



**ADVANTEX TREATMENT SYTEMS
PERFORMANCE REPORT**

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AdvanTex[®] Treatment Systems

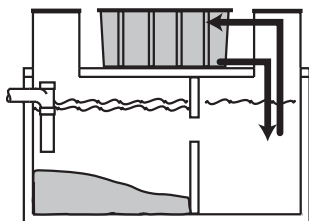
Performance Summary

Provided by
Orenco Systems[®], Inc.

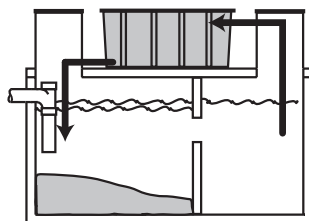
Since 2001, the performance of AdvanTex[®] Treatment Systems has been tested in nearly a dozen different programs. These include testing performed by outside companies or agencies (third-party); contract testing performed by Orenco distributors (second-party); and Orenco's own testing (first-party). More than 1000 data points are represented in these tests. The results show that AdvanTex systems easily meet advanced treatment standards for BOD, TSS, and total nitrogen.

About System Configurations

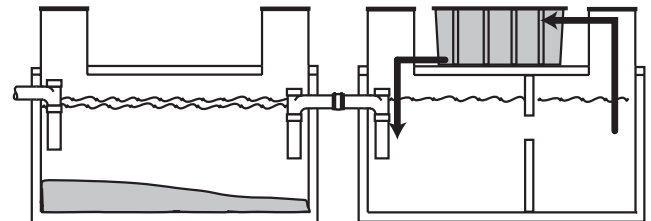
As shown in the illustrations below, AdvanTex systems can be configured in two ways depending on the degree of total nitrogen reduction required. In Mode 1, filtrate from the AdvanTex pod is recirculated to the secondary chamber of the septic tank. In Mode 3, the filtrate is recirculated to the primary chamber, where the environment favors further denitrification.



Mode 1 with processing tank



Mode 3 with processing tank



Mode 1 with primary tank and recirculation tank

BRITISH COLUMBIA

NSF Standard 40 Testing AX20 Mode 1 (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.

Although the NSF/ANSI Standard 40 protocol does not require it, Orenco elected to sample for total nitrogen.

Dates: May 2001-November 2002

Total nitrogen testing: August 2001-February 2002

Average Daily Flow: 500 gpd

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

Processing Tank Influent

	<i>cBOD₅</i> (mg/L)	<i>TSS</i> (mg/L)	<i>Total N</i> (mg/L)
Mean	166	292	33
Median	140	200	32
Standard Deviation	82	219	8
Number of Samples	108	108	27

AdvanTex Effluent

	<i>cBOD₅</i> (mg/L)	<i>TSS</i> (mg/L)	<i>Total N</i> (mg/L)	<i>Turbidity</i> (NTU)
Mean	5	4	12	4
Median	3	3	13	4
Standard Deviation	3	6	3	1
Number of Samples	109	109	27	118*
Percent Reduction	97%	99%	64%	NA

* Took samples during stress periods

BRITISH COLUMBIA

Startup Testing, AX20 Mode 1 (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. Composite sampling was used throughout this evaluation.

Dates: May 2001

Average Daily Flow: 500 gpd

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

Processing Tank Influent

	cBOD ₅ (mg/L)	TSS (mg/L)
Mean	204	316
Number of Samples	5	5

AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	17	4	9
Number of Samples	5	5	5
Percent Reduction	98%	99%	

BRITISH COLUMBIA

AX20 Mode 3 (Third-Party)

About the Testing: After completion of the NSF/ANSI Standard 40 testing, Orenco contracted with Novatec to evaluate denitrification performance of the same AX20 system in Mode 3. Composite sampling was used throughout this evaluation.

Dates: December 2002-December 2003

Average Daily Flow: 500 gpd

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

Processing Tank Influent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	112	170	34
Median	104	137	33
Standard Deviation	42	48	7
Number of Samples	7	7	5

AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)	Turbidity (NTU)
Mean	7	9	10	9
Median	5	5	10	6
Standard Deviation	8	9	3	5
Number of Samples	9	9	24	23
Percent Reduction	94%	95%	71%	NA

COLORADO

Roger Shafer, "Use of a Recirculating Textile Filter Followed by a Polishing Sand Filter..."^{*} AX20 Mode 3 (Second-Party)

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

Dates: Summer 2001

Average Daily Flow: 209 gpd (April 2001-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 to the primary compartment of a 1500-gallon processing tank.

Septic Tank Effluent^{**}

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)	Fecal Coliform ^{***} (col/100 mL)
Mean	154	96	38	>10,000
Number of Samples	5	5	5	5

AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)	Fecal Coliform ^{***} (col/100 mL)
Mean	5	6	13	4522
Number of Samples	5	5	5	5
Percent Reduction	97%	94%	66%	NA

^{*} 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 Fractured-Rock Aquifers 2002 Conference, March 13-15, Denver, Colorado

^{**} Five septic 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.

^{***} Calculated as geometric mean

COLORADO

Jefferson County Required Testing AX20 and AX30 Mode 3 (Second-Party)

About the Testing: Orenco distributor Roger Shafer sampled 27 systems at single-family residences as required by the Jefferson County Health Department as an operating permit requirement.

Dates: October 2003 and May 2004

System Configuration: Three AX20 systems and twenty-three AX30 (AX20 & AX10) systems were all configured as Mode 3, recirculating into the primary compartment of a processing tank.

AdvanTex Effluent

	Total N (mg/L)	AX30	AX20
Mean	17	17	
Median [*]	14	14	
Standard Deviation [*]	5	2	
Number of Samples	37	7	

^{*} For the 10 sites that have more than one sample

NEW YORK

Skaneateles Demonstration Project AX20 Mode 1 (Third-Party)

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

Dates: November 2004-December 2005

Average Daily Flow: 106 gpd

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

Mode 1 Systems, AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	4	3	20
Median	2	3	19
Standard Deviation	4	2	4
Number of Samples	9	9	9

NEW ZEALAND

AX20 Mode 3 (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 is to compare systems so that manufacturers that meet their specifications can be preapproved. The one-year trial is focused particularly on nitrogen reduction, and includes "stress testing" and vacation simulation as well as monitoring of each system's power usage.

Dates: May 2005-January 2006

Average Daily Flow: 265 gpd

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

Processing Tank Influent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	199	301	66
Median	209	232	62
Standard Deviation	95	239	24
Number of Samples	33	31	60

AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	3	4	22
Median	3	4	17
Standard Deviation	2	3	10
Number of Samples	26	26	62
Percent Reduction	98%	99%	67%

NORTH CAROLINA

Controlled Demonstration Testing Program AX20 Mode 1 and Mode 3 and AX100 (Second-Party)

About the Testing: This test, conducted under state oversight, involved 15 AdvanTex systems at single-family homes and vacation rentals. The data include results from both AX20 and AX100 systems.

Dates: August 2003-present

Average Daily Flow: 75-2200 gpd

System Configuration: All but one system 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.

Mode 1 Systems, Septic Tank Influent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N* (mg/L)	Fecal Coliform** (col/100 mL)
Mean	214	55	67	NA
Median	231	57	72	NA
Standard Deviation	90	13	19	NA
Number of Samples	30	30	26	NA

Mode 1 Systems, AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N*** (mg/L)	Fecal Coliform** (col/100 mL)
Mean	4	5	25	1655
Median	4	5	22	1710
Standard Deviation	2	2	11	2857
Number of Samples	47	46	42	27
Percent Reduction	98%	91%	63%	NA

Mode 3 Systems, AdvanTex Effluent

	cBOD₅ (mg/L)	TSS (mg/L)	Total N*** (mg/L)	Fecal Coliform** (col/100 mL)
Mean	6	6	12	2312
Median	5	6	12	2800
Standard Deviation	2	1	2	2652
Number of Samples	3	3	2	3

* TN as TKN

** Calculated as geometric mean

*** TN = TKN + NO₃-N + NO₂-N

OREGON

La Pine National Demonstration Project AX20 Mode 3 (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 was 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-present

Average Daily Flow: 108-334 gpd

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

Septic Tank Effluent*

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)	Fecal Coliform** (col/100 mL)
Mean	288	112	61	5.5 x 10 ⁴
Median	270	66	62	4.0 x 10 ⁴
Standard Deviation	140	204	20	4.5 x 10 ⁶
Number of Samples	70	70	70	70

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

** Calculated as geometric mean

Mode 3 Systems, AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)	Fecal Coliform** (col/100 mL)
Mean	11	7	17	2.0 x 10⁴
Median	10	6	16	2.3 x 10 ⁴
Standard Deviation	5	3	6	9.9 x 10 ³
Number of Samples	92	94	92	67
Percent Reduction	96%	94%	72%	64%

* Calculated as geometric mean

RHODE ISLAND

Green Hill Pond Watershed Demonstration Project AX20 Mode 3 (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-present

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

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean (all sites)	7	5	19
Median	4	2	13
Standard Deviation	6	8	18
Number of Samples	9	9	9

VIRGINIA

AX20 Mode 1 and Mode 3 (Third-Party)

About the Testing: Conducted by Mark Gross, PE, PhD, of the University of Arkansas Department of Civil Engineering, this test involved AX20 systems installed at 13 single-family homes.

Dates: October 2002-present

Average Daily Flow: 90-308 gpd

System Configuration: Mode 1 (4 sites) recirculating into a recirculating tank located after a separate primary septic tank; Mode 3 (13 sites) recirculating into the primary compartment of a 1500-gallon processing tank

Mode 3 Systems, AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	5	7	19
Median	4	7	18
Standard Deviation	7	7	11
Number of Samples	85	85	85

VARIOUS LOCATIONS

AX100 (First-, Second-, and Third-Party)

About the Testing: Data is being collected from twenty-one AX100 systems on various commercial and large residential applications.

Dates: June 2002-present

Average Daily Flow: 1100-120,000 gpd

System Configuration: All the systems are AX100s. None are configured to achieve the maximum amount of nitrogen reduction possible.

Septic Tank Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	410	128	55
Median	361	77	53
Standard Deviation	261	171	24
Number of Samples	35	35	11

AdvanTex Effluent

	cBOD ₅ (mg/L)	TSS (mg/L)	Total N (mg/L)
Mean	7	7	18
Median	5	5	19
Standard Deviation	5	4	15
Number of Samples	161	161	44
Percent Reduction	98%	95%	60%