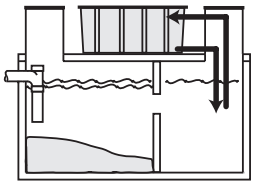
Handout

AdvanTex® General Reduction
Performance Summary

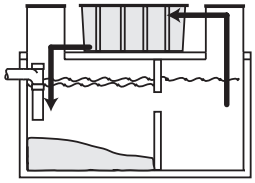
Since 2001, the performance of AdvanTex Treatment Systems has been tested in a dozen different programs, both in test centers and in the field. These programs include **first-party testing** by Orenco, **second-party testing** by Orenco distributors, and **third-party testing** by outside companies or agencies. This summary documents the performance of AdvanTex Treatment Systems in reducing $CBOD_5$, TSS, and Fecal Coliform (FC) and shows that AdvanTex systems easily meet advanced treatment standards for these parameters.

AdvanTex systems can be configured in different modes, depending on the degree of total nitrogen reduction needed (see illustrations below). In Mode 1, filtrate from the AdvanTex unit is recirculated to the secondary chamber of the septic tank. In Mode 3, filtrate is recirculated to the primary chamber, where the environment favors further nitrogen reduction. See AdvanTex Nutrient Reduction Performance Summary (NHO-ATX-000-2). In the Combo Mode, filtrate from the AdvanTex pod is recirculated to both chambers. There is also a Mode 1 configuration 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.

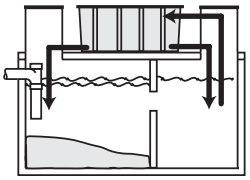
The table below summarizes effluent results from test centers and field tests. More specific results are shown on the following pages. If you have any questions about this summary, please contact Orenco's Government Relations Department.



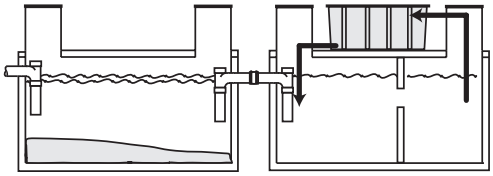
Mode 1



Mode 3



Combo Mode



Mode 1 with primary tank and recirculation tank

Test Centers

AdvanTex Effluent Averages	$CBOD_5$ (mg/L)	TSS (mg/L)	FC* (MPN/100mL)	Duration
NSF/ANSI Standard 40 Testing	5	4	-	6 months
Rotorua District Council Approval Testing	2	3	1.2×10^4	9 months
NSF/ANSI Standard 40 Testing with UV Disinfection	4	6	$1.35 \times 10^{4\,\dagger}$	7 months
New Zealand On-site Effluent Treatment National Testing Program	3	4	-	10 months

Field Testing

AdvanTex Effluent Averages (# of single-family residences)	$CBOD_5$ (mg/L)	TSS (mg/L)	FC* (units vary)	Duration
Roger Shafer, P.E., Testing in Fractured Bedrock (1)	5	6	4.5×10^3	8 months
La Pine National Demonstration Project (3)	9	6	9.9×10^3	2 years, 7 months
Virginia Approval Testing Program (18)	7	9	7.8×10^2	1 year, 6 months
Green Hill Pond Watershed Demonstration Project (5)	8	5	1.9×10^3	1 year, 4 months
North Carolina Approval Testing Program (>50) ‡	7	6	-	4 years
Pennsylvania Testing Program (11)	6	10	9.5×10^2	1-3 years
Maryland Best Available Technology Field Verification (12)**	5	4	-	1 year

** FC sample taken following AdvanTex treatment; fecal coliform calculated as a geometric mean*

† FC dropped to 1.7MPN/100mL following ultraviolet disinfection

‡ Included single-family residences and vacation rentals

*** AdvanTex AX20-RT*

TEST CENTERS

NSF/ANSI Standard 40 Testing *(Third Party)*

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 British Columbia. The testing used composite sampling and was done at a wastewater facility that serves a residential subdivision.

- **Dates/Location:** May-November, 2001, British Columbia, Canada
- **Average Daily Flow:** 500gpd (1893L/day)
- **System Configuration:** AX20 Mode 1 recirculating into the secondary compartment of a 1500gal (5678L) tank

Processing Tank Influent

	BOD_5 (mg/L)	TSS (mg/L)
Mean	162	291
Median	130	200
Number of Samples	102	108

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	5	4	4
Median	3	3	4
Number of Samples	109	109	117*
Reduction	97%	99%	-

** Samples taken during stress periods*

Rotorua District Council Approval Testing

(Third Party)

Testing of residential wastewater treatment systems was initiated by the Rotorua District Council and the Bay of Plenty Regional Council. The purpose of this project was to compare systems so that manufacturers meeting specifications could be preapproved. The trial focused on nitrogen reduction and included stress testing, vacation simulation, and monitoring each system's power usage.

- **Dates/Location:** June 2005-August 2006, Rotorua, New Zealand
- **Average Daily Flow:** 265gpd (1003L/day)
- **System Configuration:** Mode 3 recirculating into the primary compartment of a 1500gal (5678L) processing tank

Processing Tank Influent

	$CBOD_5$ (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean	229	341	6.8×10^6
Median	233	318	8.6×10^6
Number of Samples	52	52	50

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean	2	3	1.2×10^4 *
Median	2	2	2.7×10^4
Number of Samples	52	52	52
Reduction	99%	99%	99.8%

** Calculated as a geometric mean*

NSF/ANSI Standard 40 Testing with UV Disinfection *(Third Party)*

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 British Columbia. The testing used composite sampling and was done at a wastewater facility that serves a residential subdivision.

Dates/Location: July-December, 2006, British Columbia, Canada

- **Average Daily Flow:** 500gpd (1893L/day)
- **System Configuration:** AX20 Mode 1 recirculating into the second compartment of a 1500gal (5678L) tank with UV disinfection

Processing Tank Influent

	BOD_5 (mg/L)	TSS (mg/L)	FC (CFU/100mL)
Mean	180	210	3.37×10^6 *
Median	170	190	-
Number of Samples	136	136	80

** Calculated as a geometric mean*

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)	FC*	FC/UV†	Turbidity (NTU)
Mean	4	6	1.35×10^4 ‡	1.7‡	1.2
Median	3	4	-	-	0.9
Number of Samples	25	25	72	78	77
Reduction	98%	97%	-	-	-

** FC sample taken following AdvanTex treatment*

† FC sample taken following UV unit

‡ Calculated as a geometric mean

New Zealand On-Site Effluent Treatment National Testing Program *(Third Party)*

In 2009, New Zealand released a national standard and testing protocol for on-site effluent treatment. Tests of AdvanTex AX20 systems were carried out at the Rotorua Testing Facility and measured $CBOD_5$, TSS, and total nitrogen reduction, as well as electrical power consumption.

- **Dates/Location:** November 2009-August 2010, Rotorua, New Zealand
- **Average Daily Flow:** 287gpd (1086L/day)
- **System Configuration:** AX20 Mode 3

Processing Tank Influent

	$CBOD_5$ (mg/L)	TSS (mg/L)
Mean	198	203
Median	192	208
Number of Samples	46	46

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)
Mean	3	4
Median	2	3
Number of Samples	43	43
Reduction	99%	98%

FIELD TESTING

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

(Second Party)

This test included one AdvanTex system at a single-family home.

- **Dates/Location:** Summer 2001 and Winter 2002, 2007, 2008; Colorado, USA
- **Average Daily Flow:** 209gpd (791L/day), April and August, 2001
- **System Configuration:** Two AX10s (which together have the same treatment capacity as an AX20) configured in Mode 3, recirculating to the primary compartment of a 1500gal (5678L) processing tank

** 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*

Septic Tank Effluent*

	BOD_5 (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean	154	96	>10,000
Number of Samples	5	5	5

AdvanTex Effluent

	BOD_5 (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean	5	6	2.0×10^3
Number of Samples	13	13	13
Reduction	97%	94%	-

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

La Pine National Demonstration Project

(First Party, Third Party)

This project was a cooperative effort by the Deschutes County Environmental Health Division, the Oregon Department of Environmental Quality, and the US Geological Survey. Denitrification technologies were evaluated in an area where the risk of groundwater contamination is high, and climate and soil conditions are unfavorable for denitrification. Three AX20 systems were installed at single-family residences.

- **Dates/Location:** January 2002-July 2004, Oregon, USA
- **Average Daily Flow:** 108-334gpd (409-1264L/day)
- **System Configuration:** AX20 Mode 3 recirculating into the primary compartment of a 1500gal (5678L) processing tank

Septic Tank Effluent

	BOD_5 (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean	261	94	2.3×10^{5} *
Median	240	62	1.9×10^{5}
Number of Samples	428	427	429

** Calculated as a geometric mean*

AdvanTex Effluent (Mode 3 Systems)

	BOD_5 (mg/L)	TSS (mg/L)	FC (MPN/100mL)
Mean	9	6	9.9×10^3 *
Median	5	3	8.8×10^3
Number of Samples	92	94	67

Virginia Approval Testing Program *(Third Party)*

This testing was conducted by Mark Gross, P.E., Ph.D., of the University of Arkansas Department of Civil Engineering and used AdvanTex AX20 systems, which were installed at 18 single-family homes and sampled for 18 months.

- **Dates/Location:** October 2002-October 2006, Virginia, USA
- **Average Daily Flow:** 90-308gpd (341-1166L/day)
- **System Configurations:** AX20 Mode 1 (4 sites) recirculating into a recirc tank following a separate primary septic tank; AX20 Mode 3 (14 sites) recirculating into the primary compartment of a 1500gal (5678L) processing tank

AdvanTex Effluent (Mode 3 Systems)

	$CBOD_5$ (mg/L)	TSS (mg/L)	Turbidity (NTU)	E. Coli (MPN/100mL)
Mean	7	9	2	7.8×10^2 *
Median	3	5	1	1.1×10^3

** Calculated as a geometric mean*

Green Hill Pond Watershed Demonstration Project *(Third Party)*

The University of Rhode Island Cooperative Extension On-Site Wastewater Training Center constructed and tested several treatment systems, including five AdvanTex systems, in the Green Hill Pond Watershed. The Training Center evaluated the systems' performance while training installers, homeowners, designers, and regulators.

- **Dates/Location:** August 2003-December 2004, Rhode Island, USA
- **System Configuration:** Five AX20s at single-family homes, all configured as Mode 3 and recirculating into the primary compartment of a 1500gal (5678L) processing tank

AdvanTex Effluent (Mode 3 Systems)

	$CBOD_5$ (mg/L)	TSS (mg/L)	FC (col/100mL)
Mean (all sites)	8	5	1.9×10^3 *
Median	4	2	1.0×10^3
Number of Samples	21	24	24

** Calculated as a geometric mean*

FIELD TESTING, CONT.

North Carolina Approval Testing Program

(Second Party)

This testing was conducted under state oversight and involved more than 50 AdvanTex systems at single-family homes and vacation rentals. The data include results from both AX20 and AX100 systems.

- **Dates/Location:** August 2003-2005, North Carolina, USA
- **Average Daily Flow:** 75-2200gpd (284-8328L/day)
- **System Configurations:** AX20 Mode 1, AX20 Mode 3, and AX100; one system configured as Mode 3 with a single processing tank, and all others configured as Mode 1 with recirculation into a recirc tank following a separate primary septic tank

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)
Mean	7	6
Median	3	4
Number of Samples	200	198

Pennsylvania Testing Program *(Third Party)*

This test was performed as required by the State of Pennsylvania under its Onlot Technology Verification Program. NSF International was contracted to oversee the testing, which used AX20 systems installed at 11 single-family homes.

- **Dates/Location:** September 2005-2008, Pennsylvania, USA
- **Average Daily Flow:** 100-300gpd (379-1136L/day)
- **System Configuration:** AX20 Combo Mode recirculating into the primary compartment and secondary compartment of a 1500gal (5678L) processing tank

Processing Tank Influent

	$CBOD_5$ (mg/L)	TSS (mg/L)	Turbidity (NTU)	FC (col/100mL)
Mean	130	180	140	3.7×10^4
Median	110	50	45	8.2×10^4
Number of Samples	89	89	88	88

AdvanTex Effluent

	$CBOD_5$ (mg/L)	TSS (mg/L)	Turbidity (NTU)	FC (col/100mL)
Mean	6	10	7	9.5×10^2
Median	4	5	3	6.1×10^2
Number of Samples	211	211	213	82
Reduction	95%	94%	95%	97%

Maryland Best Available Technology Field Verification *(Third Party)*

Field verification testing was performed on AdvanTex AX20-RT units to qualify them for the "Best Available Technology" designation in Maryland. Twelve single-family residences were selected for the AdvanTex installations, with each system being sampled every quarter for one year.

- **Dates/Location:** August 2010-March 2012, Maryland, USA
- **Average Daily Flow:** 100-400gpd (379-1514L/day)
- **System Configuration:** AX20-RT Mode 3

AdvanTex Effluent (Mode 3 Systems)

	$CBOD_5$ (mg/L)	TSS (mg/L)	Turbidity (NTU)
Mean	5	4	2
Median	4	2	2
Number of Samples	44	39	48