen reduction for residential wastewater treatment systems is achieved within the provisions of NSF/ANSI Standard 245: Wastewater Treatment Systems – Nitrogen Reduction (April 2013), prepared by the NSF Joint Committee on Wastewater Technology and adopted by the NSF Board of Trustees.

Conformance with the Standard is recognized by issuance of the NSF Mark. This is not to be construed as an approval of the equipment, but a certification of the data provided by the test and an indication of compliance with the requirements expressed in the Standard.

Systems conforming to Standard 245 are classified as having met the requirements of the Standard. Permission to use the NSF Mark is granted only after the equipment has been tested and found to perform satisfactorily, and all other requirements of the Standard have been satisfied. Continued use of the Mark is dependent upon evidence of compliance with the Standard and NSF General and Program Specific Policies, as determined by periodic reinspection of the equipment at the factory, distributors and reports from the field.

NSF Standard 245 requires the testing laboratory to provide the manufacturer of a residential wastewater treatment system a report including significant data and appropriate commentary relative to the performance evaluation of the plant. NSF policy specifies provision of performance evaluation reports to appropriate state regulatory agencies at publication. Subsequent direct distribution of the report by NSF is made only at the specific request of or by permission of the manufacturer.

The following report contains results of the entire testing program, a description of the plant, its operation and key process control equipment, and a narrative summary of the test program, including test location, procedures and significant occurrences. The plant represented herein reflects the equipment authorized to bear the NSF Mark.

## CERTIFICATION

NSF International has determined by performance evaluation under the provisions of NSF/ANSI Standard 245 (revised April 2013) that the AX20RTN-UV manufactured by Orenco Systems, has fulfilled the requirements of NSF/ANSI Standard 245. The AX20RTN-UV has therefore been authorized to bear the NSF Mark so long as Orenco continues to meet the requirements of Standard 245 and NSF General and Program Specific Policies.

General performance evaluation and stress tests were performed at the Wastewater Technology Site located at Massachusetts Alternative Septic System Test Center located at Otis Air National Guard Base in Bourne, Massachusetts. The raw wastewater used in the test was sanitary sewage from the base residential housing. The characteristics of the wastewater during the test are included in the tabulated data of this report.

The observations and analyses included in this report are certified to be correct and true copies of the data secured during the performance tests conducted by NSF on the wastewater treatment system described herein. The manufacturer has agreed to present the data in this certification in its entirety whenever it is used in advertising, prospectuses, bids or similar uses.

Thomas J. Bruursema
General Manager
Wastewater Treatment Unit Certification

Thomas G Stevens

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Technical Manager
Federal Programs

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## 1.0 PROCESS DESCRIPTION

The Orenco Systems, Inc. AdvanTex® AX20RTN-UV is an attached growth multiple-pass packed bed reactor.

Raw sewage enters a primary chamber where it separates into three zones: a scum layer, a clear layer, and a sludge layer. Primary-treated effluent from the clear zone passes on to a recirc-chamber/compartment where it is blended with filtrate and then recirculated back to the treatment unit through a pressurized distribution network. A portion of the blended effluent is recirculated back to the primary septic tank. The remainder of the blended effluent is periodically applied in short controlled doses to the surface of the packed bed media and allowed to percolate down through the textile media. During periods of no forward flow, effluent from the dosing chamber flows back through a recirculating return valve into the recirculation portion of the AX20RTN-UV unit.

In the packed bed reactor, microorganisms break down and utilize wastewater contaminants for growth and reproduction of new organisms. The organic matter is solubilized by microbial extracellular enzymes so that it may be absorbed through the microbial wall and utilized as a food source. The organisms primarily responsible for the degradation of the organic, and some inorganic matter, are facultative microbes capable of functioning in aerobic and anaerobic conditions. As such, the transfer of oxygen into the wastewater as it is applied and percolates down through the media is critical to the treatment process, thus, a passive ventilation system is configured to allow air flow into the interior of the packed bed reactor pod.

During the testing for NSF/ANSI Standard 40, Orenco elected to additionally test a UV disinfection device in order to comply with the state of Washington's DOH requirements for disinfection prior to final dispersal. For this supplemental testing, the treated effluent from the AX20RTN unit passed through an AXUV Orenco disinfection device located in a 24" diameter pump basin for final discharge. The AXUV unit was located in an external pump basin to facilitate sampling; it can also be located within the AX20RTN-UV unit itself.

## 2.0 PERFORMANCE EVALUATION

### 2.1 Description of Plant Evaluated

The AdvanTex AX20RTN-UV tested in this evaluation has a rated capacity of 600 gallons per day (gpd). Specifications and drawings are included in Appendix A.

Raw sewage enters a septic tank (1200 gal working volume) that provides 48 hours of retention at the rated capacity. This tank provides primary treatment; settleable solids accumulate on the bottom and floatable solids accumulate on the surface. Effluent from the clear layer flows through an effluent filter into the recirculation compartment of the AX20RTN-UV tank (800 gal volume), which provides 24 hours retention at the rated capacity. A pump located in a flow inducer in the discharge chamber transfers effluent at a predetermined frequency from the recirculation compartment to a spray-nozzle network that distributes the liquid over the textile media inside the AX20RTN-UV unit. Effluent percolates down through the media and into the recirc and discharge portions of the AX20RTN-UV unit.

## 2.2 Test Protocol

Section 8 of NSF/ANSI Standard 40 protocol, "Performance Testing and Evaluation", is included in Appendix B. Start up of the plant was accomplished by filling the plant with 2/3 water and 1/3 raw sewage. The plant was then dosed at the design loading rate of 600 gpd as follows:

6 a.m. to 9 a.m. - 35 percent of daily rated capacity (210 gallons)
11 a.m. to 2 p.m. - 25 percent of daily rated capacity (150 gallons)
5 p.m. to 8 p.m. - 40 percent of daily rated capacity (240 gallons)

Dosing was accomplished by opening an electrically actuated valve to feed wastewater to the test plant. Ten gallon doses were spread uniformly over each dosing period to comprise the total dose volume for the period.

After a start up period (up to three weeks at the manufacturer's discretion), the plant is subjected to the following loading sequence:

| | | |
|---|---|---|
| Design loading | - | 16 weeks |
| Stress loading | - | 7.5 weeks |
| Design loading | - | 2.5 weeks |

During the design loading periods, flow proportioned 24-hour composite influent and effluent samples are collected three times per week. The influent samples are analyzed for five-day biochemical oxygen demand ($BOD_5$), total suspended solids (TSS), alkalinity, total Kjeldahl nitrogen (TKN), and ammonia-N. The effluent samples are analyzed for carbonaceous five-day biochemical oxygen demand ($CBOD_5$), TSS, alkalinity, TKN, ammonia-N and nitrite/nitrate-N concentrations. Onsite determinations of the influent and effluent pH, temperature and dissolved oxygen are made five days per week on grab samples.

Stress testing is designed to evaluate how the plant performs under non-ideal conditions, including varied hydraulic loadings and electrical or system failure. The test sequence includes (1) Wash Day stress, (2) Working Parent stress, (3) Power/Equipment Failure stress, and (4) Vacation stress. Detailed descriptions of the stress sequences are shown in Appendix B.

During the stress test sequences, 24-hour composite samples are collected before and after each stress dosing pattern. The analyses and on-site determinations completed on the samples are the same as described for the design load testing. Each stress is followed by seven consecutive days of dosing at design rated capacity before beginning the next stress test. Sample collection is initiated twenty-four hours after completion of Wash Day, Working Parent, and Vacation stresses, and beginning 48 hours after completion of the Power/Equipment Failure stress.

In order for the system to successfully pass the Standard 245 evaluation:

(1) $CBOD_5$: The average of all effluent samples shall not exceed 25 mg/L.

(2) TSS: The average of all effluent samples shall not exceed 30 mg/L.

(3) Total Nitrogen: The average total nitrogen concentration of all effluent samples shall be less than 50% of the average total nitrogen concentration of all influent samples.

(4) pH: Individual effluent values shall remain between 6.0 and 9.0 SU.

### 2.3 Test Chronology

The system was installed under the direction of the manufacturer on July 21st, 2014. The infiltration/exfiltration test, during which the entire system was tested for leaks, was completed on July 24th, 2014. The unit was filled with 2/3 fresh water and 1/3 raw sewage and dosing was initiated at the rate of 600 gallons per day beginning August 15, 2014. The test was officially started on August 18th, 2014. The stress test sequence was started on December 8th, 2014 and ended on January 20th, 2015. Testing was completed on February 13th, 2015.

## 3.0 ANALYTICAL RESULTS

### 3.1 Summary

Chemical analyses of samples collected during the evaluation were completed using the procedures in *Standard Methods for the Examination of Water and Wastewater* 21st edition. Copies of the data generated during the evaluation are included in Appendix C. Results of the chemical analyses and on-site observations and measurements made during the evaluation are summarized in Table I.

**TABLE I.** SUMMARY OF ANALYTICAL RESULTS

| | Average | Std. Dev. | Minimum | Maximum | Median | Interquartile Range |
|---|---|---|---|---|---|---|
| Biochemical Oxygen Demand (mg/L) | | | | | | |
| *Influent ($BOD_5$)* | 180 | 54 | 67 | 400 | 160 | 140 - 200 |
| *Effluent ($CBOD_5$)* | 7 | 5 | <2 | 21 | 5 | 3 - 9 |
| Total Suspended Solids (mg/L) | | | | | | |
| *Influent* | 180 | 46 | 81 | 350 | 170 | 150 -210 |
| *Effluent* | 3 | 3 | <2 | 18 | 2 | 2 - 3 |
| pH | | | | | | |
| *Influent* | - | - | 6.6 | 8.0 | 7.0 | 7.0 – 7.1 |
| *Effluent* | - | - | 6.1 | 7.5 | 6.8 | 6.6 – 6.9 |
| Temperature (°C) | | | | | | |
| *Influent* | 15 | 5 | 7 | 22 | 16 | 11 - 20 |
| *Effluent* | 16 | 6 | 6 | 25 | 16 | 11 - 22 |
| Dissolved Oxygen (mg/L) | | | | | | |
| *Effluent* | 5.2 | 1.3 | 1.7 | 8.3 | 5.2 | 4.3 – 6.1 |
| Alkalinity (mg/L) | | | | | | |
| *Influent* | 220 | 64 | 150 | 450 | 200 | 170 - 240 |
| *Effluent* | 81 | 36 | 11 | 170 | 74 | 60 - 120 |
| Total Kjeldahl Nitrogen | | | | | | |
| *Influent* | 52 | 7 | 35 | 75 | 51 | 47 – 54 |
| *Effluent* | 8.9 | 8 | <0.5 | 29 | 6.7 | 3.4 – 17 |
| Ammonia-N | | | | | | |
| *Influent* | 36 | 6 | 26 | 53 | 35 | 33 – 39 |
| *Effluent* | 7.5 | 7 | 0.5 | 23 | 5.6 | 2.4 – 12 |
| Nitrite/nitrate-N (mg/L) | | | | | | |
| *Influent* | 0.12 | 0.2 | 0.04 | 0.7 | 0.05 | 0.05 – 0.05 |
| *Effluent* | 15 | 7 | 0.4 | 25 | 17 | 6 – 20 |
| Total Nitrogen | | | | | | |
| *Influent* | 52 | 7 | 36 | 75 | 51 | 47 - 55 |
| *Effluent* | 24 | 3 | 16 | 31 | 24 | 22 - 25 |

Notes: The median is the point where half of the values are greater and half are less.
The interquartile range is the range of values about the median between the upper and lower 25 percent of all values.

Criteria for evaluating the analytical results from the testing are described in Section 8.5 of NSF/ANSI Standard 40. In completing the pass/fail determination for the data, an allowance is made for effluent TSS and $CBOD_5$ during the first month of testing. The 30- and 7-day averages during this time may not equal or exceed 1.4 times the effluent limits required for the rest of the test. This provision recognizes that an immature culture of microorganisms within the system may require additional time to achieve adequate treatment efficiency. Effluent $CBOD_5$ and TSS concentrations from the AX20RTN-UV during the first calendar month of testing were within the normal limits and did not need to use this provision.

Section 8.5.1.1 of the Standard provides guidance addressing the impact of unusual testing conditions, including sampling, dosing, or influent characteristics, on operation of a system under test. Specific data points may be excluded from 7- and 30-day average calculations where determined to have an adverse impact on performance of the system, with rationale for the exclusion to be documented in the final report. There were no such conditions during this test.

Sections 3.6 and 8.2.1 of the Standard define influent wastewater characteristics as they apply to testing under the Standard. Typical domestic wastewater is defined as having a 30-day average $BOD_5$ concentration between 100 and 300 mg/L and a 30-day average TSS concentration between 100 and 350 mg/L. The 30-day average influent remained inside this specified range for the duration of the test.

## 3.2 Biochemical Oxygen Demand

The five-day biochemical oxygen demand ($BOD_5$) and five-day carbonaceous biochemical oxygen demand ($CBOD_5$) analyses were completed using *Standard Methods for the Examination of Water and Wastewater* The results of both analyses are shown in Figure 1.

*Influent $BOD_5$:*

Individual influent $BOD_5$ concentrations ranged from 67 to 400 mg/L during the evaluation, with average concentration of 180 mg/L and a median concentration of 160 mg/L. Thirty day average concentrations ranged from 140 to 220 mg/L. The average influent $BOD_5$ delivered to the treatment unit was within the influent characteristics defined under Section 8.2.1 of NSF/ANSI Standard 245.

*Effluent $CBOD_5$:*

Effluent $CBOD_5$ concentrations ranged from <2 to 21 mg/L over the course of the evaluation, with an average concentration of 7 mg/L and a median effluent $CBOD_5$ concentration of 5 mg/L.

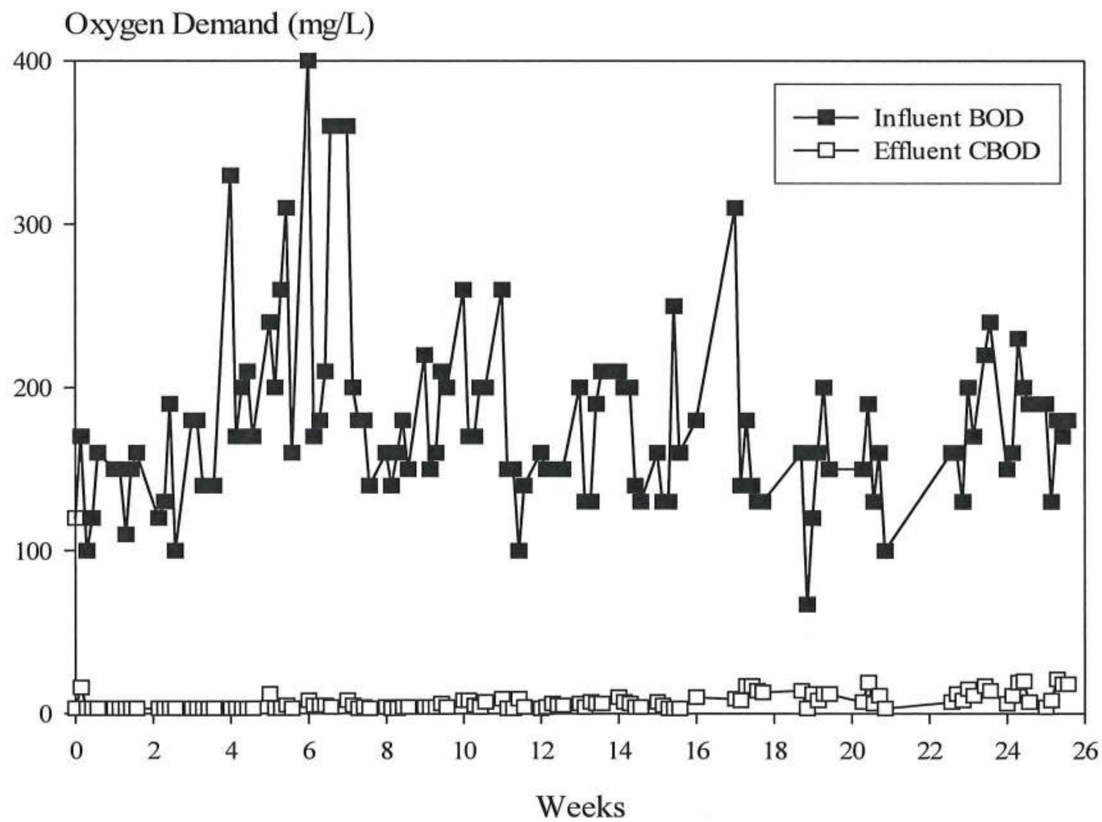

Figure 1. Biochemical Oxygen Demand

## 3.3 Total Suspended Solids

TSS analyses were completed using *Standard Methods for the Examination of Water and Wastewater* 21st edition. The TSS results over the entire evaluation are shown in Figure 2. Data from the TSS analyses are summarized in Table I.

*Influent TSS:*

The influent TSS ranged from 81 to 350 mg/L during the evaluation, with an average concentration of 180 mg/L and a median concentration of 170 mg/L. The 30-day average concentrations during the test ranged from 150 to 210 mg/L. The average influent TSS delivered to the treatment unit was within the influent characteristics defined under Section 8.2.1 of NSF/ANSI Standard 245.

*Effluent TSS:*

The effluent TSS concentration ranged from <2 to 18 mg/L during the evaluation, with an average concentration of 3 mg/L and a median concentration of 2 mg/L.

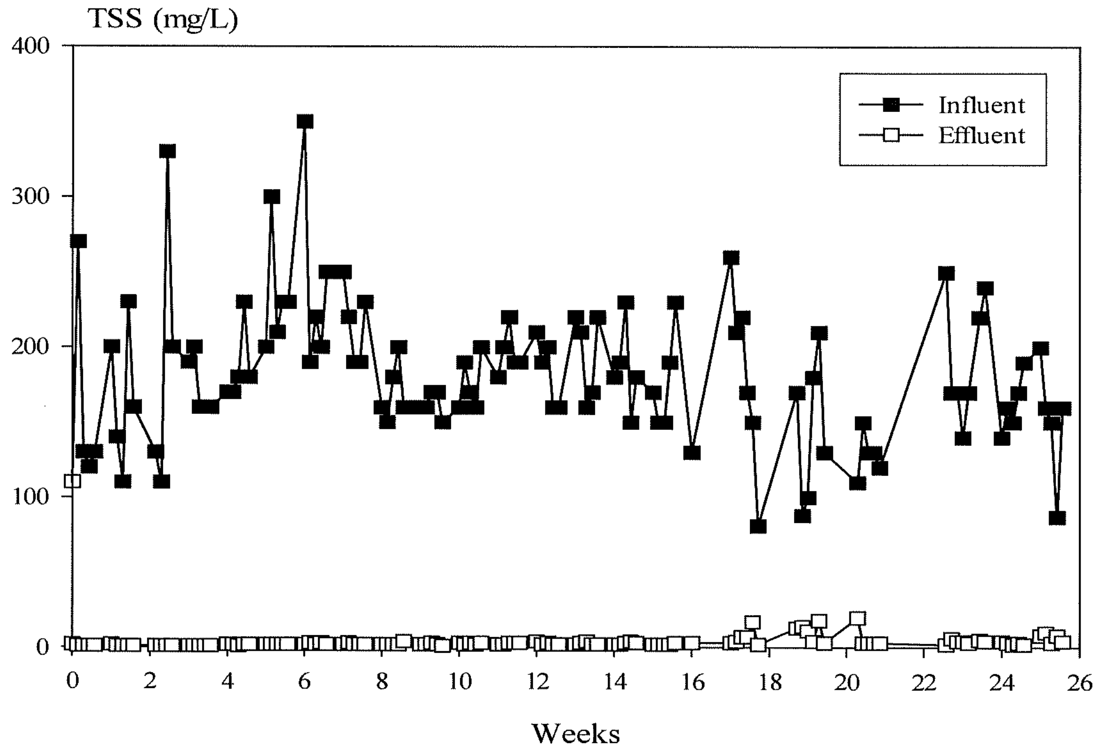

Figure 2. Total Suspended Solids

3.4 pH

Over the entire evaluation period, the influent pH ranged from 6.6 to 8.0 (median of 7.0). The effluent pH ranged from 6.1 to 7.5 during the evaluation (median of 6.8); within the 6 to 9 range required by NSF/ANSI Standard 245. The pH data for the evaluation are shown in Appendix C.

3.5 Temperature

Influent temperatures over the evaluation period ranged from 7 to 22 °C (median of 16 °C). The temperature data are shown in Appendix C. The Standard requires that the average influent temperature fall within 10 to 30 °C. The average influent temperature was within the characteristics defined under Section 8.2.1 of NSF/ANSI Standard 245.

3.6 Dissolved Oxygen

Dissolved Oxygen (DO) was measured in the effluent during the evaluation. The effluent DO ranged between 1.7 and 8.3 mg/L (median of 5.2 mg/L). All dissolved oxygen data are shown in Appendix C.

## 3.7 Alkalinity

Alkalinity analyses were completed using *Standard Methods for the Examination of Water and Wastewater* 21st edition. The alkalinity results over the entire evaluation are shown in Figure 3. The influent and effluent alkalinities were all well within the range required by the Standard, and review of the nitrogen data indicates that alkalinity was not a limiting factor for nitrification in the system.

### *Influent Alkalinity*

The influent alkalinity ranged from 150 to 450 (average of 220). The average influent alkalinity delivered to the treatment unit was greater than 175 mg/L as $CaCO_3$ required by Section 8.2.1 of NSF/ANSI Standard 245.

### *Effluent Alkalinity*

The effluent Alkalinity concentration ranged from 11 to 170 mg/L during the period when alkalinity samples were collected, with an average concentration of 81 mg/L and a median concentration of 74 mg/L.

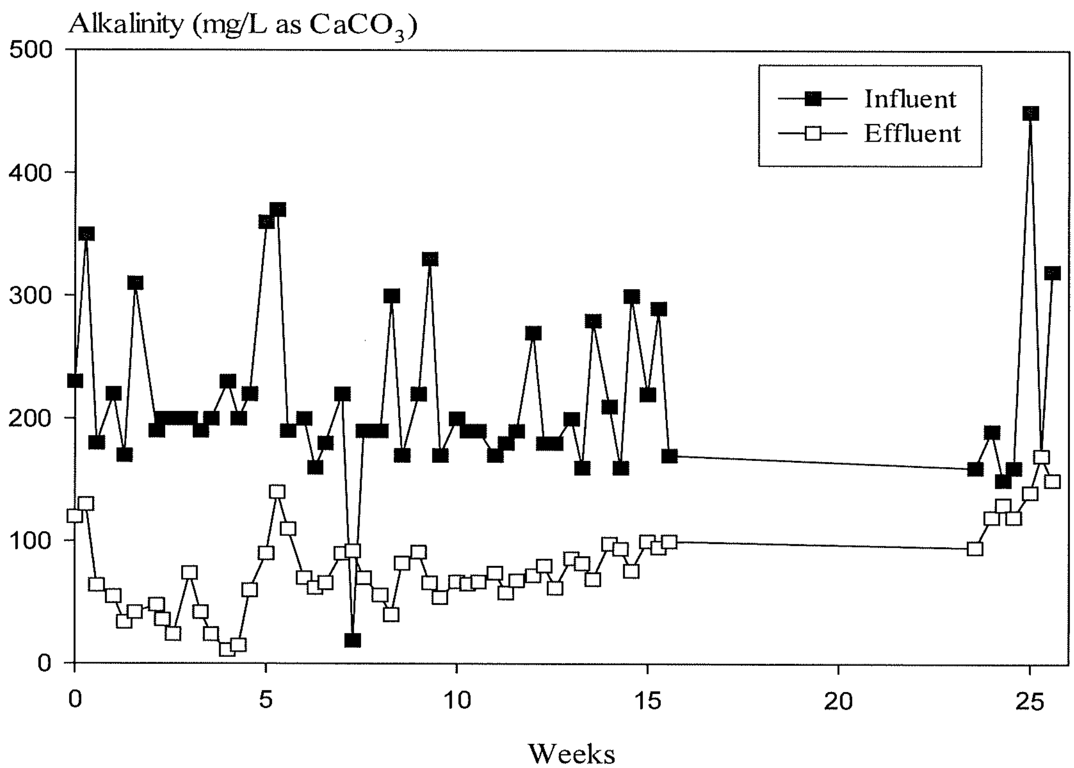


Figure 3: Alkalinity

## 3.8 Total Kjeldahl Nitrogen (TKN)

TKN analyses were completed using *Standard Methods for the Examination of Water and Wastewater* 21st edition. The TKN results over the entire evaluation are shown in Figure 4.

*Influent TKN:*

The influent TKN ranged from 35 to 75 mg/L during the evaluation, with average concentration of 52 mg/L and a median concentration of 51 mg/L. The influent TKN delivered to the treatment unit was within the influent characteristics defined under Section 8.2.1 of NSF/ANSI Standard 245.

*Effluent TKN:*

The effluent TKN concentration ranged from <0.5 to 29 mg/L during the evaluation, with an average concentration of 8.9 mg/L and a median concentration of 6.7 mg/L.

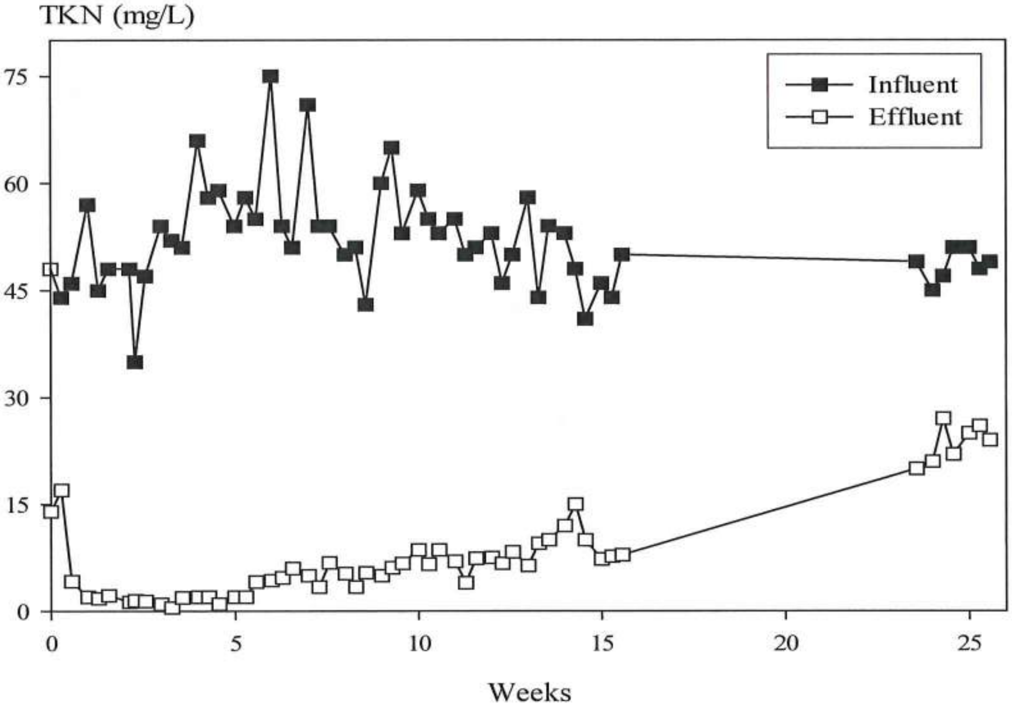


Figure 4: Total Kjeldahl Nitrogen

### 3.9 Ammonia-N

Ammonia-N analyses were completed using *Standard Methods for the Examination of Water and Wastewater* 21st edition. The Ammonia-N results over the entire evaluation are shown in Figure 5.

*Influent Ammonia-N:*

The influent Ammonia-N ranged from 26 to 53 mg/L during the evaluation, with an average concentration of 36 mg/L and a median concentration of 35 mg/L.

*Effluent Ammonia-N:*

The effluent Ammonia-N concentration ranged from 0.5 to 23 mg/L during the evaluation, with an average of 7.5 mg/L and a median concentration of 5.6 mg/L.

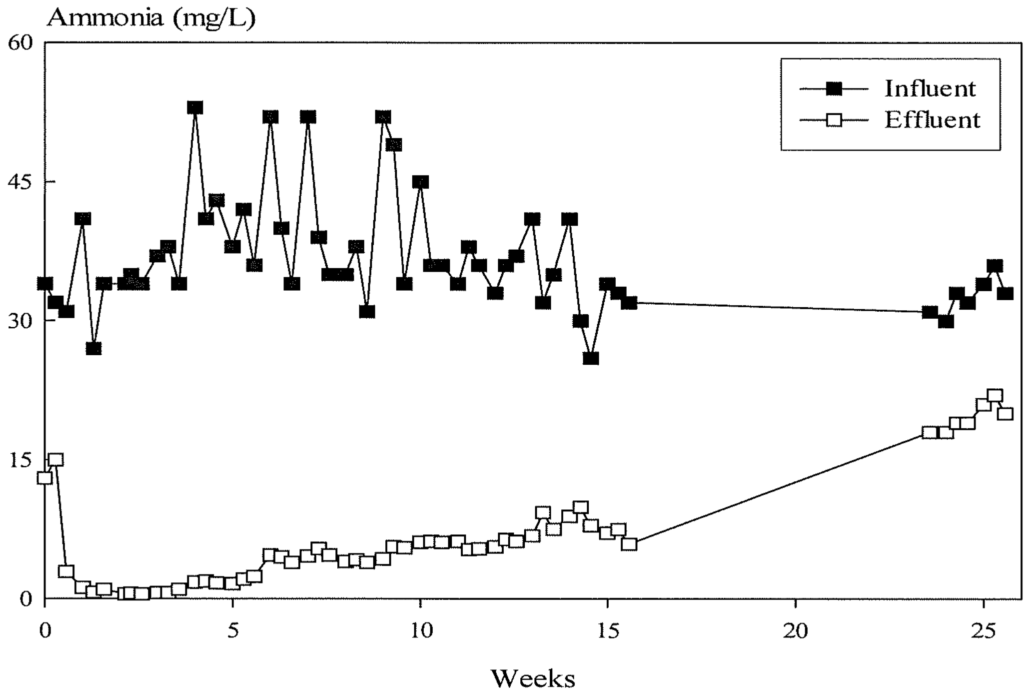

Figure 5: Ammonia

### 3.10 Nitrite/nitrate-N

Nitrite/nitrate-N analyses were completed using *Standard Methods for the Examination of Water and Wastewater* 21st edition. The Nitrite/nitrate-N results over the entire evaluation are shown in Figure 6.

*Influent Nitrite/nitrate-N:*

The influent Nitrite/nitrate-N ranged from 0.04 to 0.7 mg/L during the evaluation, with average concentration of 0.12 mg/L and a median concentration of 0.05 mg/L.

*Effluent Nitrite/nitrate-N:*

The effluent Nitrite/nitrate-N concentration ranged from 0.4 to 25 mg/L during the evaluation, with an average of 15 mg/L and a median concentration of 17 mg/L.

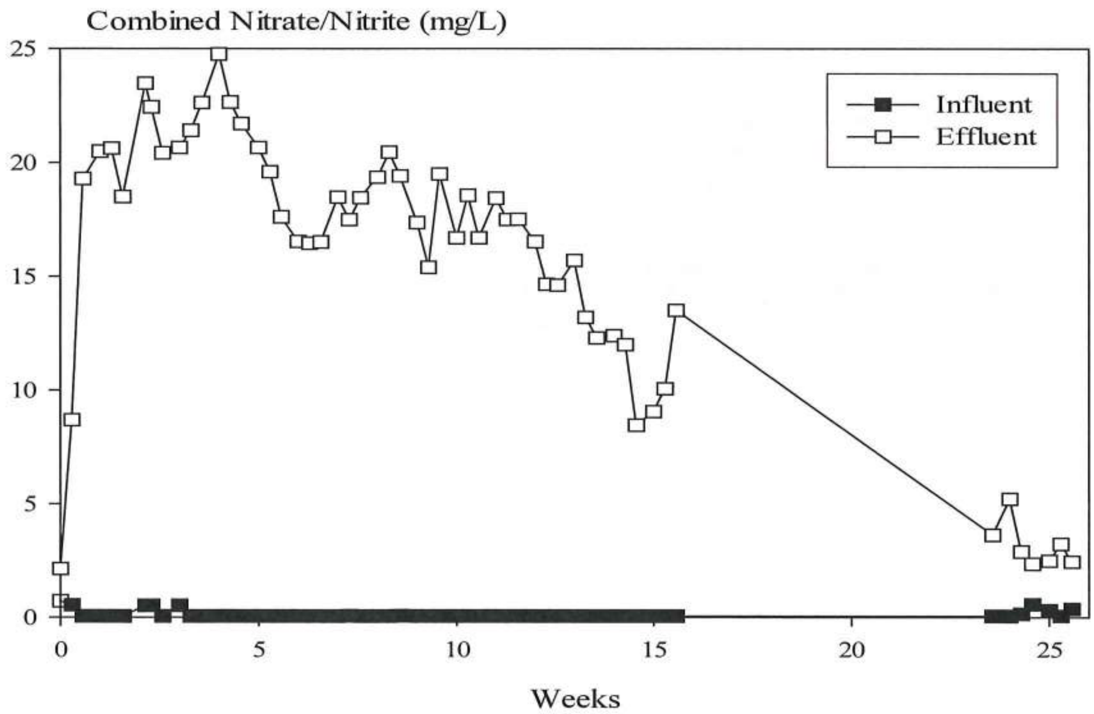

Figure 6: Effluent Nitrate/Nitrite

3.11 Total Nitrogen

Total Nitrogen (TN) is the sum of the total Kjeldahl nitrogen (TKN), nitrite ($NO_2$) and nitrate ($NO_3$) in a sample, and is expressed as mg/L as N. The TN results over the entire evaluation are shown in Figure 7.

*Influent Total Nitrogen*

The influent TN ranged from 36 to 75 mg/L during the evaluation, with average concentration of 52 mg/L and a median concentration of 51 mg/L.

*Effluent Total Nitrogen:*

The effluent TN concentration ranged from 16 to 31 mg/L during the evaluation, with an average and median concentrations of 24 mg/L. The Orenco AX20RTN-UV successfully met the requirements of Standard 245 by reducing the influent TN by 55%, which exceeds the pass/fail criteria of 50%.

*Nitrogen Loading:*

Over the course of the evaluation the influent Total Nitrogen loading averaged 0.26 lb/day. The Orenco AX20RTN-UV achieved an average reduction of 0.14 lbs/day.

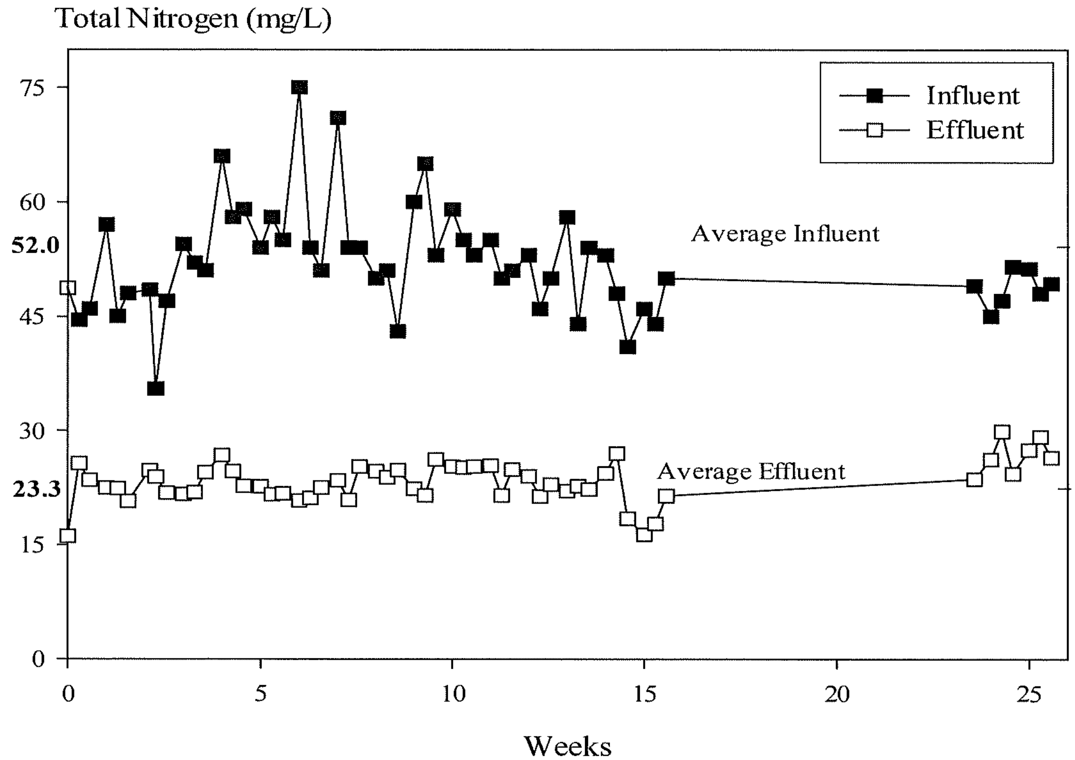


Figure 7: Total Nitrogen

## 4.0 REFERENCES


1. American Public Health Association (APHA), American Water Works Association (AWWA) & Water Environment Federation (WEF): *Standard Methods for the Examination of Water and Wastewater,* 21st Edition, 2005 (hereinafter referred to as *Standard Methods*)

2. ANSI/AWS D.1.1/D1.1M:2010, *Structural Welding Code – Steel and* ANSI/AWS D1.3/D1.3M:2008, *Structural Welding Code – Sheet Steel,* 5th Edition, with Errata

3. NFPA 70®: *National Electrical Code®* (NEC®), 2011

4. NSF/ANSI 40, *Residential Wastewater Treatment Systems*

5. US EPA, *Code of Federal Regulations (CFR), Title 40: Protection of Environment, July 1, 2010*

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# APPENDIX A

# PLANT SPECIFICATIONS

## PLANT SPECIFICATIONS

Orenco Systems, Inc    AX20RTN-UV

Plant Capacity

| | |
|---|---|
| Design Flow | 600 gpd |
| Plant Hydraulic Capacity at Design Flow | 2000 gallons |
| Primary Tank | 1200 gallons |
| RT Unit | 800 gallons |
| Hydraulic Retention Time (at Design Flow) | |
| Septic Tank | 48 hours |
| Recirculation Tank | 24 hours |
| Effluent Pump | Orenco Systems Inc.<br>PF300511, ½ HP, 115 V, 60 Hz |
| Disinfection | Orenco AXUV Ultraviolet disinfection unit |
| Filter | AdvanTex® AX20RTN Textile Filter |

Filter Media

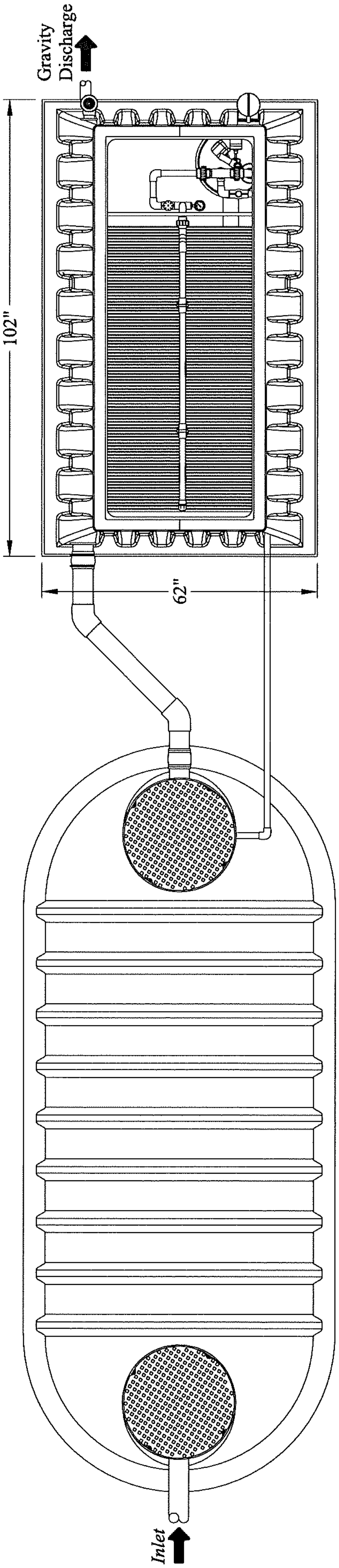
| | |
|---|---|
| Manufacture | All Felt or AFFCO |
| Model # | 4.2 to 4.8 lbs/cubic foot |
| Shape | Rectangle |
| Size | 20" x 37.5" |
| Material | Polyester |

Alarm Panel

Orenco VCOM-AX20B1UVIBHTSA

# AdvanTex™ Treatment System

AX20RTN Mode 3

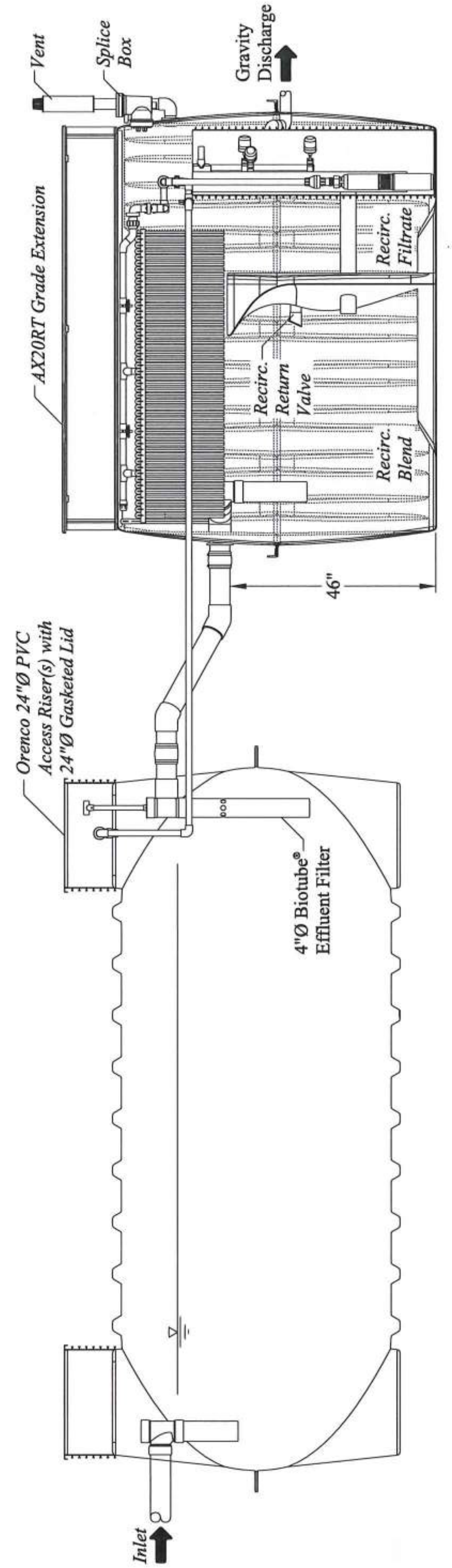



Orenco Systems®
Incorporated

Top View

# AdvanTex™ Treatment System

## AX20RTN Mode 3




Side View

## APPENDIX B

## NSF STANDARD 245 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

## 8 Performance testing and evaluation

This section describes the methods used to evaluate the performance of residential wastewater treatment systems designed to remove nitrogen from residential wastewater. Performance testing and evaluation shall not be restricted to specific seasons.

### 8.1 Preparations for testing and evaluation

The system shall be assembled, installed, and filled in accordance with the manufacturer's instructions.

The manufacturer shall inspect the system for proper installation. If no defects are detected and the system is judged to be structurally sound, it shall be placed into operation in accordance with the manufacturer's start-up procedures. If the manufacturer does not provide a start-up procedure, ⅔ of the system's capacity shall be filled with water and the remaining ⅓ shall be filled with residential wastewater.

The system shall undergo design loading (see 8.2.2.1) until testing and evaluations are initiated. Sample collection and analysis shall be initiated within three weeks of filling the system and shall continue without interruption until the end of the evaluation period, except as specified in 8.4.2.

If conditions at the test site preclude installation of the system at its normally prescribed depth, the manufacturer shall be permitted to cover the system with soil to achieve normal installation depth.

When possible, electrical or mechanical defects shall be repaired to prevent delays. All repairs made during the performance testing and evaluation shall be documented in the final report.

The system shall be operated in accordance with the manufacturer's instructions. However, routine service and maintenance of the system shall not be allowed during the testing and evaluation period.

> NOTE – The manufacturer may recommend or offer more frequent service and maintenance of the system, but for purpose of performance testing and evaluation, the service and maintenance shall not be performed beyond what is specified in this Standard.

### 8.2 Testing conditions, hydraulic loading and schedules

#### 8.2.1 Influent wastewater characteristics

Except as required by NSF/ANSI 40 for systems seeking concurrent NSF/ANSI 40 and Nitrogen Reduction certification, the average wastewater characteristics delivered to the system over the course of the testing shall fall within:

- BOD5: 100 to 300 mg/L
- TSS: 100 to 350 mg/L
- TKN: 35 to 70 mg/L as N
- alkalinity: > 175 mg/L as $CaCO_3$ (alkalinity may be adjusted if inadequate)
- temperature: 10 to 30 °C (50 to 86 °F)
- pH: 6.5 to 9 SU

Unless requested by the manufacturer, the raw influent shall be supplemented with sodium bicarbonate if the wastewater is found to be deficient in alkalinity. In addition, the influent shall be supplemented with urea to meet the required influent TKN concentration. The influent may also be supplemented with methanol to maintain a carbon:nitrogen ratio of no less than 5:1.

NOTE – For this testing, minimum alkalinity may be calculated as described in Annex A.
If the influent temperature drops below 10 °C (50 °F), impacting the nitrification process, sample collection may be suspended until the influent temperature returns to 10 °C (50 °F).

### 8.2.2 Hydraulic loading

The performance of the system shall be evaluated for a minimum of 26 wks. During the testing and evaluation period, the system shall be subjected to 16 wks of design loading, followed by 7.5 wks (52 d) of stress loading, and an additional period of design loading to obtain a minimum of 55 influent and effluent data sets collected during non-stress dosing period.

#### 8.2.2.1 Design loading

The system shall be dosed 7 d/wk with a wastewater volume equivalent to the daily hydraulic capacity of the system. The following schedule shall be adhered to for dosing:

| Time Frame | Approximate % rated daily hydraulic capacity |
|---|---|
| 6 a. m. – 9 a. m. | 35 |
| 11 a. m. – 2 p. m. | 25 |
| 5 p. m. – 8 p. m. | 40 |

NOTE – An individual dose shall be no more than 10 gal (37.9 L), unless the dosage system is based on a continuous flow, and the doses shall be uniformly applied over the dosing period.

#### 8.2.2.2 Stress loading

Stress loading sequences shall begin in week 17 of the testing and will be completed in the order listed in the following sections. Each stress sequence shall be separated by 7 d of design loading, as described in 8.2.2.1.

##### 8.2.2.2.1 Wash-day stress

The wash-day stress shall consist of 3 wash-days in a 5-d period. Each wash-day shall be separated by a 24-h period. During a wash-day, the system shall be loaded at times and capacities similar to those delivered during design loading (see 8.2.2.1). However, during the first two dosing periods per day, the design loading shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

##### 8.2.2.2.2 Working-parent stress

For five consecutive days, the system shall be subjected to a working-parent stress. During this stress, the system shall be dosed with 40% of its daily hydraulic capacity between 6:00 a. m. and 9:00 a. m. Between 5:00 p. m. and 8:00 p. m., the system shall be dosed with the remaining 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

#### 8.2.2.2.3 Power/equipment failure stress

Power/equipment failure stress simulation shall consist of a flow pattern where approximately 40% of the total daily flow is received between 5 p. m. and 8 p. m. on the day when the power/equipment failure stress is initiated. Power to the system shall then be turned off at 9 p. m. and the flow pattern shall be discontinued for 48 h. After the 48-h period, power shall be restored and the system shall receive approximately 60% of the total daily flow over a 3-h period which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

#### 8.2.2.2.4 Vacation stress

Vacation stress simulation shall consist of a flow pattern where approximately 35% of the total daily flow is received between 6 a. m. and 9 a. m. and approximately 25% of the total daily flow is received between 11 a. m. and 2 p. m. on the day that the vacation stress is initiated. The flow pattern shall be discontinued for 8 consecutive days with power continuing to be supplied to the system. Between 5 p. m. and 8 p. m. of the ninth day, the system shall receive 60% of the total daily flow, which shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

### 8.2.3 Dosing volumes

The 30-d average volume of the wastewater delivered to the system shall be within 100% ± 10% of the system's rated hydraulic capacity.

> NOTE – All dosing days, except those with dosing requirements less than the daily hydraulic capacity, shall be included in the 30-d average calculation.

## 8.3 Sample collection

### 8.3.1 Sampling frequency

Influent and effluent samples shall be collected three times per week during design loading periods and twice during each stress recovery period (the week following completion of each of the stress simulations described in 8.2.2.2). This schedule shall be continued in the event that testing is extended beyond the 26-wk minimum.

### 8.3.2 Collection methods

All sample collection shall be in accordance with *Standard Methods*, unless otherwise specified. Influent wastewater samples shall be flow-proportional, 24-h composites obtained during periods of system dosing. Effluent samples shall be flow-proportional, 24-h composites obtained during periods of system discharge. Effluent samples shall be representative of all treated effluent discharged from the system, as sampled from a central point of collection of all treated effluent. Grab samples shall be collected for pH, temperature, and dissolved oxygen (DO). The location of the grab sample shall be appropriate to provide a sample that is representative of the influent or effluent, and shall be determined in conjunction with the manufacturer. Grab samples shall be collected during the morning dosing period for gravity flow systems and during a time of discharge for systems that are pump discharged.

### 8.3.3 Analyses

**The samples collected as described in 8.3.1 and 8.3.2 shall be analyzed as follows:**

| | | Sample location | | |
|---|---|---|---|---|
| Parameter | Sample type | Raw influent | Treated effluent | Testing location |
| $BOD_5$ | 24 h composite | X | | Laboratory |
| $CBOD_5$ | 24 h composite | | X | Laboratory |
| Total suspended solids | 24 h composite | X | X | Laboratory |
| PH | Grab | X | X | Test site |
| Temperature (°C) | Grab | X | X | Test site |
| Dissolved oxygen | Grab | | X | Test site |
| Alkalinity (as $CaCO_3$) | 24 h composite | X | X | Laboratory |
| TKN (as N) | 24 h composite | X | X | Laboratory |
| Ammonia-N (as N) | 24 h composite | X | X | Laboratory |
| Nitrite/nitrate-N (as N) | 24 h composite | X | X | Laboratory |

### 8.3.4 Analytical methods

The appropriate methods in *Standard Methods* shall be used to complete the analyses indicated in 8.3.3.

### 8.4 Criteria

### 8.4.1 Testing conditions

If conditions during the testing and evaluation period result in system upset, improper sampling, improper dosing, or influent characteristics outside the ranges specified in 8.2.1, an assessment shall be conducted to determine the extent to which these conditions adversely affected the performance of the system. Based on this assessment, specific data points may be excluded from the averages. Rationale for all data exclusions shall be documented in the final report.

### 8.4.2 Catastrophic site problems

In the event that a catastrophic site problem not described in the Standard including, but not limited to, influent characteristics, malfunctions of test site apparatus and acts of God, jeopardizes the validity of the performance testing, manufacturers shall be given the choice to:

– perform maintenance on the system, reinitiate system start-up procedures, and restart the performance testing; or
– with no routine maintenance performed, have the system brought back to pre-existing conditions and resume testing within 3 wks after the site problem has been identified and corrected. Data collected during the system recovery period shall be excluded from the effluent averages.

NOTE – "Pre-existing conditions" shall be defined as the point when the results of 1 wk's worth of sampling are within 15% of the averages of the samples from the previous 3 wks of sampling.

#### 8.4.3 Effluent quality

For purposes of determining system performance, only samples collected during design loading periods, described in 8.2.2, shall be used in the calculations. The data collected during the stress sequences shall not be included in the calculations, but shall be included in the final report.

#### 8.4.3.1 CBOD5

The average CBOD5 of all effluent samples shall not exceed 25 mg/L.

#### 8.4.3.2 TSS

The average TSS of all effluent samples shall not exceed 30 mg/L.

#### 8.4.3.3 Total nitrogen

The average total nitrogen concentration of all effluent samples shall be less than 50% of the average total nitrogen concentration of all influent samples.

#### 8.4.3.4 pH

The pH of individual effluent samples shall be between 6.0 and 9.0 SU.

#### 8.5 Final report

A final report shall be prepared that presents the following:

– all data collected in accordance with the testing and evaluations within this Standard;

– a table indicating the actual percent reduction over the course of the test (included in the Executive Summary, as well as in the body, of the report);

– observations made during the testing;

– an estimation of the pounds of nitrogen loaded during the test and the pounds removed;

– any adjustments made to the alkalinity of the influent wastewater;

– a copy of the current edition of the Owner's Manual; and

– process description and detailed dimensioned drawings of the system evaluated.

A supplemental report shall be prepared for any system(s) approved under the performance classification section (1.4) of this Standard, including process description(s) and dimensioned drawings.

## APPENDIX C

## ANALYTICAL RESULTS

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 17-Aug-14 Plant Code: Orenco Advantex

Weeks Into Test: 1

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 7.6 | 5.99 | 6.94 | 6.61 | 6.84 |
| Temperature (C) | influent | 20 | 20 | 20 | 21 | 21 |
| | aeration chamber | | | | | |
| | effluent | 23 | 23 | 23 | 23 | 23 |
| pH | influent | 7.3 | 7.5 | 7.0 | 7.1 | 6.7 |
| | aeration chamber | | | | | |
| | effluent | 7.5 | 7.2 | 7.0 | 7.0 | 6.9 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 120 | 170 | 100 | 120 | 160 |
| | effluent ($CBOD_5$) | <3 | 16 | <3 | <3 | <3 |
| Suspended Solids (mg/L) | influent | 110 | 270 | 130 | 120 | 130 |
| | aeration chamber | | | | | |
| | effluent | 2 | <2 | <2 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 8/20/14 - Influent Alkalainty was 350 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 24-Aug-14 Plant Code: Orenco Advantex

Weeks Into Test: 2

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 6.48 | 7.13 | 7.46 | 7.85 | 7.21 |
| Temperature (C) | influent | 20 | 20 | 20 | 20 | 21 |
| | aeration chamber | | | | | |
| | effluent | 23 | 23 | 24 | 24 | 22 |
| pH | influent | 6.9 | 6.7 | 6.8 | 7.1 | 7.0 |
| | aeration chamber | | | | | |
| | effluent | 6.6 | 6.5 | 6.8 | 6.3 | 6.5 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 160 | 150 | 110 | 150 | 160 |
| | effluent ($CBOD_5$) | <3 | <3 | <3 | <3 | <3 |
| Suspended Solids (mg/L) | influent | 200 | 140 | 110 | 230 | 160 |
| | aeration chamber | | | | | |
| | effluent | 2 | <2 | <2 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 8/29/2014 - Influent Alkalinity was 310 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 31-Aug-14 Plant Code: Orenco Advantex

Weeks Into Test: 3

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | d | 6.85 | 6.86 | 6.1 | 7.22 |
| Temperature (C) | influent | d | 20 | 21 | 20 | 21 |
| | aeration chamber | | | | | |
| | effluent | d | 24 | 24 | 24 | 25 |
| pH | influent | d | 7 | 6.6 | 6.9 | 6.8 |
| | aeration chamber | | | | | |
| | effluent | d | 6.4 | 6.6 | 6.3 | 6.1 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | d | 120 | 130 | 190 | 100 |
| | effluent ($CBOD_5$) | d | <3 | <2 | <2 | <3 |
| Suspended Solids (mg/L) | influent | d | 130 | 110 | 330 | 200 |
| | aeration chamber | | | | | |
| | effluent | d | <2 | <2 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: No data on 9/1 due to the Labor Day holiday.
9/3/14 - Infleunt Alkalinity was 200 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 7-Sep-14 Plant Code: Orenco Advantex

Weeks Into Test: 4

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 6.88 | 6.23 | 8.34 | 7.32 | 6.48 |
| Temperature (C) | influent | 21 | 20 | 21 | 21 | 21 |
| | aeration chamber | | | | | |
| | effluent | 25 | 24 | 24 | 23 | 23 |
| pH | influent | 7.0 | 7.1 | 7.1 | 7.1 | 7.1 |
| | aeration chamber | | | | | |
| | effluent | 6.2 | 6.8 | 6.7 | 6.4 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 180 | 180 | 140 | 140 | 140 |
| | effluent ($CBOD_5$) | <2 | <2 | <2 | <2 | <2 |
| Suspended Solids (mg/L) | influent | 190 | 200 | 160 | 160 | 160 |
| | aeration chamber | | | | | |
| | effluent | <2 | <2 | <2 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 9/10/14 - Infleunt Alkalinity was 190 mg/L

**NSF International**

**Standard 40 - Residential Wastewater Treatment Systems**

Plant Effluent

Week Beginning: 14-Sep-14 Plant Code: Orenco Advantex

Weeks Into Test: 5

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 6.12 | 5.59 | 5.84 | 5.85 | 6.07 |
| Temperature (C) | influent | 20 | 20 | 20 | 20 | 20 |
| | aeration chamber | | | | | |
| | effluent | 23 | 23 | 23 | 23 | 23 |
| pH | influent | 7.2 | 7.0 | 7.7 | 7.0 | 7.2 |
| | aeration chamber | | | | | |
| | effluent | 6.2 | 6.2 | 6.2 | 6.6 | 7.0 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 330 | 170 | 200 | 210 | 170 |
| | effluent ($CBOD_5$) | <2 | <2 | <2 | <2 | <2 |
| Suspended Solids (mg/L) | influent | 170 | 170 | 180 | 230 | 180 |
| | aeration chamber | | | | | |
| | effluent | 2 | 2 | <2 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 9/17/14 - Influent Alkalinity was 200 mg/L

**NSF International**

**Standard 40 - Residential Wastewater Treatment Systems**

Plant Effluent

Week Beginning: 21-Sep-14 Plant Code: Orenco Advantex

Weeks Into Test: 6

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.42 | 6.04 | 5.93 | 3.8 | 3.61 |
| Temperature (C) | influent | 20 | 20 | 19 | 20 | 20 |
| | aeration chamber | | | | | |
| | effluent | 23 | 22 | 22 | 22 | 22 |
| pH | influent | 7.0 | 7.1 | 7.1 | 7.0 | 6.9 |
| | aeration chamber | | | | | |
| | effluent | 7.0 | 7.3 | 6.9 | 7.2 | 7.2 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 240 | 200 | 260 | 310 | 160 |
| | effluent ($CBOD_5$) | 12 | <2 | <2 | 5 | <2 |
| Suspended Solids (mg/L) | influent | 200 | 300 | 210 | 230 | 230 |
| | aeration chamber | | | | | |
| | effluent | 2 | <2 | 2 | 2 | 2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 9/24/14 - Influent Alkalinity was 370 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 28-Sep-14 Plant Code: Orenco Advantex

Weeks Into Test: 7

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 4.21 | 4.52 | 4.22 | 5.21 | 3.86 |
| Temperature (C) | influent | 22 | 20 | 20 | 19 | 19 |
| | aeration chamber | | | | | |
| | effluent | 20 | 22 | 21 | 22 | 21 |
| pH | influent | 7.0 | 7.0 | 6.9 | 7.1 | 7.1 |
| | aeration chamber | | | | | |
| | effluent | 6.7 | 6.8 | 6.9 | 7.0 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 400 | 170 | 180 | 210 | 360 |
| | effluent ($CBOD_5$) | 8 | 5 | 5 | 5 | 4 |
| Suspended Solids (mg/L) | influent | 350 | 190 | 220 | 200 | 250 |
| | aeration chamber | | | | | |
| | effluent | <2 | 3 | 2 | 3 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 10/3/2014 - Influent Allkalinity was 180 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 5-Oct-14 Plant Code: Orenco Advantex

Weeks Into Test: 8

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.2 | 4.76 | 4.73 | 5.21 | 5.16 |
| Temperature (C) | influent | 20 | 19 | 19 | 19 | 19 |
| | aeration chamber | | | | | |
| | effluent | 20 | 21 | 21 | 20 | 20 |
| pH | influent | 7.1 | 7.2 | 7.2 | 7.1 | 7.3 |
| | aeration chamber | | | | | |
| | effluent | 6.8 | 6.8 | 6.8 | 7.0 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 360 | 200 | 180 | 180 | 140 |
| | effluent ($CBOD_5$) | 8 | 5 | <2 | 4 | <2 |
| Suspended Solids (mg/L) | influent | 250 | 220 | 190 | 190 | 230 |
| | aeration chamber | | | | | |
| | effluent | <2 | 3 | 2 | <2 | 2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 10/8/14 - Influent Alkalinity was 190 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 12-Oct-14 Plant Code: Orenco Advantex

Weeks Into Test: 9

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 6.38 | 5.78 | 5.82 | 4.87 | 4.77 |
| Temperature (C) | influent | 18 | 19 | 18 | 19 | 19 |
| | aeration chamber | | | | | |
| | effluent | 19 | 19 | 20 | 20 | 20 |
| pH | influent | 7.2 | 6.9 | 7.0 | 7.0 | 7.4 |
| | aeration chamber | | | | | |
| | effluent | 6.8 | 6.5 | 6.5 | 6.5 | 6.6 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 160 | 140 | 160 | 180 | 150 |
| | effluent ($CBOD_5$) | 4 | 3 | 3 | 4 | 4 |
| Suspended Solids (mg/L) | influent | 160 | 150 | 180 | 200 | 160 |
| | aeration chamber | | | | | |
| | effluent | <2 | <2 | 2 | <2 | 2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 10/15/14 - Influent Alkalinity was 300 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 19-Oct-14 Plant Code: Orenco Advantex

Weeks Into Test: 10

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.29 | 5.07 | 4.32 | 5.2 | 4.46 |
| Temperature (C) | influent | 18 | 18 | 18 | 18 | 18 |
| | aeration chamber | | | | | |
| | effluent | 20 | 19 | 19 | 19 | 19 |
| pH | influent | 7.2 | 7.6 | 7.1 | 7.3 | 7.8 |
| | aeration chamber | | | | | |
| | effluent | 7.1 | 6.9 | 6.7 | 6.9 | 6.7 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 220 | 150 | 160 | 210 | 200 |
| | effluent ($CBOD_5$) | 4 | 4 | 4 | 6 | 4 |
| Suspended Solids (mg/L) | influent | 160 | 160 | 170 | 170 | 150 |
| | aeration chamber | | | | | |
| | effluent | 2 | 2 | 3 | <2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Color, odor, foam, and oily film all ND on 10/21.
10/24/14 - Influent Alkalinity was 170 mg/L

## NSF International
## Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 26-Oct-14 — Plant Code: Orenco Advantex

Weeks Into Test: 11

Weekend Dosing: Sunday 600 gallons — Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 4.27 | 4.42 | 5.38 | 5.29 | 2.13 |
| Temperature (C) | influent | 17 | 17 | 18 | 17 | 18 |
| | aeration chamber | | | | | |
| | effluent | 19 | 19 | 19 | 18 | 18 |
| pH | influent | 7.1 | 7.1 | 7.1 | 7.1 | 7.2 |
| | aeration chamber | | | | | |
| | effluent | 6.8 | 6.7 | 6.8 | 6.9 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 260 | 170 | 170 | 200 | 200 |
| | effluent ($CBOD_5$) | 8 | 8 | 5 | 4 | 7 |
| Suspended Solids (mg/L) | influent | 160 | 190 | 170 | 160 | 200 |
| | aeration chamber | | | | | |
| | effluent | 3 | <2 | 3 | 2 | 3 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 10/27/14 - Influent Alkalinity was 200 mg/L

## NSF International
## Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 2-Nov-14 — Plant Code: Orenco Advantex

Weeks Into Test: 12

Weekend Dosing: Sunday 600 gallons — Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.5 | 5.6 | 2.8 | 4.6 | 4.1 |
| Temperature (C) | influent | 16 | 16 | 16 | 16 | 16 |
| | aeration chamber | | | | | |
| | effluent | 16 | 16 | 16 | 16 | 16 |
| pH | influent | 7.1 | 7.0 | 7.1 | 7.1 | 7.1 |
| | aeration chamber | | | | | |
| | effluent | 7.0 | 7.0 | 6.6 | 6.6 | 6.7 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 260 | 150 | 150 | 100 | 140 |
| | effluent ($CBOD_5$) | 9 | 3 | 4 | 9 | 4 |
| Suspended Solids (mg/L) | influent | 180 | 200 | 220 | 190 | 190 |
| | aeration chamber | | | | | |
| | effluent | 2 | <2 | 3 | 3 | 3 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 11/6/14 - Influent Alkalinity was 220 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 9-Nov-14 Plant Code: Orenco Advantex

Weeks Into Test: 13

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.4 | 5.6 | 4.8 | 5.1 | 4.7 |
| Temperature (C) | influent | 16 | 16 | 15 | 15 | 15 |
| | aeration chamber | | | | | |
| | effluent | 16 | 16 | 16 | 16 | 16 |
| pH | influent | 7.0 | 7.2 | 7.1 | 7.2 | 7.0 |
| | aeration chamber | | | | | |
| | effluent | 6.6 | 6.7 | 6.7 | 6.7 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 160 | 150 | 150 | 150 | 150 |
| | effluent ($CBOD_5$) | <2 | 4 | 6 | 5 | 5 |
| Suspended Solids (mg/L) | influent | 210 | 190 | 200 | 160 | 160 |
| | aeration chamber | | | | | |
| | effluent | 4 | 3 | 3 | 3 | 2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 11/12/14 - Influent Alkalinity was 270 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 16-Nov-14 Plant Code: Orenco Advantex

Weeks Into Test: 14

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.3 | 5.2 | 4.8 | 5.2 | 5.2 |
| Temperature (C) | influent | 14 | 14 | 14 | 14 | 14 |
| | aeration chamber | | | | | |
| | effluent | 14 | 14 | 14 | 14 | 13 |
| pH | influent | 7.0 | 6.9 | 6.9 | 7.2 | 7.1 |
| | aeration chamber | | | | | |
| | effluent | 7.1 | 7.0 | 6.4 | 6.4 | 6.6 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 200 | 130 | 130 | 190 | 210 |
| | effluent ($CBOD_5$) | 6 | 5 | 7 | 6 | 6 |
| Suspended Solids (mg/L) | influent | 220 | 210 | 160 | 170 | 220 |
| | aeration chamber | | | | | |
| | effluent | 2 | 3 | 4 | 2 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 11/19/14 - Influent Alkalinity was 160 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 23-Nov-14 Plant Code: Orenco Advantex

Weeks Into Test: 15

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 4.5 | 5.1 | 2.1 | 3.8 | 2.5 |
| Temperature (C) | influent | 14 | 14 | 14 | 14 | 14 |
| | aeration chamber | | | | | |
| | effluent | 13 | 14 | 13 | 13 | 13 |
| pH | influent | 6.9 | 7.0 | 7.1 | 7.0 | 7.0 |
| | aeration chamber | | | | | |
| | effluent | 6.6 | 6.9 | 6.4 | 6.5 | 6.4 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 210 | 200 | 200 | 140 | 130 |
| | effluent ($CBOD_5$) | 10 | 7 | 6 | 4 | 4 |
| Suspended Solids (mg/L) | influent | 180 | 190 | 230 | 150 | 180 |
| | aeration chamber | | | | | |
| | effluent | <2 | 2 | 3 | 4 | 3 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 11/24/14 - Influent Alkalinity was 210 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 30-Nov-14 Plant Code: Orenco Advantex

Weeks Into Test: 16

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.6 | 3.7 | 6.1 | 6.2 | 5.3 |
| Temperature (C) | influent | 13 | 13 | 13 | 13 | 13 |
| | aeration chamber | | | | | |
| | effluent | 13 | 13 | 13 | 13 | 13 |
| pH | influent | 6.9 | 7.0 | 7.0 | 6.9 | 6.9 |
| | aeration chamber | | | | | |
| | effluent | 6.8 | 6.6 | 6.5 | 6.6 | 6.6 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 160 | 130 | 130 | 250 | 160 |
| | effluent ($CBOD_5$) | 7 | 5 | <2 | 3 | <2 |
| Suspended Solids (mg/L) | influent | 170 | 150 | 150 | 190 | 230 |
| | aeration chamber | | | | | |
| | effluent | <2 | 2 | <2 | 2 | 3 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 12/5/14 - Influent Alkalinity was 170 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 7-Dec-14 Plant Code: Orenco Advantex

Weeks Into Test: 17

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | | 6.28 | | | | | |
| Temperature (C) | influent | | 12 | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | | 12 | | | | | |
| pH | influent | | 7.1 | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | | 6.9 | | | | | |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | | 180 | | | | | |
| | effluent ($CBOD_5$) | | 10 | | | | | |
| Suspended Solids (mg/L) | influent | | 130 | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | | 3 | | | | | |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Wash Day Stress 12/8 through 12/12.
12/12/14 - Influent Alkalinity was 170 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 14-Dec-14 Plant Code: Orenco Advantex

Weeks Into Test: 18

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | | 1.8 | 5.0 | 4.3 | 4.3 | 1.7 | 4.1 |
| Temperature (C) | influent | | 12 | 12 | 12 | 11 | 11 | 12 |
| | aeration chamber | | | | | | | |
| | effluent | | 11 | 11 | 11 | 11 | 11 | 11 |
| pH | influent | | 6.9 | 6.9 | 7.0 | 8.0 | 7.0 | 6.9 |
| | aeration chamber | | | | | | | |
| | effluent | | 6.6 | 6.7 | 6.7 | 6.6 | 6.7 | 6.7 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | | 310 | 140 | 180 | 140 | 130 | 130 |
| | effluent ($CBOD_5$) | | 9 | 8 | 17 | 17 | 14 | 13 |
| Suspended Solids (mg/L) | influent | | 260 | 210 | 220 | 170 | 150 | 81 |
| | aeration chamber | | | | | | | |
| | effluent | | 3 | 4 | 7 | 7 | 17 | <2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress started on 12/20.
12/15/14 - Influent Alkalinity was 280 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 21-Dec-14 Plant Code: Orenco Advantex

Weeks Into Test: 19

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | | | | | | | 2.9 |
| Temperature (C) | influent | | | | | | | 11 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | | 12 |
| pH | influent | | | | | | | 7.0 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | | 6.7 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | | | | | | | 160 |
| | effluent ($CBOD_5$) | | | | | | | 14 |
| Suspended Solids (mg/L) | influent | | | | | | | 170 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | | 13 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress completed on 12/24.

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 28-Dec-14 Plant Code: Orenco Advantex

Weeks Into Test: 20

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 0 | 360 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | 2.9 | 2.5 | 5.2 | 2.7 | 5.4 | | |
| Temperature (C) | influent | 11 | 11 | 11 | 11 | 11 | | |
| | aeration chamber | | | | | | | |
| | effluent | 12 | 11 | 11 | 10 | 10 | | |
| pH | influent | 7.0 | 6.6 | 7.1 | 7.0 | 7.0 | | |
| | aeration chamber | | | | | | | |
| | effluent | 6.7 | 6.4 | 6.6 | 6.7 | 6.9 | | |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 67 | 120 | 160 | 200 | 150 | | |
| | effluent ($CBOD_5$) | <3 | 12 | 8 | 12 | 12 | | |
| Suspended Solids (mg/L) | influent | 88 | 100 | 180 | 210 | 130 | | |
| | aeration chamber | | | | | | | |
| | effluent | 14 | 11 | 4 | 18 | 3 | | |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Power/Equipment Failure Stress 1/1 through 1/3/15.
12/31/14 - Influent Alkalinity was 180 mg/L

## NSF International
### Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 4-Jan-15  Plant Code: co Advantex

Weeks Into Test: 21

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | | | | 5.4 | 5.7 | 2.7 | 5.7 |
| Temperature (C) | influent | | | | 10 | 10 | 10 | 10 |
| | aeration chamber | | | | | | | |
| | effluent | | | | 9 | 8 | 8 | 8 |
| pH | influent | | | | 7.0 | 7.2 | 7.1 | 7.0 |
| | aeration chamber | | | | | | | |
| | effluent | | | | 6.8 | 7.2 | 6.9 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | | | | 150 | 190 | 130 | 160 |
| | effluent ($CBOD_5$) | | | | 7 | 19 | 6 | 11 |
| Suspended Solids (mg/L) | influent | | | | 110 | 150 | 130 | 130 |
| | aeration chamber | | | | | | | |
| | effluent | | | | 5 | 3 | 3 | 3 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 1/9/15 - Influent Alkalinity was 180 mg/L

## NSF International
### Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 11-Jan-15  Plant Code: co Advantex

Weeks Into Test: 22

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 360 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | 5.92 | | | | | | |
| Temperature (C) | influent | 10 | | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | 7 | | | | | | |
| pH | influent | 7.2 | | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | 6.4 | | | | | | |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 100 | | | | | | |
| | effluent ($CBOD_5$) | <2 | | | | | | |
| Suspended Solids (mg/L) | influent | 120 | | | | | | |
| | aeration chamber | | | | | | | |
| | effluent | 3 | | | | | | |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress started on 1/11.

**NSF International**

**Standard 40 - Residential Wastewater Treatment Systems**

Plant Effluent

Week Beginning: 18-Jan-15    Plant Code: Orenco Advantex

Weeks Into Test: 23

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 0 | 0 | 360 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | | | | | | 4.2 | 3.6 |
| Temperature (C) | influent | | | | | | 8 | 8 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | 6 | 8 |
| pH | influent | | | | | | 7.0 | 6.9 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | 6.7 | 6.9 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | | | | | | 160 | 160 |
| | effluent ($CBOD_5$) | | | | | | 7 | 12 |
| Suspended Solids (mg/L) | influent | | | | | | 250 | 170 |
| | aeration chamber | | | | | | | |
| | effluent | | | | | | 2 | 6 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress was completed on 1/20.

**NSF International**

**Standard 40 - Residential Wastewater Treatment Systems**

Plant Effluent

Week Beginning: 25-Jan-15    Plant Code: Orenco Advantex

Weeks Into Test: 24

| | | Sun | Mon | Tue | Wed | Thur | Fri | Sat |
|---|---|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | | | |
| | effluent | 3.7 | 6.4 | c | c | 6.8 | 5.6 | |
| Temperature (C) | influent | 8 | 8 | c | c | 8 | 8 | |
| | aeration chamber | | | | | | | |
| | effluent | 7 | 7 | c | c | 7 | 7 | |
| pH | influent | 6.8 | 6.9 | c | c | 7.2 | 6.9 | |
| | aeration chamber | | | | | | | |
| | effluent | 6.8 | 6.6 | c | c | 6.8 | 6.6 | |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 130 | 200 | 170 | c | 220 | 240 | |
| | effluent ($CBOD_5$) | 8 | 15 | 11 | c | 17 | 14 | |
| Suspended Solids (mg/L) | influent | 170 | 140 | 170 | c | 220 | 240 | |
| | aeration chamber | | | | | | | |
| | effluent | 4 | 4 | 3 | c | 5 | 4 | |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: On site measurements were not completed on 1/27 and 1/28 and samples were not collected on 1/28 due to a blizzard.
1/30/15 - Influent Alkalinity was 160 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 1-Feb-15 Plant Code: Advantex

Weeks Into Test: 25

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 4.7 | 5.7 | 5.4 | 4.1 | 5.5 |
| Temperature (C) | influent | 10 | 8 | 8 | 8 | 7 |
| | aeration chamber | | | | | |
| | effluent | 7 | 7 | 7 | 7 | 7 |
| pH | influent | 7.0 | 6.9 | 7.1 | 6.9 | 7.1 |
| | aeration chamber | | | | | |
| | effluent | 6.8 | 6.8 | 6.9 | 6.8 | 6.9 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 150 | 160 | 230 | 200 | 190 |
| | effluent ($CBOD_5$) | 6 | 11 | 19 | 20 | 7 |
| Suspended Solids (mg/L) | influent | 140 | 160 | 150 | 170 | 190 |
| | aeration chamber | | | | | |
| | effluent | 4 | 3 | <2 | 3 | 2 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 2/6/15 - Influent Alkalinity was 160 mg/L

**NSF International**
**Standard 40 - Residential Wastewater Treatment Systems**
Plant Effluent

Week Beginning: 8-Feb-15 Plant Code: Advantex

Weeks Into Test: 26

Weekend Dosing: Sunday 600 gallons Saturday 600 gallons

| | | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|---|
| Dosed Volume (gallons) | | 600 | 600 | 600 | 600 | 600 |
| Dissolved Oxygen (mg/L) | aeration chamber | | | | | |
| | effluent | 5.1 | 6.1 | 4.9 | 6.2 | 4.9 |
| Temperature (C) | influent | 7 | 8 | 7 | 8 | 7 |
| | aeration chamber | | | | | |
| | effluent | 7 | 7 | 7 | 7 | 6 |
| pH | influent | 6.9 | 7.2 | 7.1 | 7.6 | 7.0 |
| | aeration chamber | | | | | |
| | effluent | 7.0 | 7.2 | 6.9 | 7.1 | 6.8 |
| Biochemical Oxygen Demand (mg/L) | influent ($BOD_5$) | 190 | 130 | 180 | 170 | 180 |
| | effluent ($CBOD_5$) | 4 | 8 | 21 | 18 | 18 |
| Suspended Solids (mg/L) | influent | 200 | 160 | 150 | 87 | 160 |
| | aeration chamber | | | | | |
| | effluent | 8 | 10 | 3 | 8 | 4 |

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: 2/13/15 - Influent Alkalinity was 320 mg/L

## APPENDIX D

## ANALYTICAL RESULTS – Nitrogen Analyses

| Date | Ammonia Nitrogen (mg/L) | | Total Kjeldahl Nitrogen (mg/L) | | Nitrate/Nitrite (mg/L) | | Total Nitrogen (mg/L) | | Total Alkalinity (mg/L CaCO3) | | Days | Daily TN Reduction | Avg TN Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Influent | Effluent | Influent | Effluent | Influent | Effluent | Influent | Effluent | Influent | Effluent | | | |
| 08/18/14 | 34 | 13 | 48 | 14 | 0.72 | 2.14 | 48.7 | 16.1 | 230 | 120 | 1 | 66.87 | |
| 08/20/14 | 32 | 15 | 44 | 17 | 0.54 | 8.7 | 44.5 | 25.7 | 350 | 130 | 2 | 42.30 | |
| 08/22/14 | 31 | 2.9 | 46 | 4.2 | 0.0525 | 19.3 | 46.1 | 23.5 | 180 | 64 | 3 | 48.97 | |
| 08/25/14 | 41 | 1.2 | 57 | 2 | 0.0525 | 20.5 | 57.1 | 22.5 | 220 | 55 | 4 | 60.56 | |
| 08/27/14 | 27 | 0.7 | 45 | 1.8 | 0.0525 | 20.63 | 45.1 | 22.4 | 170 | 34 | 5 | 50.21 | |
| 08/29/14 | 34 | 1 | 48 | 2.2 | 0.0525 | 18.51 | 48.1 | 20.7 | 310 | 42 | 6 | 56.90 | |
| 09/02/14 | 34 | 0.5 | 48 | 1.3 | 0.525 | 23.49 | 48.5 | 24.8 | 190 | 48 | 7 | 48.91 | |
| 09/03/14 | 35 | 0.6 | 35 | 1.5 | 0.525 | 22.45 | 35.5 | 24.0 | 200 | 36 | 8 | 32.58 | |
| 09/05/14 | 34 | 0.5 | 47 | 1.4 | 0.0525 | 20.43 | 47.1 | 21.8 | 200 | 24 | 9 | 53.61 | |
| 09/08/14 | 37 | 0.6 | 54 | 1 | 0.525 | 20.66 | 54.5 | 21.7 | 200 | 74 | 10 | 60.28 | |
| 09/10/14 | 38 | 0.6 | 52 | 0.5 | 0.0525 | 21.42 | 52.1 | 21.9 | 190 | 42 | 11 | 57.89 | |
| 09/12/14 | 34 | 1 | 51 | 1.9 | 0.0525 | 22.64 | 51.1 | 24.5 | 200 | 24 | 12 | 51.93 | |
| 09/15/14 | 53 | 1.8 | 66 | 2 | 0.0525 | 24.77 | 66.1 | 26.8 | 230 | 11 | 13 | 59.47 | |
| 09/17/14 | 41 | 1.9 | 58 | 2 | 0.0525 | 22.66 | 58.1 | 24.7 | 200 | 15 | 14 | 57.52 | |
| 09/19/14 | 43 | 1.7 | 59 | 1 | 0.0525 | 21.72 | 59.1 | 22.7 | 220 | 60 | 15 | 61.53 | |
| 09/22/14 | 38 | 1.6 | 54 | 2 | 0.0525 | 20.66 | 54.1 | 22.7 | 360 | 90 | 16 | 58.08 | |
| 09/24/14 | 42 | 2.1 | 58 | 2 | 0.0525 | 19.6 | 58.1 | 21.6 | 370 | 140 | 17 | 62.79 | |
| 09/26/14 | 36 | 2.4 | 55 | 4.1 | 0.0525 | 17.62 | 55.1 | 21.7 | 190 | 110 | 18 | 60.55 | |
| 09/29/14 | 52 | 4.7 | 75 | 4.3 | 0.0525 | 16.54 | 75.1 | 20.8 | 200 | 70 | 19 | 72.23 | |
| 10/01/14 | 40 | 4.5 | 54 | 4.7 | 0.0525 | 16.46 | 54.1 | 21.2 | 160 | 62 | 20 | 60.85 | |
| 10/03/14 | 34 | 3.9 | 51 | 6 | 0.0525 | 16.52 | 51.1 | 22.5 | 180 | 66 | 21 | 55.89 | |
| 10/06/14 | 52 | 4.6 | 71 | 5 | 0.0525 | 18.49 | 71.1 | 23.5 | 220 | 90 | 22 | 66.94 | |
| 10/08/14 | 39 | 5.4 | 54 | 3.4 | 0.07 | 17.5 | 54.1 | 20.9 | 19 | 92 | 23 | 61.35 | |
| 10/10/14 | 35 | 4.7 | 54 | 6.8 | 0.0525 | 18.46 | 54.1 | 25.3 | 190 | 70 | 24 | 53.27 | |
| 10/13/14 | 35 | 4 | 50 | 5.3 | 0.0525 | 19.37 | 50.1 | 24.7 | 190 | 56 | 24 | 50.71 | |
| 10/15/14 | 38 | 4.2 | 51 | 3.4 | 0.0525 | 20.47 | 51.1 | 23.9 | 300 | 40 | 26 | 53.24 | |
| 10/17/04 | 31 | 3.9 | 43 | 5.4 | 0.07 | 19.4 | 43.1 | 24.8 | 170 | 82 | 27 | 42.37 | |
| 10/20/14 | 52 | 4.3 | 60 | 5 | 0.0525 | 17.37 | 60.1 | 22.4 | 220 | 91 | 28 | 62.75 | |
| 10/22/14 | 49 | 5.6 | 65 | 6.1 | 0.0525 | 15.4 | 65.1 | 21.5 | 330 | 66 | 29 | 66.95 | |
| 10/24/14 | 34 | 5.5 | 53 | 6.7 | 0.0525 | 19.5 | 53.1 | 26.2 | 170 | 54 | 30 | 50.61 | |
| 10/27/14 | 45 | 6.1 | 59 | 8.6 | 0.0525 | 16.7 | 59.1 | 25.3 | 200 | 67 | 31 | 57.16 | |
| 10/29/14 | 36 | 6.2 | 55 | 6.6 | 0.0525 | 18.6 | 55.1 | 25.2 | 190 | 65 | 32 | 54.28 | |
| 10/31/14 | 36 | 6.1 | 53 | 8.6 | 0.05 | 16.7 | 53.1 | 25.3 | 190 | 67 | 33 | 52.31 | |
| 11/03/14 | 34 | 6.2 | 55 | 7.0 | 0.05 | 18.4 | 55.1 | 25.4 | 170 | 74 | 34 | 53.79 | |
| 11/05/14 | 38 | 5.3 | 50 | 4.0 | 0.0525 | 17.5 | 50.1 | 21.5 | 180 | 58 | 35 | 57.05 | |
| 11/07/14 | 36 | 5.4 | 51 | 7.4 | 0.0525 | 17.5 | 51.1 | 24.9 | 190 | 68 | 36 | 51.19 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/10/14 | 33 | 5.6 | 53 | 7.5 | 0.0525 | 16.5 | 53.1 | 24.0 | 270 | 72 | 37 | 54.71 | |
| 11/12/14 | 36 | 6.4 | 46 | 6.7 | 0.0525 | 14.7 | 46.1 | 21.4 | 180 | 80 | 38 | 53.62 | |
| 11/14/14 | 37 | 6.2 | 50 | 8.3 | 0.0525 | 14.6 | 50.1 | 22.9 | 180 | 62 | 39 | 54.21 | |
| 11/17/14 | 41 | 6.8 | 58 | 6.4 | 0.0525 | 15.7 | 58.1 | 22.1 | 200 | 86 | 40 | 61.93 | |
| 11/19/14 | 32 | 9.3 | 44 | 9.5 | 0.0525 | 13.2 | 44.1 | 22.7 | 160 | 82 | 41 | 48.47 | |
| 11/21/14 | 35 | 7.5 | 54 | 10.0 | 0.0525 | 12.3 | 54.1 | 22.3 | 280 | 69 | 42 | 58.74 | |
| 11/24/14 | 41 | 8.9 | 53 | 12.0 | 0.0525 | 12.4 | 53.1 | 24.4 | 210 | 98 | 43 | 54.01 | |
| 11/26/14 | 30 | 9.9 | 48 | 15.0 | 0.0525 | 12.0 | 48.1 | 27.0 | 160 | 94 | 44 | 43.81 | |
| 11/28/14 | 26 | 7.9 | 41 | 10.0 | 0.0525 | 8.5 | 41.1 | 18.5 | 300 | 76 | 45 | 55.03 | |
| 12/01/14 | 34.0 | 7.1 | 46 | 7.3 | 0.0525 | 9.1 | 46.1 | 16.4 | 220 | 100 | 46 | 64.48 | |
| 12/03/14 | 33 | 7.5 | 44 | 7.7 | 0.0525 | 10.1 | 44.1 | 17.8 | 290 | 95 | 47 | 59.68 | |
| 12/05/14 | 32 | 5.9 | 50 | 7.9 | 0.0525 | 13.5 | 50.1 | 21.4 | 170 | 100 | 48 | 57.20 | 56.53 |
| 12/08/14 | 38 | 8 | 48 | 8.2 | 0.525 | 10.5 | 48.5 | 18.7 | 170 | 110 | | | |
| 12/15/14 | 39 | 12 | 53 | 14 | 0.0525 | 6.3 | 53.1 | 20.3 | 280 | 120 | | | |
| 12/17/14 | 36 | 15 | 50 | 18 | 0.0525 | 5.8 | 50.1 | 23.8 | 160 | 140 | | | |
| 12/19/14 | 32 | 14 | 46 | 17 | 0.0525 | 3.23 | 46.1 | 20.2 | 290 | 150 | Stress data, do not use for 245 | | |
| 12/29/14 | 36 | 12 | 46 | 11 | 0.0525 | 4.06 | 46.1 | 15.1 | 170 | 120 | | | |
| 12/31/14 | 36 | 12 | 48 | 18 | 0.0525 | 3.83 | 48.1 | 21.8 | 180 | 120 | | | |
| 01/07/15 | 37 | 18 | 50 | 20 | 0.0525 | 6.32 | 50.1 | 26.3 | 240 | 102 | | | |
| 01/09/15 | 34 | 17 | 52 | 21 | 0.0525 | 6.18 | 52.1 | 27.2 | 180 | 110 | | | |
| 01/30/15 | 31 | 18 | 49 | 20 | 0.0525 | 3.63 | 49.1 | 23.6 | 160 | 95 | 49 | 51.83 | 56.44 |
| 02/02/15 | 30 | 18 | 45 | 21 | 0.0525 | 5.22 | 45.1 | 26.2 | 190 | 120 | 50 | 41.80 | 56.19 |
| 02/04/15 | 33 | 19 | 47 | 27 | 0.153 | 2.9 | 47.2 | 29.9 | 150 | 130 | 51 | 36.59 | 55.84 |
| 02/06/15 | 32 | 19 | 51 | 22 | 0.57 | 2.36 | 51.6 | 24.4 | 160 | 120 | 52 | 52.76 | 55.79 |
| 02/09/15 | 34 | 21 | 51 | 25 | 0.31 | 2.49 | 51.3 | 27.5 | 450 | 140 | 53 | 46.42 | 55.61 |
| 02/11/15 | 36 | 22 | 48 | 26 | 0.062 | 3.23 | 48.1 | 29.2 | 170 | 170 | 54 | 39.18 | 55.33 |
| 02/13/15 | 33 | 20 | 49 | 24 | 0.37 | 2.45 | 49.4 | 26.5 | 320 | 150 | **55** | **46.42** | **55.18** |
| 02/17/15 | 31 | 22 | 47 | 25 | 0.2 | 0.36 | 47.2 | 25.4 | 160 | 150 | 56 | 46.27 | 55.03 |
| 02/18/15 | 32 | 23 | 49 | 29 | 0.037 | 2.04 | 49.0 | 31.0 | 160 | 140 | 57 | 36.70 | 54.73 |
| 02/20/15 | 31 | 22 | 47 | 25 | 0.09 | 2.65 | 47.1 | 27.7 | 280 | 130 | 58 | 41.28 | 54.52 |
| **Median** | 35 | 5.6 | 51 | 6.7 | 0.05 | 16.7 | 51.1 | 24 | 195 | 74 | | | |
| **Min** | 26 | 0.5 | 35 | 0.5 | 0.04 | 0.4 | 35.5 | 16 | 19 | 11 | | | |
| **Max** | 53 | 23 | 75 | 29 | 0.72 | 24.8 | 75.1 | 31 | 450 | 170 | | | |
| **Avg** | 36 | 7 | 52 | 9 | 0.12 | 15 | 52 | 24 | 216 | 81 | | | |
| **Std Dev** | 36 | 7 | 52 | 9 | 0.12 | 15 | 52 | 24 | 216 | 81 | | | |

# APPENDIX E

# OWNERS MANUAL

# HOMEOWNER'S MANUAL

## Onsite Wastewater Collection & Treatment Systems

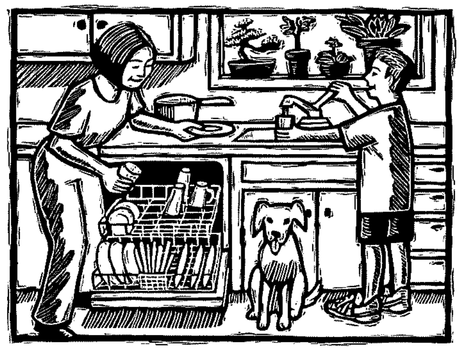
# How to Take Care of Your Wastewater System

**Orenco®**

**Orenco Systems®**, Incorporated

**1-800-348-9843 • 1-541-459-4449**
**www.orenco.com • www.vericomm.net**

# How to Take Care of Your Wastewater System



*Congratulations!*

Your home includes reliable, carefully engineered equipment — manufactured by Orenco Systems®, Inc. — for the collection and/or treatment of household wastewater. And your service provider should have a copy of this manual. It's available on our Document Library, at www.orenco.com. Or call 800-348-9843 (541-459-4449) and we will send you another.

When properly designed and installed, onsite wastewater treatment does a terrific job of decomposing household waste and recycling precious water resources. Our systems use little energy and frequently outperform municipal sewage treatment plants. The treated effluent is often returned harmlessly to the soil, where it receives final polishing and filtration for groundwater recharge. There's no degrading of our nation's rivers and oceans . . . which is so often the case with municipal sewage.

As with any engineered system, such as your car or your heat pump, your onsite wastewater system will work better and last longer if it is regularly maintained by a qualified service provider. Your service provider should be present during installation, so he or she is familiar with your system, especially those service lines, conduits, and connections that get buried.

Your system will also work better and last longer if you learn what can go into it — and what can not. Little effort is required. Just read and practice the "do's and don'ts" that follow. Every member of your household should be familiar with these. And if you have guests who want to "help out in the kitchen," be sure to tell them, too. With this preventive maintenance, along with periodic inspections, your onsite wastewater system should function for decades. And you'll save water, energy, and pumpout costs, too!

There's a place on the back of this Homeowner's Manual to record "Important System Facts." If those have not been filled in for you, please record those now, before you file or shelve this manual. And give a copy of these facts to your service provider, especially if your service provider changes. You'll be glad you did.

# Do's and Don'ts for INSIDE the House

*There are a number of do's and don'ts that will help ensure a long life and minimal maintenance for your system. As a general rule, nothing should be disposed into any wastewater system that hasn't first been ingested, other than toilet tissue, mild detergents, and wash water. Here are some additional guidelines.*


**Don't** flush dangerous and damaging substances into your wastewater treatment system. (Please refer to the "Substitutes for Household Hazardous Waste," on the next panel.) Specifically, do not flush . . .

- Pharmaceuticals
- Excessive amounts of bath or body oils
- Water softener backwash
- Flammable or toxic products
- Household cleaners, especially floor wax and rug cleaners
- Chlorine bleach, chlorides, and pool or spa products
- Pesticides, herbicides, agricultural chemicals, or fertilizers

**Don't** plumb water softener discharge brine into your wastewater system. (The softened WATER is OK, just not the BRINE that's produced during the regeneration cycle.)

**Do** route the brine around your wastewater system so it discharges directly into the soil. This is a cost-effective solution that ensures the long-term performance of your system and the biological processes that occur inside it.

Water softener brine can interfere with nitrogen removal. And it degrades treatment by interfering with the settling process inside the tank. Without proper settling, solids, grease, and oils are carried through your system, clogging components. This increases your costs by...

- requiring the tank to be pumped more often (at hundreds of dollars per pumpout)
- requiring filters to be cleaned more often
- fouling drainfields and other downstream equipment

**Do** collect grease in a container and dispose with your trash. And avoid using garbage disposals excessively. Compost scraps or dispose with your trash, also. Food by-products accelerate the need for septage pumping and increase maintenance.

**Do** keep lint out of your wastewater treatment system by cleaning the lint filters on your washing machine and dryer before every load. Installing a supplemental lint filter on your washing machine would be a good precautionary measure. (This normally takes just a few minutes. Lint and other such materials can make a big difference in the frequency and cost of pumping out your primary treatment tank.)

**Do** use your trash can to dispose of substances that cause maintenance problems and/or increase the need for septage pumping.

**Don't ever** flush the following down the drain:

- Egg shells, cantaloupe seeds, gum, coffee grounds
- Tea bags, chewing tobacco, cigarette butts
- Condoms, dental floss, sanitary napkins, diapers
- Paper towels, newspapers, candy wrappers
- Rags, large amounts of hair
- Baby wipes, medicated wipes, cleaning wipes, and wipes made out of non-biodegradeable material


**Don't** use special additives that are touted to enhance the performance of your tank or system. Additives can cause major damage to other areas in the collection system. The natural microorganisms that grow in your system generate their own enzymes that are sufficient for breaking down and digesting nutrients in the wastewater.

# Do's and Don'ts for INSIDE the House

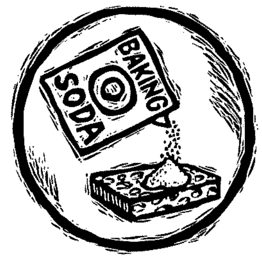

**Don't** ignore leaky plumbing fixtures; repair them. A leaky toilet can waste up to 2,000 gallons (7500 liters) of water in a single day. That's 10-20 times more water than a household's typical daily usage. Leaky plumbing fixtures increase your water bill, waste natural resources, and overload your system.

**Don't** use excessive amounts of water. Using 50 gallons (200 liters) per person per day is typical. If your household does not practice any of the "water conserving tips" below, you may be using too much water.

**Do** conserve water:

- Take shorter showers or take baths with a partially filled tub. Be cautious about excessive use of large soaking tubs.
- Don't let water run unnecessarily while brushing teeth or washing hands, food, dishes, etc.
- Wash dishes and clothes when you have a full load.
- When possible, avoid doing several loads in one day.
- Use water-saving devices on faucets and showerheads.
- When replacing old toilets, buy low-flush models.


**Don't** leave interior faucets on to protect water lines during cold spells. A running faucet can easily increase your wastewater flow by 1,000 to 3,000 gallons (4,000 to 12,000 liters) per day and hydraulically overload your system. Instead, properly insulate or heat your faucets and plumbing.




**Do** use substitutes for household hazardous waste. Replace the following hazardous products with products that are less environmentally harmful. The hazardous cleaners are listed below, followed by the suggested substitute.

### *Ammonia-based cleaners:*
For surfaces, sprinkle baking soda on a damp sponge. For windows, use a solution of 2 tbs (30 mL) white vinegar to 1 qt (1 L) water. Pour the mixture into a spray bottle.

### *Carpet/upholstery cleaners:*
Sprinkle dry cornstarch or baking soda on, then vacuum. For tougher stains, blot with white vinegar in soapy water.

### *Disinfectants:*
Use borax: ½ cup (100 g) in a gallon (4 L) of water; deodorizes also.

### *Drain decloggers:*
Use a plunger or metal snake, or remove and clean the drain trap.

### *Scouring cleaners & powders:*
Sprinkle baking soda on a damp sponge or add 4 tbs (50 g) baking soda to 1 qt (1 L) warm water. Or use Bon Ami® cleanser; it's cheaper and won't scratch.

### *Furniture/floor polishes:*
To clean, use oil soap and warm water. Dry with soft cloth. To polish, use 1 part lemon juice and 2 parts oil (any kind). Or use natural products with lemon oil or beeswax in mineral oil.


### *Laundry detergents:*
Choose a liquid detergent (not a powder) that doesn't have chlorine or phosphates.

### *Metal cleaners:*
To polish silver, rub gently with toothpaste and soft wet cloth. To clean and polish brass and copper, scrub with half of a lemon dipped in salt. To clean stainless steel, use a scouring pad and soapy water.

### *Oven cleaners:*
Quickly sprinkle salt on drips, then scrub. Use baking soda and scouring pads on older spills.

### *Toilet cleaners:*
Sprinkle on baking soda or Bon Ami; then scrub with a toilet brush.

## Do's and Don'ts for OUTSIDE the House


**Don't** enter your tank, ever! Gases that can be generated in the tank and/or oxygen depletion can be fatal.

**Do keep the tank access lid secure to the riser at all times** with stainless steel lid bolts. If bolts are lost or damaged, call your service provider immediately for replacements. Or call Orenco at (800) 348-9843 or +1 (541) 459-4449. If the tank lid becomes detached from the riser or if the lid or riser becomes damaged, BLOCK ACCESS TO THE TANK OPENING IMMEDIATELY AND KEEP CHILDREN AWAY until all repairs are made.

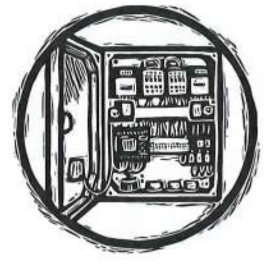

**Don't** dig without knowing the location of your wastewater system. As much as possible, plan landscaping and permanent outdoor structures before installation. But easily removable items, such as bird baths and picnic tables, are OK to place on top of your system.


**Don't** drive over your tank or any buried components in your system, unless they've been equipped with a special traffic lid. If the system is subject to possible traffic, put up a barricade or a row of shrubs.


**Don't** dump RV waste into your wastewater system. It will increase the frequency of required septage pumping. When dumped directly into the pumping vault, RV waste clogs or fouls equipment, causing undue maintenance and repair costs. (Also, some RV waste may contain chemicals that are toxic or that may retard the biological digestion occurring within the tank.)

**Don't** ever connect rain gutters or storm drains to the sewer or allow surface water to drain into it. And don't discharge hot-tub water into your system. The additional water will increase costs and reduce the capacity of the collection and treatment systems. It can also wash excess solids through the tank, and, for properties with drainfields, additional water can flood the drainfield.

## At the Control Panel



**Do** locate your electrical control panel where it will be protected from potential vandalism and have unobstructed access.

**Do** familiarize yourself with the location of your wastewater system and electrical control panel. Refer to the panel's model number when reporting a malfunction in the system.

### IMPORTANT! CAUTION!

**Only a qualified electrician or authorized installer/operator should work on your control panel. Before anyone does any work on either the wiring to the level control floats and pumps in the vault or on the control panel itself, it is imperative to first switch the isolation fuse/breaker and the circuit breakers in the panel to the "Off" positions, then switch "Off" the power to the system at the main breaker!**

**Do** make arrangements with a reliable service person to provide regular monitoring and maintenance, and place the service person's phone number on or in your control panel!

**Do** remember that the audible alarm can be silenced by pushing the lighted button located directly above the "Push to Silence" label on the front of the electrical control panel. Hold the button until the alarm goes off. With normal use, the tank has a reserve storage capacity good for about 24 hours.

**Don't** turn off the main circuit breaker to the wastewater pumps when going on vacation. If there is any infiltration or inflow into the system, the pumps will need to handle it.

# HOMEOWNER'S MANUAL

## Onsite Wastewater Collection & Treatment Systems

**Do** keep an "as built" system diagram in a safe place for reference. And keep accurate records of maintenance and service calls. Make sure whoever services your tank keeps a complete record, and ask for a copy for your records.

## IMPORTANT SYSTEM FACTS

**Distributor or Dealer:**

***Please fill out the following important information before giving out this Homeowner's Manual:***

_Distributor/Dealer Name_

_Distributor/Dealer Address_

_Distributor/Dealer Phone Number(s)_

_Authorized Service Provider Name_

_Authorized Service Provider Phone Number(s)_

_Authorized Installer Name_

_Authorized Installer Phone Number(s)_

_Engineer Name (if applicable)_

_Engineer Phone Number(s)_

_Regulatory Agency_

_Regulatory Contact Name_

_Regulatory Contact Phone Number(s)_

_Permit # (if applicable)_

_Property Address_

_Property Owner Name(s)_

_Start-Up Date_

_Control Panel Model # and UL #_

_AdvanTex® Model # (if applicable)_

_AdvanTex® Serial # (if applicable)_

**Orenco Systems®**, Incorporated

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

*ABR-OM-1*
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