

AdvanTex® Performance Summary #1

General Reduction: CBOD₅, TSS, FC

AdvanTex® Treatment Systems — Manufactured by Orenco Systems®, Inc.

Since 2001, the performance of AdvanTex® Treatment Systems has been tested in a dozen different programs. Tests have been performed both in test centers and in the field. These include testing performed by outside companies or agencies (third-party); contract testing performed by Orenco distributors (second-party); and Orenco's own testing (first-party).

This performance summary documents the performance of AdvanTex Treatment Systems relative to reduction of BOD₅, TSS, and Fecal Coliform. The results show that AdvanTex systems easily meet advanced treatment standards for these parameters.

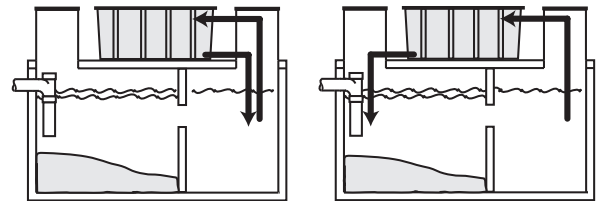
About System Configurations

As shown in the illustrations on the right, AdvanTex systems can be configured in different ways, depending on the degree of total nitrogen required. In Mode 1 (top left illus), filtrate from the AdvanTex pod is recirculated to the secondary chamber of the septic tank. In Mode 3 (top right illus), filtrate is recirculated to the primary chamber, where the environment favors further nitrogen reduction. See *AdvanTex Performance Summary — Nutrient Reduction* for TN, NH₃, and TP results (AHO-ATX-PERF-TN-1).

In the Combo Mode (center illus), filtrate from the AdvanTex pod is recirculated to both chambers. There is also a Mode 1 configuration (bottom illus) that uses a primary tank and a recirculation tank. In the primary tank, sludge and scum are separated from liquid effluent, which then flows into a separate recirculation tank, into which the AdvanTex filtrate is recirculated.

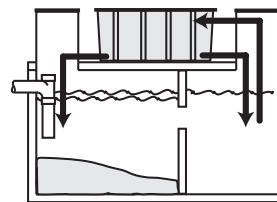
About the Results

The table below summarizes effluent testing results for CBOD₅, TSS, Turbidity, and Fecal Coliform, both from test center programs and field testing programs. The pages that follow provide more specific results of these testing programs. For ease of comparison, we have also included information about the circumstances of each test. If you have any questions regarding this summary, please contact Sam Carter, Government Relations Manager, Orenco Systems, Inc., (800) 536-4192, scarter@orenco.com.

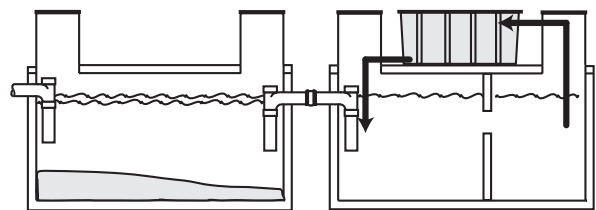


Mode 1

Mode 3



Combo Mode



Mode 1 with primary tank and recirculation tank

TEST CENTERS

AdvanTex Effluent Averages	cBOD₅ (mg/L)	TSS (mg/L)	Turbidity (ntu)	FC* (mpn/100ml)	Duration
NSF/ANSI Standard 40 Testing	5	4	4	-	6 months
NSF/ANSI Standard 40 Testing with UV Disinfection	4	6	1.2	1.35x10 ⁴ (1.7)**	7 months
Rotorua District Council Approval Testing	2	3	-	1.2x10 ⁴	9 months
NovaTec Consultants, Inc. Start-up Testing	20	5	9.0	-	1 week

FIELD TESTING

AdvanTex Effluent Averages (# of SFRs)***	cBOD₅ (mg/L)	TSS (mg/L)	Turbidity (ntu)	FC* (units vary)	Duration
Roger Shafer, P.E., "Testing in Fractured Bedrock" (1)	5	6	-	4.5x10 ³	8 months
Virginia Approval Testing Program (18)	7	9	2	7.8x10 ²	18 months
Pennsylvania Testing Program (11)	6	10	7	9.5x10 ²	1-3 years
Skaneateles Demonstration Project (2)	4	3	1	3.5x10 ²	2 years
La Pine National Demonstration Project (3)	9	6	-	9.9x10 ³	2 years, 7 months
Green Hill Pond Watershed Demonstration Project (5)	8	5	-	1.9x10 ³	1 year, 4 months
North Carolina Approval Testing Program- (>50)****	7	6	-	-	4 years

* FC sample taken following AdvanTex treatment. Fecal Coliform figured as a geometric mean

** FC sample taken following UV unit. Fecal Coliform figured as a geometric mean

*** sfr = Single-family residences

**** Includes single-family residences and vacation rentals

TEST CENTERS

NSF/ANSI Standard 40 Testing

(Third-Party)

About the Testing: Orenco contracted with Novatec to test an AX20 Mode 1 system in support of its application for NSF approval. Novatec conducts official NSF/ANSI Standard 40 testing under contract to manufacturers at its facility in Squamish, British Columbia. Testing is done at a wastewater facility that serves a residential subdivision. Composite sampling was used throughout this evaluation.

Dates: May 2001-November 2001

Location: British Columbia

Average Daily Flow: 500 gpd

System Configuration: AX20 Mode 1 recirculating into the second compartment of a 1500-gallon tank

Processing Tank Influent

	BOD₅ (mg/L)	TSS (mg/L)
Mean	162	291
Median	130	200
Number of Samples	102	108

AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	5	4	4
Median	3	3	4
Number of Samples	109	109	117*
Percent Reduction	97%	99%	-

* Samples taken during stress periods

NSF/ANSI Standard 40 Testing with UV Disinfection

(Third-Party)

About the Testing: Orenco contracted with Novatec to test an AX20N Mode 1 system with UV disinfection to determine its capabilities for reducing fecal coliform. Novatec conducts official NSF/ANSI Standard 40 testing under contract to manufacturers at its facility in Squamish, British Columbia. Although the NSF/ANSI Standard 40 protocol does not require it, Orenco elected to sample for total nitrogen. Testing is done at a wastewater facility that serves a residential subdivision.

Dates: July 2006-December 2006

Location: British Columbia

Average Daily Flow: 500 gpd

System Configuration: AX20 Mode 1 recirculating into the second compartment of a 1500-gallon tank with UV disinfection

Processing Tank Influent

	BOD₅ (mg/L)	TSS (mg/L)	FC (cfu/100 mL)
Mean	180	210	3.37x10 ⁶ *
Median	170	190	-
Number of Samples	136	136	80

* Calculated as a geometric mean

AdvanTex Effluent

	cBOD₅*	TSS*	FC**	FC / UV***	Turbidity****
Mean	4	6	1.35x10⁴	1.7	1.2
Median	3	4	-	-	0.9
Number of Samples	25	25	72	78	77
Percent Reduction	98%	97%	-	-	-

Rotorua District Council Approval Testing

(Third-Party)

About the Testing: Testing of residential wastewater treatment systems was initiated by the Rotorua District Council and Environment Bay of Plenty, the Regional Council. The purpose of the project was to compare systems so that manufacturers that meet their specifications can be preapproved. The one-year trial was focused particularly on nitrogen reduction, and includes "stress testing" and vacation simulation as well as monitoring of each system's power usage.

Dates: June 2005-August 2006

Location: New Zealand

Average Daily Flow: 265 gpd

System Configuration: Mode 3 recirculating into the primary compartment of a 1500-gallon processing tank.

Processing Tank Influent

	cBOD₅ (mg/L)	TSS (mg/L)	FC (col/100 mL)
Mean	229	341	6.8x10 ⁶
Median	233	318	8.6x10 ⁶
Number of Samples	52	52	50

AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	FC (col/100 mL)
Mean	2	3	1.2x10⁴**
Median	2	2	2.7x10 ⁴
Number of Samples	52	52	52
Percent Reduction	99%	99%	99.8%

* Calculated as a geometric mean

Start-up Testing Novatec Consultants, Inc.

(Third-Party)

About the Testing: This was part of Orenco's NSF/ANSI Standard 40 official testing, conducted by Novatec. The Standard 40 protocol allows a start-up period of three weeks. We elected to start testing within *three days* of startup. Below is the average performance for the first five days following start-up. Composite sampling was used throughout this evaluation.

Dates: May 2001

Location: British Columbia

Average Daily Flow: 500 gpd

System Configuration: AX20 Mode 1 recirculating into the second compartment of a 1500-gallon processing tank

Processing Tank Influent

	BOD₅ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	200	273	-
Number of Samples	3	3	-

AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	20	5	9
Number of Samples	3	3	3
Percent Reduction	90%	98%	-

* mg/L

** FC sample taken following AdvanTex treatment. Fecal Coliform figured as a geometric mean

*** FC sample taken following UV unit. Fecal Coliform figured as a geometric mean

**** Turbidity (NTU)

FIELD TESTING

Roger Shafer, P.E., Testing in Fractured Bedrock*

(Second-Party)

About the Testing: This test involved one AdvanTex system at a single-family home.

Dates: Summer 2001, Winter 2002, Winter 2007/2008

Location: Colorado

Average Daily Flow: 209 gpd (April 2001 and August 2001)

System Configuration: This system consisted of two AX10s (which together have the same treatment capacity as an AX20), configured in Mode 3, recirculating into the primary compartment of a 1500-gallon processing tank.

Septic Tank Effluent**

	<i>BOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>	<i>FC (col/100 mL)</i>
Mean	154	96	>10,000
Number of Samples	5	5	5

AdvanTex Effluent

	<i>BOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>	<i>FC (col/100 mL)</i>
Mean	5	6	2.0x10³
Number of Samples	13	13	13
Percent Reduction	97%	94%	-

* Roger Shafer, "Use of a Recirculating Textile Filter followed by a Polishing Sand Filter for Onsite Wastewater Treatment in Colorado's Fractured Bedrock Environment," presented at the Colorado Professional Onsite Wastewater 2008 Education Conference.

**Five septic tank effluent samples were collected from the system between April and May 2001 using a 3/4-in. clear plastic tank sampler. Samples were collected from the outlet tee of the septic tank before installation of the AdvanTex system.

Virginia Approval Testing Program

(Third-Party)

About the Testing: Conducted by Mark Gross, P.E., Ph.D., of the University of Arkansas Department of Civil Engineering, this testing program involved AX20 systems installed at 18 single-family homes, which were sampled for 18 months.

Dates: October 2002-2006

Location: Virginia

Average Daily Flow: 90-308 gpd

System Configuration: AX20 Mode 1 (4 sites) recirculating into a recirculating tank located after a separate primary septic tank; AX20 Mode 3 (14 sites) recirculating into the primary compartment of a 1500-gallon processing tank.

Mode 3 Systems, AdvanTex Effluent

	<i>cBOD₅ *</i>	<i>TSS*</i>	<i>Turbidity (NTU)</i>	<i>E. Coli**</i>
Mean	7	9	2	7.8x10²***
Median	3	5	1	1.1x10 ³

* mg/L

** mpn/100ml

*** Calculated as a geometric mean

Pennsylvania Testing Program

(Third-Party)

About the Testing: This test was performed as required by the State of Pennsylvania under its Technology Verification Program. NSF International is the third party that was contracted with to oversee the testing. The test involved AX20 systems installed at 11 single-family homes.

Dates: September 2005-2008

Location: Pennsylvania

Average Daily Flow: 100-300 gpd

System Configuration: AX20 Combo Mode recirculating into the primary compartment and secondary compartment of a 1500-gallon processing tank.

Processing Tank Influent

	<i>cBOD₅ *</i>	<i>TSS*</i>	<i>Turbidity (NTU)</i>	<i>FC (col/100ml)</i>
Mean	130	180	140	3.7x10 ⁴
Median	110	50	45	8.2x10 ⁴
No. of Samples	89	89	88	88

AdvanTex Effluent

	<i>cBOD₅ *</i>	<i>TSS*</i>	<i>Turbidity (NTU)</i>	<i>FC (col/100ml)</i>
Mean	6	10	7	9.5x10²
Median	4	5	3	6.1x10 ²
Number of Samples	211	211	213	82
Percent Reduction	95%	94%	95%	97%

* mg/L

Skaneateles Demonstration Project

(Third-Party)

About the Testing: This testing was performed as part of the Skaneateles Demonstration Project. The purpose of this project was to evaluate the performance and management of innovative technologies on single-family residences. As part of this project, two AX20 systems were installed at a single-family residence and tested.

Dates: November 2004-November 2006

Location: New York

Average Daily Flow: 106 gpd

System Configuration: AX20 Mode 1 recirculating into the second compartment of a 1500-gallon processing tank.

Mode 1 Systems, AdvanTex Effluent

	<i>cBOD₅ *</i>	<i>TSS*</i>	<i>Turbidity (NTU)</i>	<i>FC (col/100ml)</i>
Mean	4	3	1	3.5x10²**
Median	2	2	1	9.2x10 ²
Number of Samples	18	18	18	18

* mg/L

** Calculated as a geometric mean

La Pine National Demonstration Project

(Third-Party and First-Party)

About the Testing: This project is a cooperative effort by the Deschutes County Environmental Health Division, the Oregon Department of Environmental Quality, and the U.S. Geological Survey. The purpose of the project is to evaluate innovative denitrification technologies in an area of the state where climate and soil conditions are unfavorable for denitrification and the risk of groundwater contamination is high. As part of the project, three AX20 systems were installed at single-family residences. In addition to the samples required for the project, some samples were collected by Orenco.

Dates: January 2002-July 2004

Location: Oregon

Average Daily Flow: 108-334 gpd

System Configuration: AX20 Mode 3 recirculating into the primary compartment of a 1500-gallon processing tank.

Septic Tank Effluent*

	<i>BOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>	<i>FC (col/100 mL)</i>
Mean	261	94	2.3 x 10 ^{5*}
Median	240	62	1.9 x 10 ⁵
Number of Samples	428	427	429

*Average of all other sites where septic tank effluent is being sampled

Mode 3 Systems, AdvanTex Effluent

	<i>BOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>	<i>FC (mpn/100 mL)</i>
Mean	9	6*	9.9 x 10^{3*}
Median	5	3	8.8 x 10 ³
Number of Samples	92	94	67

* Calculated as a geometric mean

Green Hill Pond Watershed Demonstration Project

(Third-Party)

About the Testing: The University of Rhode Island Cooperative Extension On-Site Wastewater Training Center constructed and is testing several innovative septic systems, including five AdvanTex systems, in the Green Hill Pond Watershed. The Training Center is evaluating the systems' performance and using the installations to train installers, homeowners, designers, and regulators.

Dates: August 2003-December 2004

Location: Rhode Island

System Configuration: The project includes five AX20s at single-family homes, all configured as Mode 3, recirculating into the primary compartment of a 1500-gallon processing tank.

Mode 3 Systems, AdvanTex Effluent

	<i>cBOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>	<i>FC (col/100 mL)</i>
Mean (all sites)	8	5	1.9x10^{3*}
Median	4	2	1.0x10 ³
Number of Samples	21	24	24

* Calculated as a geometric mean

North Carolina Approval Testing Program

(Second-Party)

About the Testing: This testing, conducted under state oversight, involves more than 50 AdvanTex systems at single-family homes and vacation rentals. The data include results from both AX20 and AX100 systems.

Dates: August 2003-present

Location: North Carolina

Average Daily Flow: 75-2200 gpd

System Configuration: AX20 Mode 1 and Mode 3 and AX100. Except for one system, all were configured as Mode 1 with recirculation into a recirculation tank located after a separate primary septic tank. A single system was configured as Mode 3 with a single processing tank.

AdvanTex Effluent

	<i>cBOD₅ (mg/L)</i>	<i>TSS (mg/L)</i>
Mean	7	6
Median	3	4
Number of Samples	200	198