Design

Residential Applications

Our Presenter

Joshua Billman

Joshua Billman is a Technical Sales Representative with Orenco Systems, Inc., a wastewater equipment manufacturing firm based in Sutherlin, Oregon. In this role, he handles residential sales and technical support for a number of U.S. states and Canadian provinces in Orenco's East Region. He helps familiarize customers with Orenco's products, assists them in determining proper equipment selection, and handles quote requests and purchase orders. Before joining Orenco, Josh served in the U.S. Navy. He also has a variety of valuable work experience in the electronics, communications, and wastewater industries.

Josh holds a bachelor's degree in visual communications from AIU. When he's not on the job, he loves to spend time with his wife and children. He's also an outdoor enthusiast who especially enjoys fishing at high mountain lakes with his family.

AdvanTex® Design Module Outline

- Filter type
- Performance data
- Processing tank requirements
- System settings
- Ventilation requirements
- Disinfection
- Power requirements
- Siting considerations
- Effluent reuse

Sustainability

"Advanced onsite wastewater treatment systems are a permanent part of the nations infrastructure and must be managed as such."

Albert Rubin – Professor Emeritus, NC State University

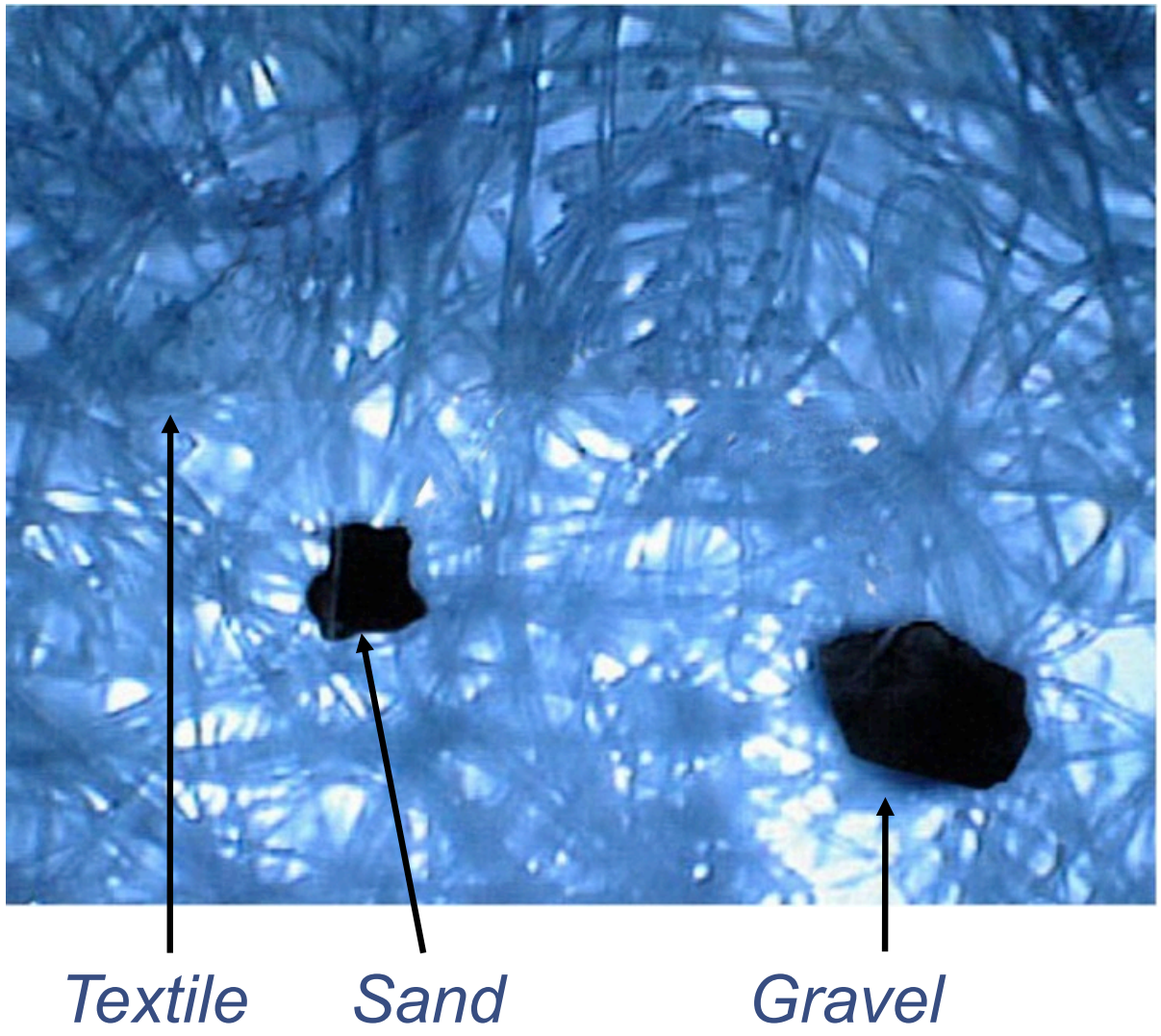
Filter Type
AX20

- Physical specifications
  - ~ 7.5' x 3' x 2.5'
  - ~ Footprint: ~23 sq. ft.
  - ~ Dry weight: ~300 lb.

AX Series

- Uses hanging textile sheets
- Can withstand occasional abnormally high loading conditions
- Has outstanding serviceability

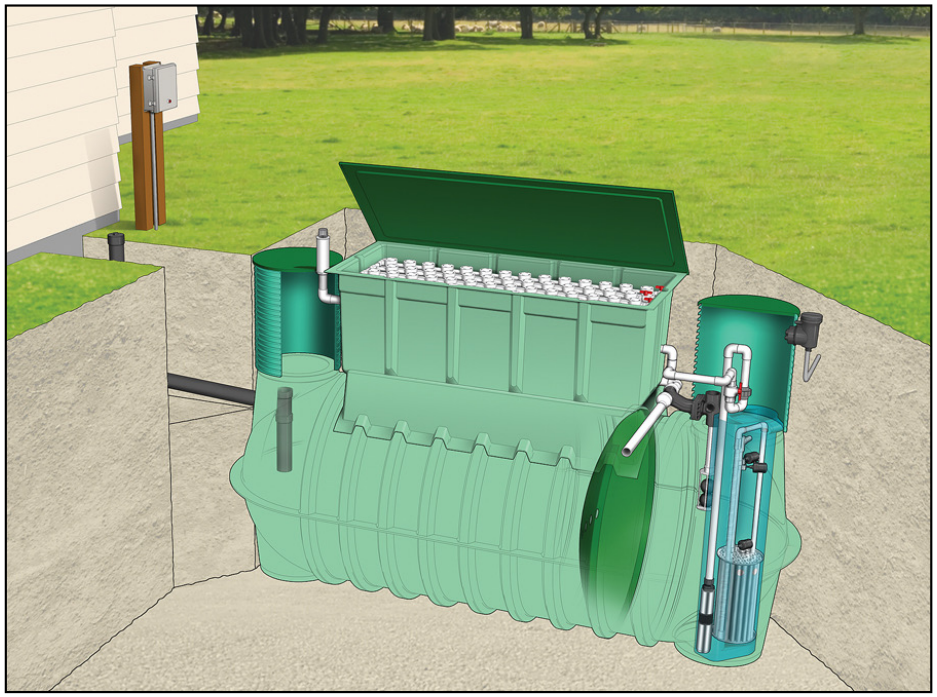
Finding the Right Media



AdvanTex® Overview

Main Components

- Control panel
- Processing tank
- Biotube® pump package
- AdvanTex filter with vent
- Recirculating splitter valve



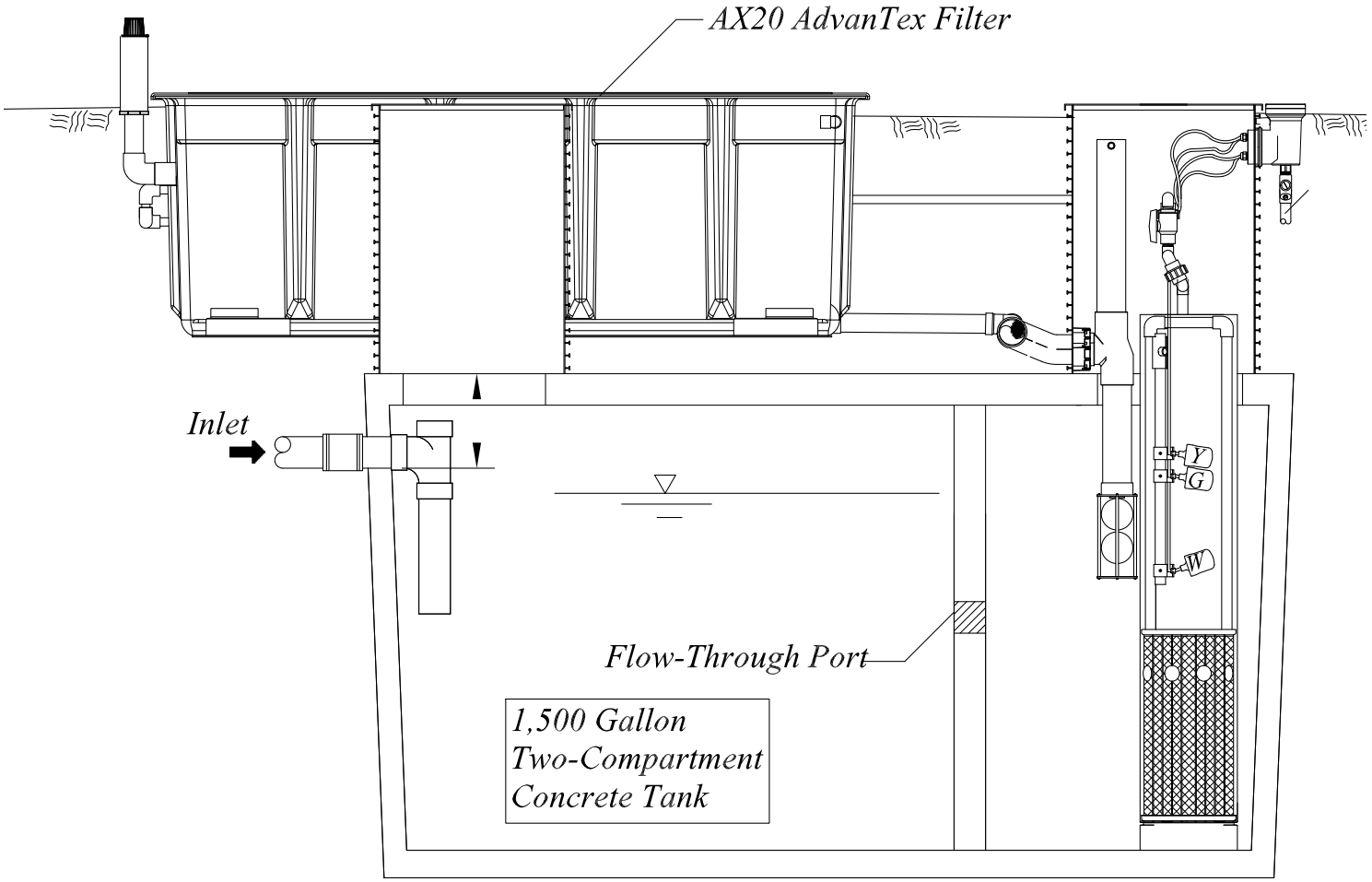
AdvanTex® Filter Installation

- Processing tank
- Filter
- Passive vent
- Treated effluent basin

Modes of Operation

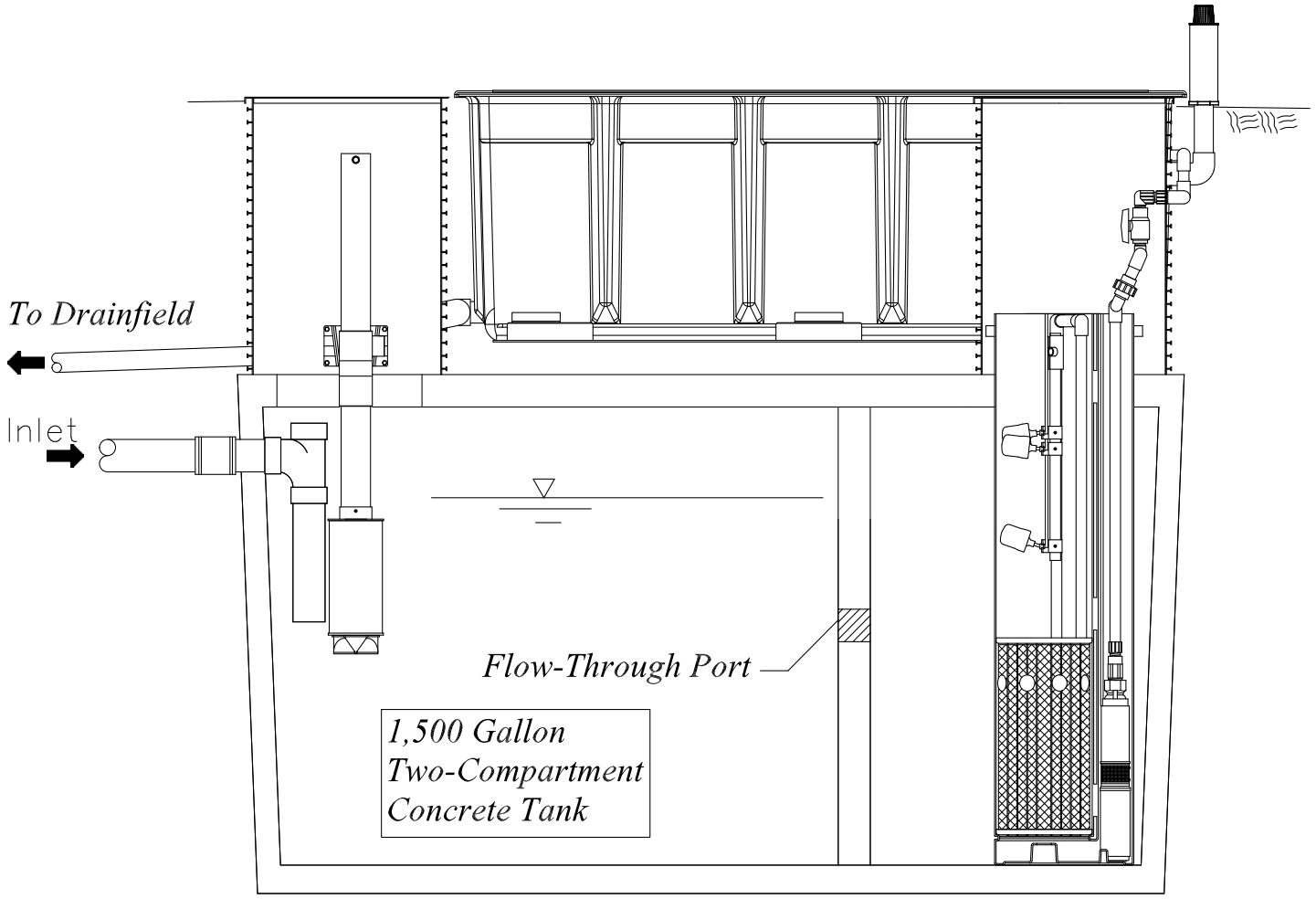
- AdvanTex® Treatment Systems available in two different modes
  - Mode 1: BOD_5 and TSS the primary concern
  - Mode 3: Nitrogen reduction maximized
- Mode determined by local and state regulations

Mode 1: Standard Configuration – AX20



Recirculates through 2nd chamber: Filtrate discharge.

Mode 3: Maximizing Nitrogen Reduction - AX20



Recirculates through both chambers: Filtrate discharge

Performance Data

Definition of Design Flow

- The maximum daily flow a residence is expected to produce
  - ~ Allows for a safety margin and reserve capacity during periods of heavy use

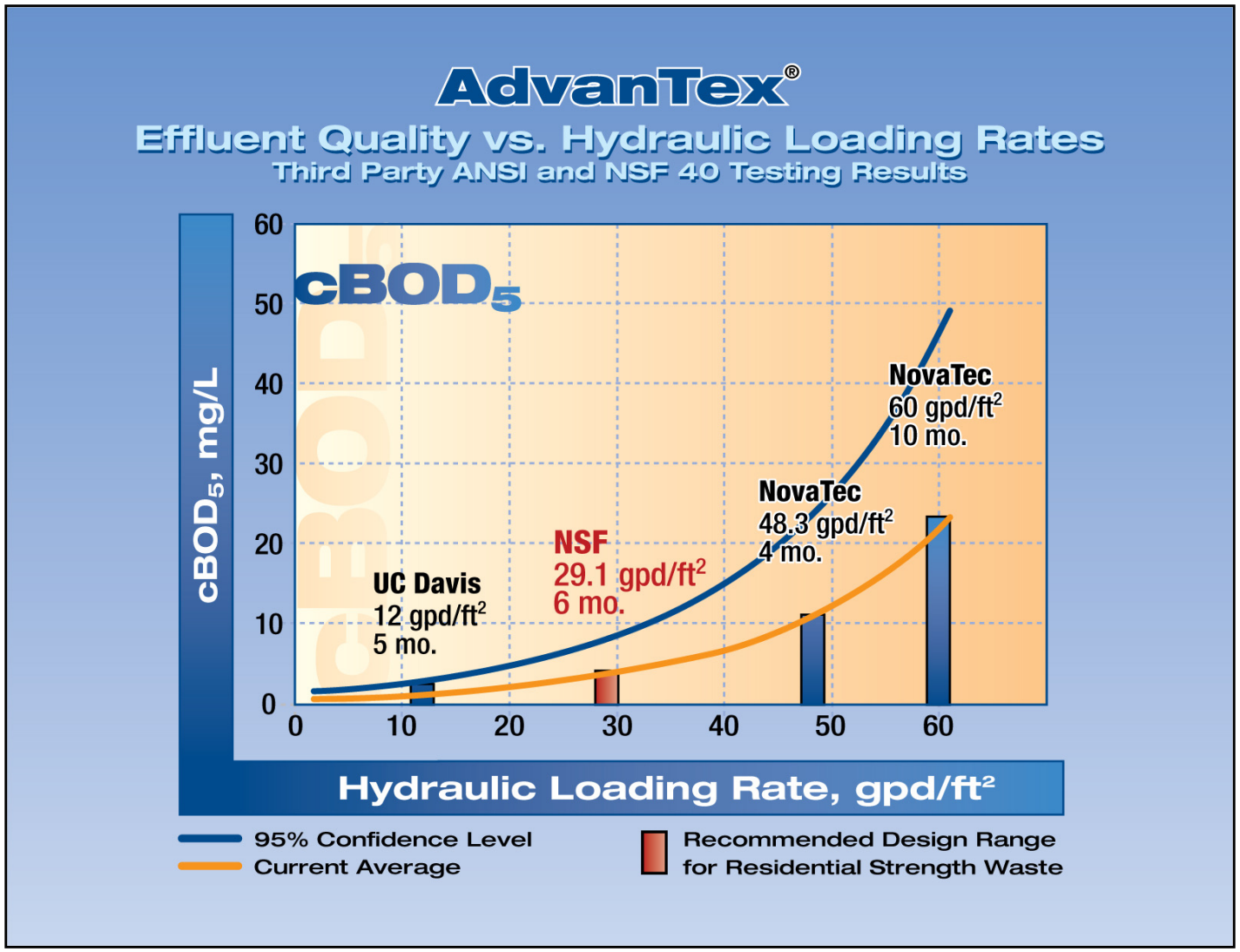
Determine Waste Strength

Screened Residential Effluent*

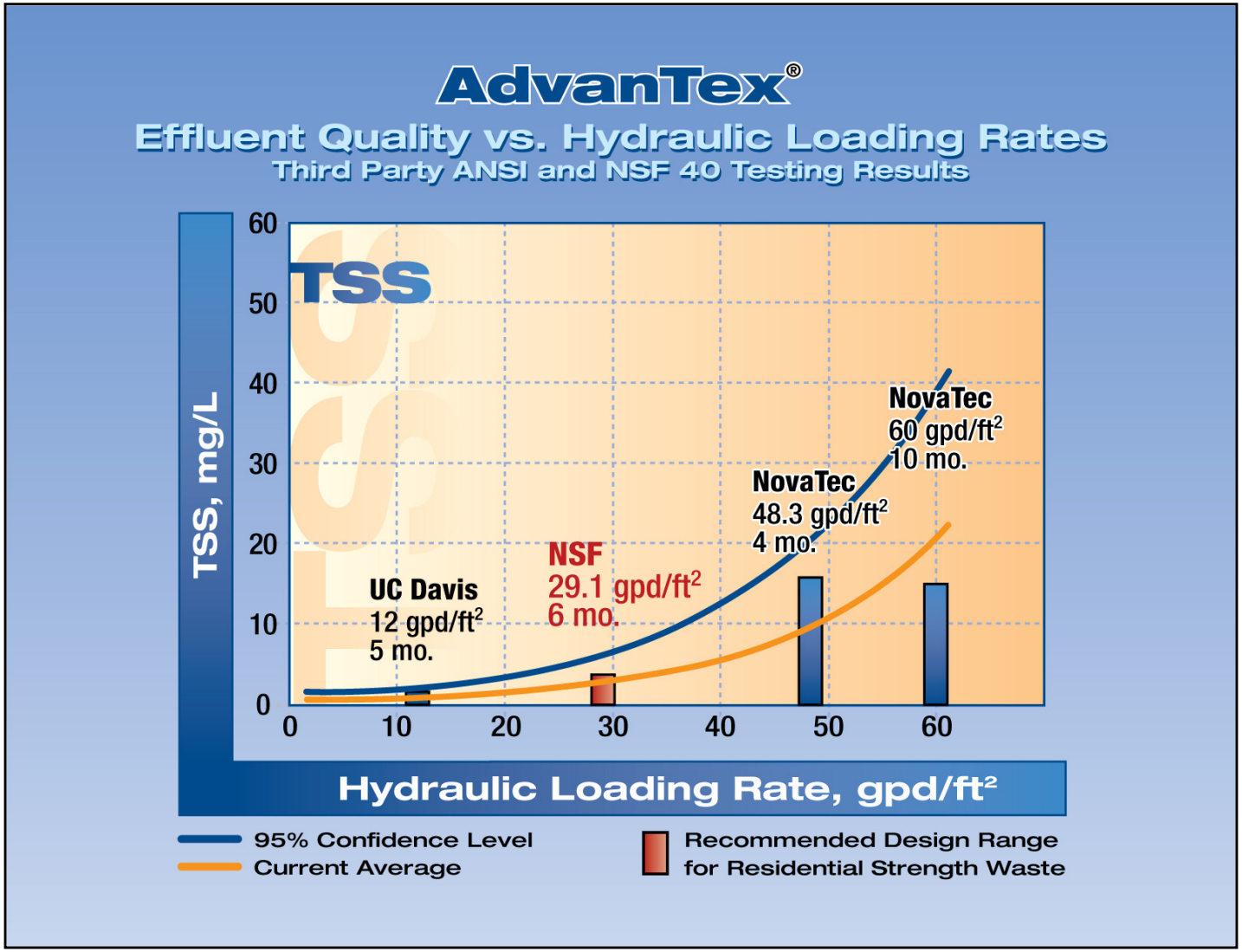
	Average *mg/L*	Weekly Peak *mg/L*	Rarely Exceed *mg/L*
$cBOD_5$	**150**	200	300
TSS	**40**	60	150
TKN	**65**	75	150
G&O	**20**	25	25

** From structurally sound and watertight tanks.*

Performance vs. Loading Rates, $cBOD_5$



Performance vs. Loading Rates, TSS



Performance Data Sources

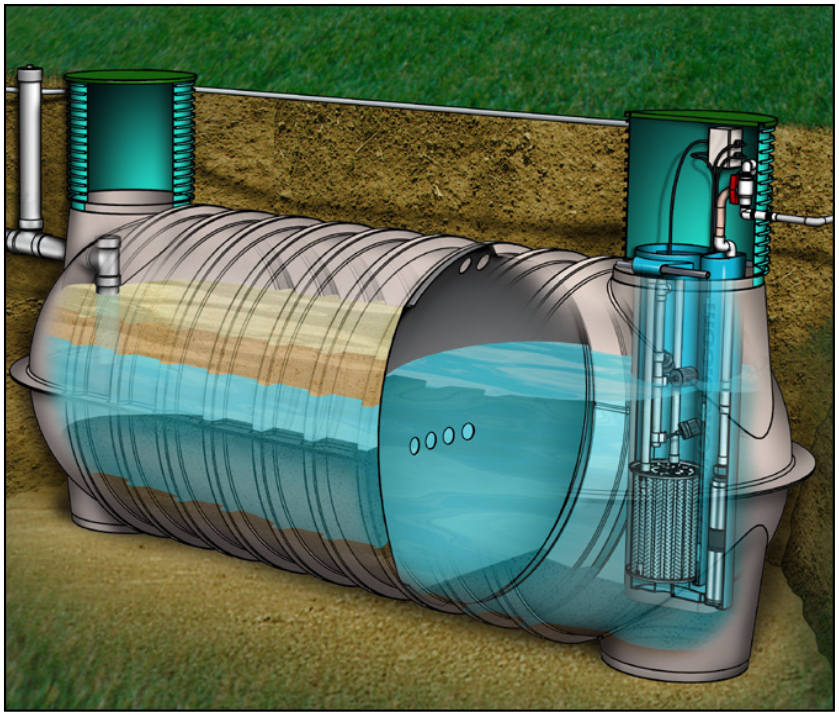
- NSF 40 testing and evaluation to ANSI standards
- NovaTec testing and evaluation to ANSI standards
- EPA national demonstration projects
- State demonstration projects
- University research projects
  - ~ UC Davis, University of MN
- Private installations
  - ~ Throughout U.S., Canada, New Zealand
- Performance summary in real world data

Nitrogen Reduction

- Depends on alkalinity of WW, strength of WW, pH, G&O, etc.
- Mode 1: Typically exceeds 60% reduction; TN of 25 to 35 mg/L
- Mode 3: Typically exceeds 70% reduction

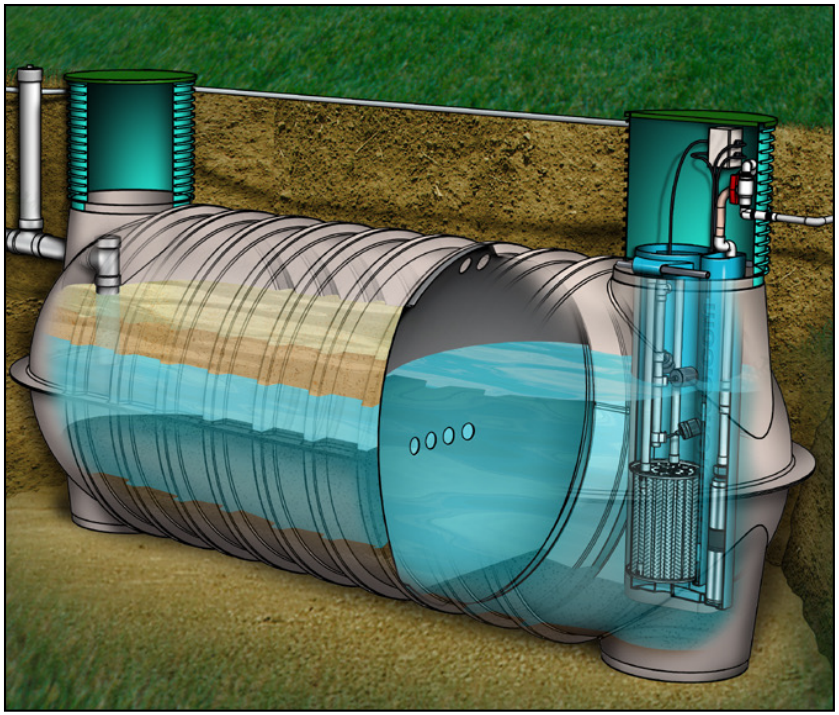
Processing Tank Requirements Residential

- Two-compartment tank with “center pass-through” design
- Must be structurally sound and watertight
- Must be from Orenco-approved tank manufacturer/design



Two-Compartment Processing Tank

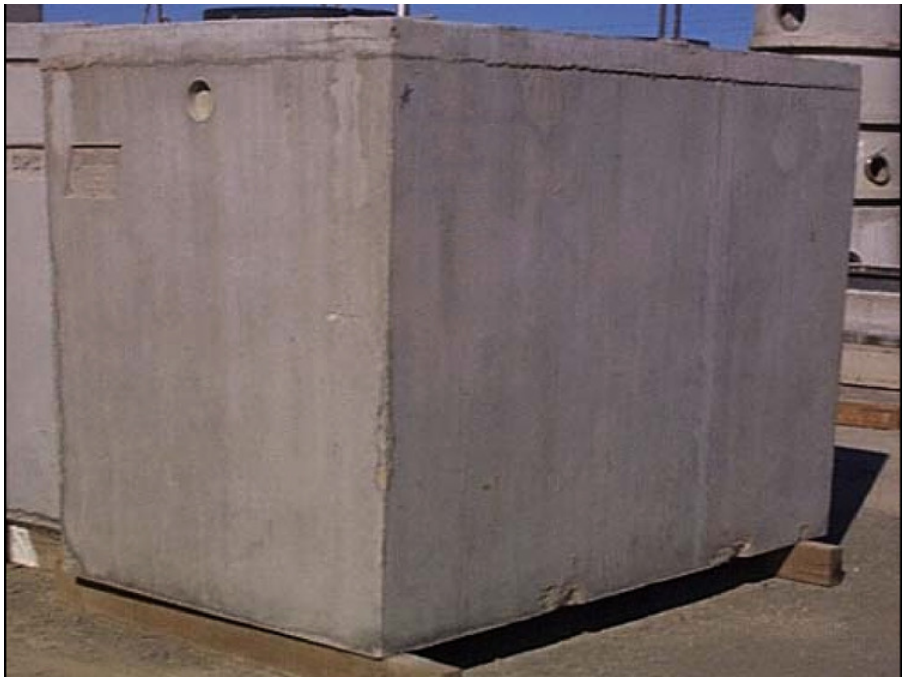
- Minimum 12-square-inch pass-through port in baffle wall
- Port center located at 65 to 75% of minimum liquid level

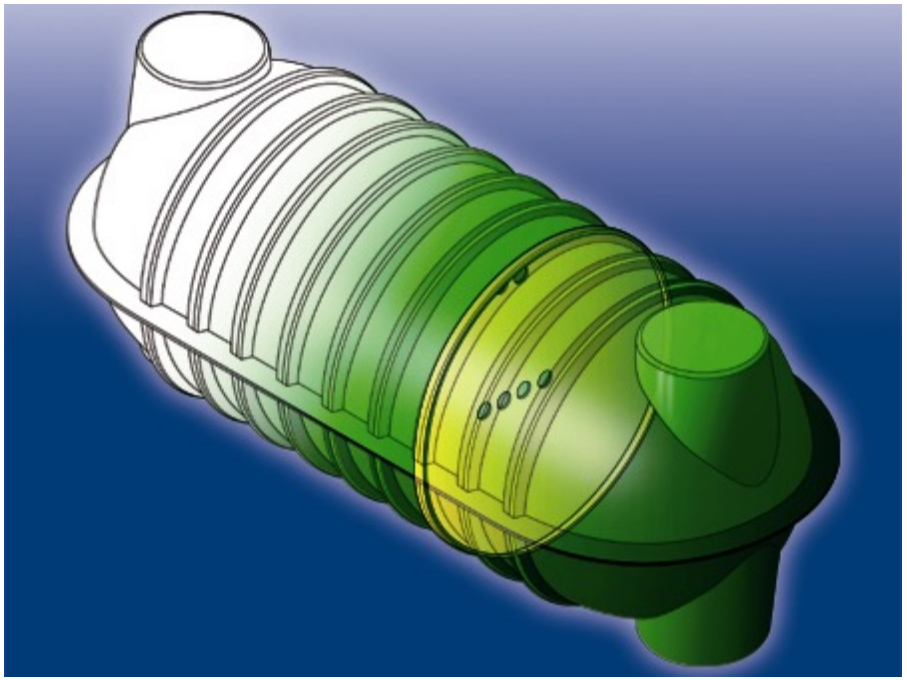


Materials of Tank Construction

Tanks must ...

- Be concrete or fiberglass
- Meet Orenco's General Specifications Guidelines
- Be approved for use with AdvanTex® Treatment Systems





Required Number of Filter Units and Tankage*

Table 2. Required Tankage and Number of Filter Units: Systems Using Single Processing Tank

Number of Bedrooms[1]	Occupants[2] *maximum*	Processing Tank *minimum size, gal. (L)*	AX Units[4] *model*
4 (or fewer)	8	1,500 (5,700)	1 – AX20[5]
5	10	2,500 (9,500)	2 – AX20[5]
6	12	3,000 (11,400)	2 – AX20[5]

Table 3. Recommended Tankage and Number of Filter Units: Systems Using Separate Septic/Recirc Tanks*

Number of Bedrooms[1]	Occupants[2] *maximum*	Septic Tank *minimum size, gal. (L)*	Recirc Tank[3] *minimum size, gal. (L)*	AX Units[4] *model*
4 (or fewer)	8	1,000 (3,800)	1,000 (3,800 L)	1 – AX20[5]
5	10	1,500 (5,700)	1,000 (3,800 L)	2 – AX20[5]
6	12	2,000 (7,600)	1,000 (3,800 L)	2 – AX20[5]

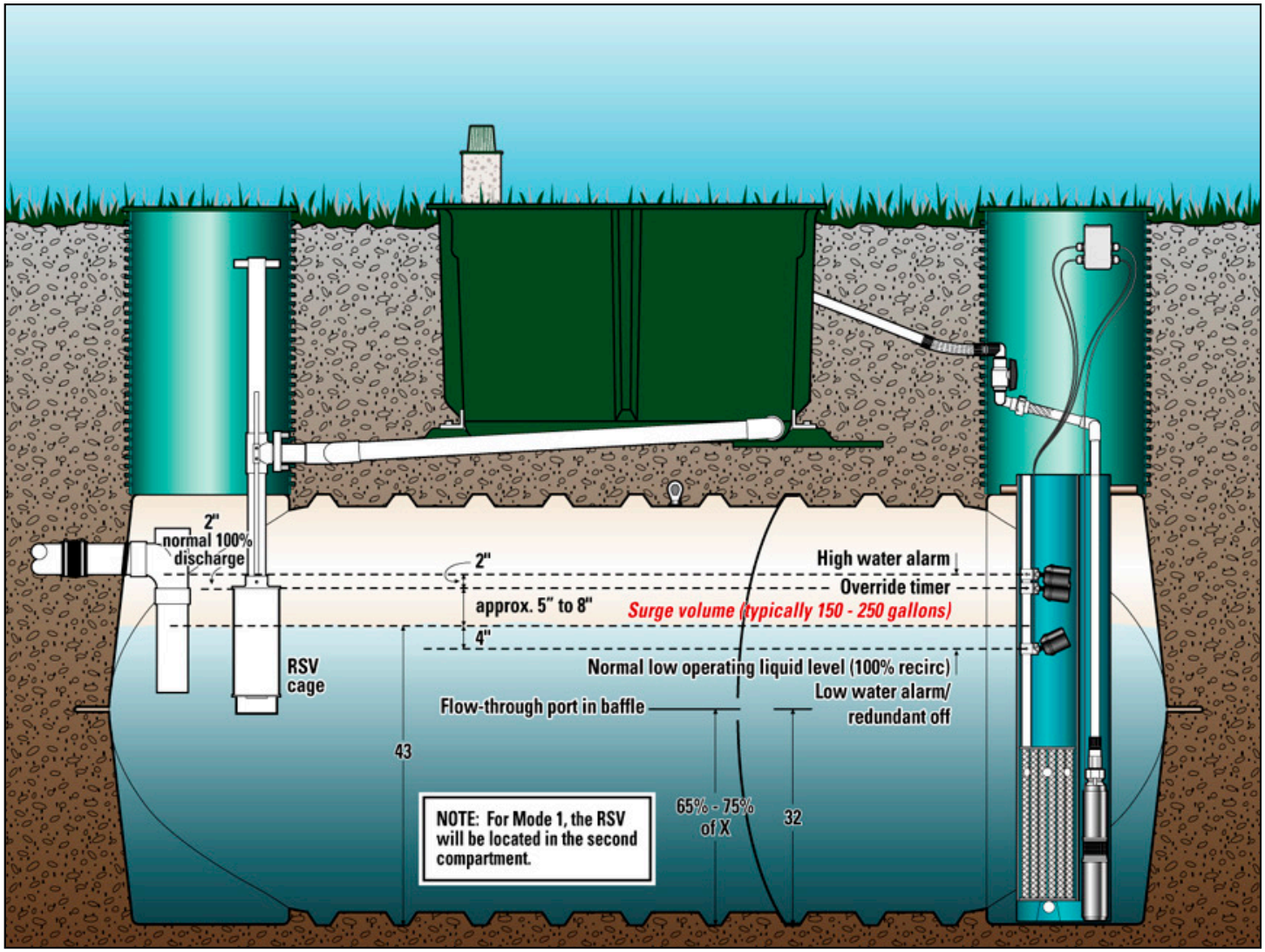
** In jurisdictions which require separate septic and recirc tankage, contact Orenco for options.*

System applications > 6 bedrooms will require a design review by Orenco

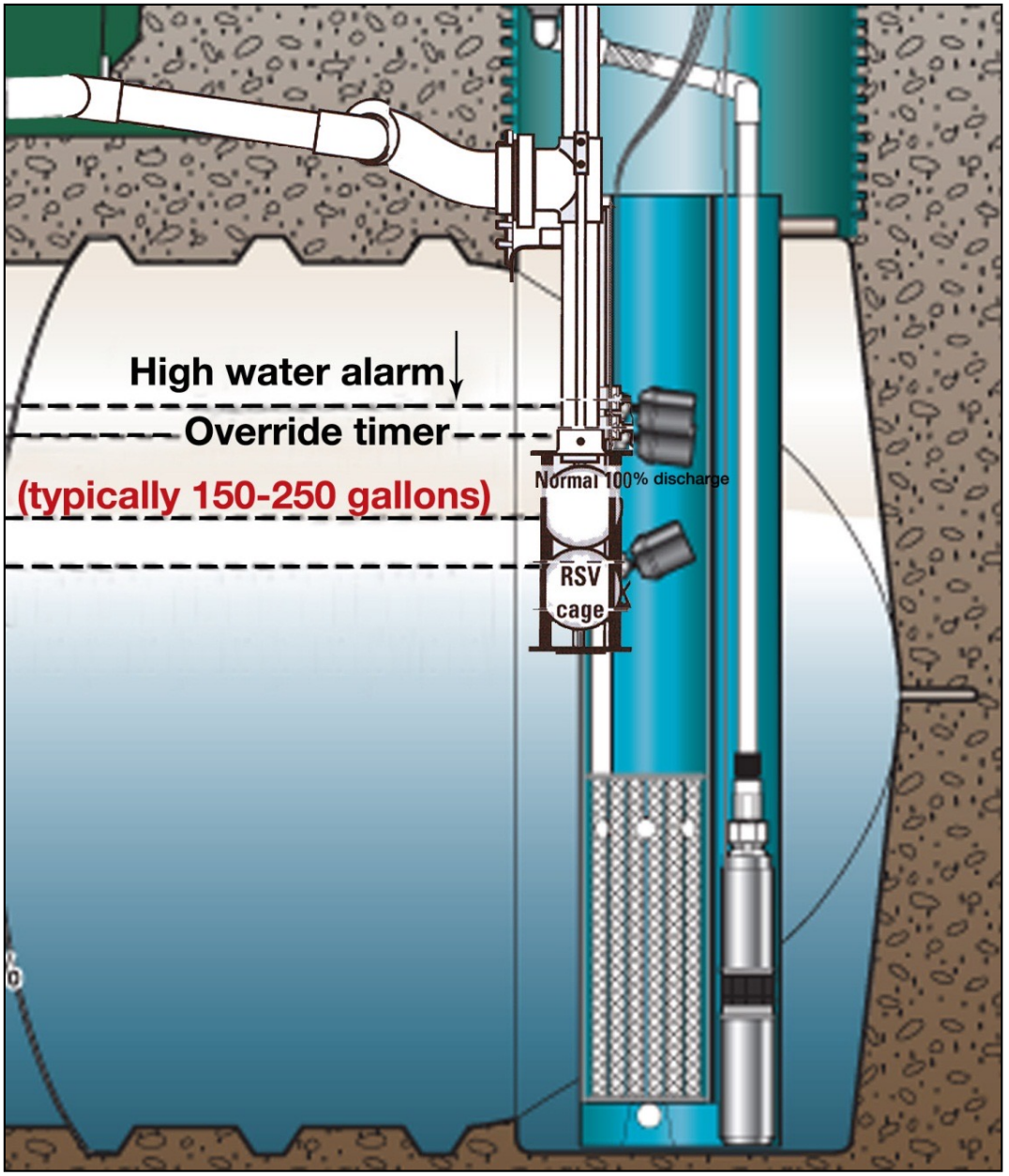
System Settings

- Processing tank liquid levels
- Programmable timer settings

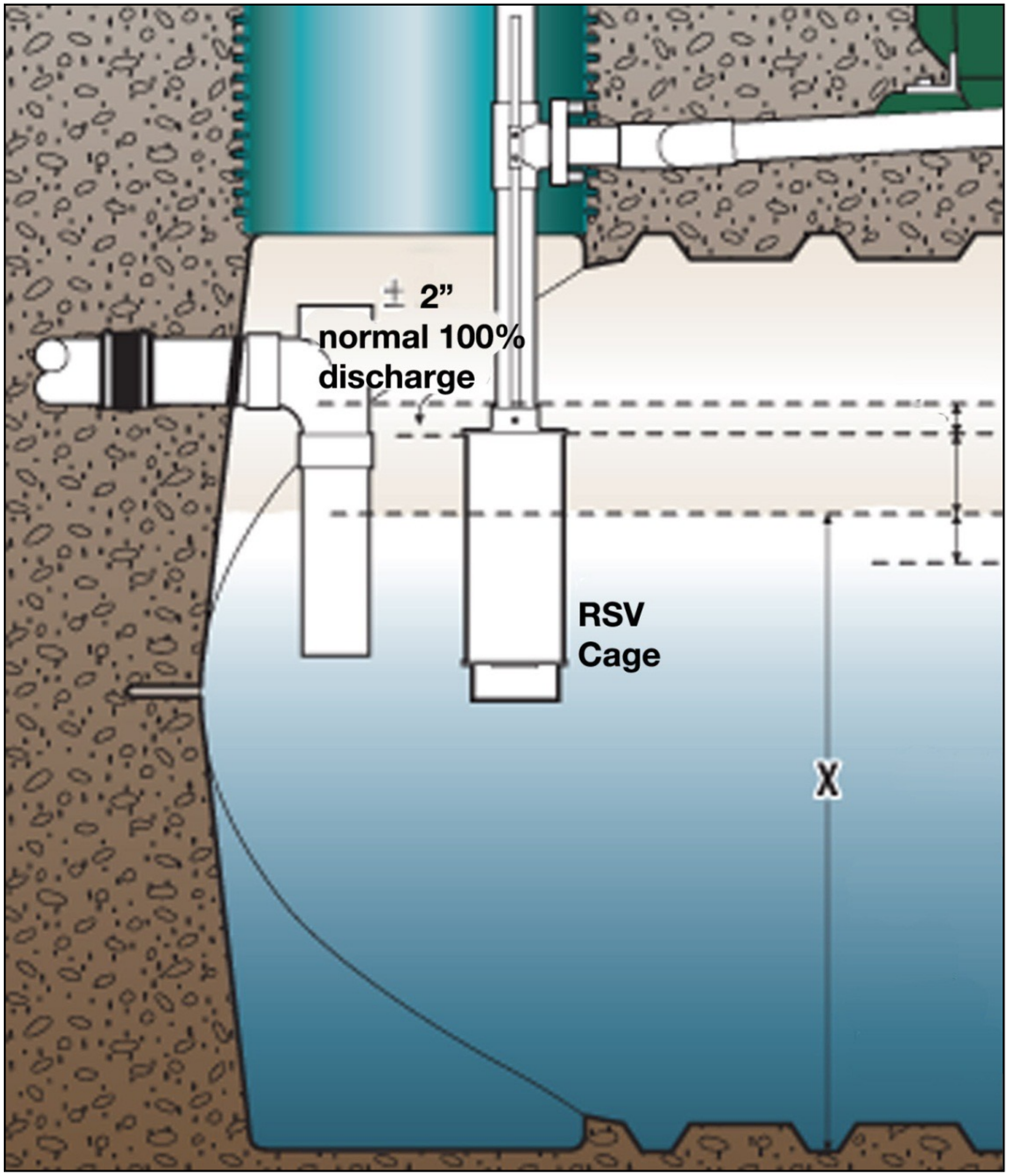
Processing Tank Liquid Level Settings



Mode 1 RSV


High water alarm
Override timer
(typically 150-250 gallons)
Normal 100% discharge
RSV
cage

Mode 3 RSV



AX20 Recirculation Ratio

- Initial timer settings based upon expected average daily flows
- Initial recirculation ratio 4:1
- Recommended timer settings
  - Typical “on” time for AX20 is .3 min
  - “off” time varies depending on flow
  - View Vericomm® point data to check actual flows at three-month checkup
  - Reset recirculation ratio, if necessary

Typical Timer Settings

- 72 to 300 cycles per day (typically a 20-minute cycle time)
- Typically 72 cycles per day
  - ~ 0:18 seconds ON
  - ~ 19 minutes and 42 seconds OFF

Timer Setting Worksheet Handout

Ventilation Requirements

- Passive air vent
  - ~ 2" line vent: 20' or less
  - ~ No moving parts
  - ~ No power usage
  - ~ Carbon-impregnated
  - ~ Serviceable

Disinfection

- Orenco UV Disinfection
  - UL Recognized
  - 360º contact zone
  - 99.999% bacteria reduction (5 logs)
  - Ballast in control panel
  - NSF comparative testing meets or exceeds other residential UV units

AXRT

Filter Type AX20

- *Physical specifications*
  - ~ *7.5' x 3' x 2.5'*
  - ~ *Textile: ~ 20ft²*
  - ~ *Dry weight: ~ 300 lb.*

Filter Type AXRT

- *Physical specifications*
  - *8.5’x 5’x 6’*
  - *Textile: 20ft² or 25ft²*
  - *Dry weight*
    - *Gravity Discharge - 900 lbs*
    - *Pump Discharge - 940 lbs*

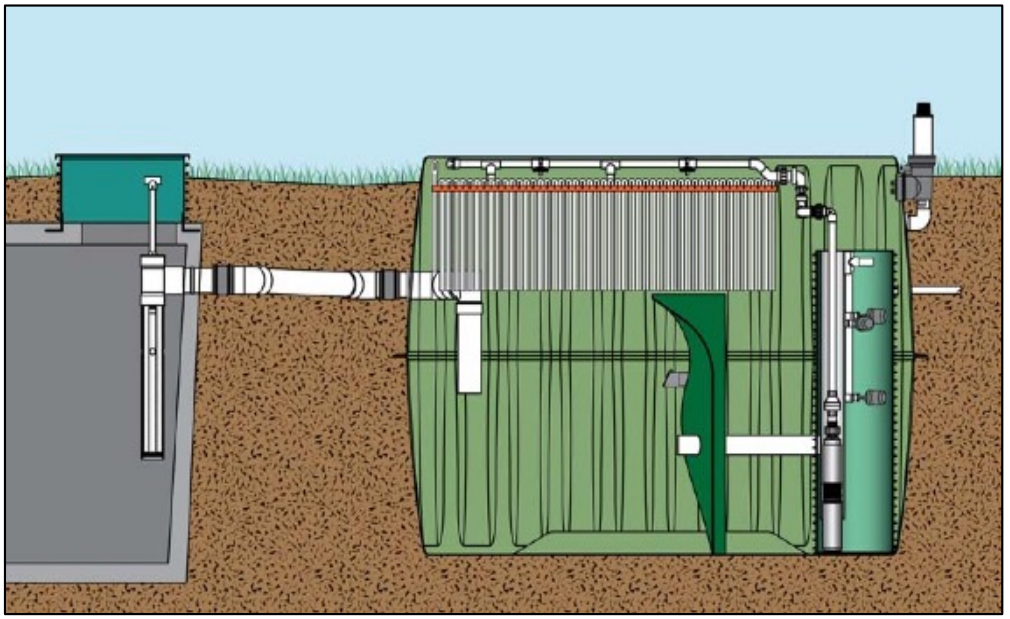
AX Series

- Uses hanging textile sheets
- Can withstand occasional abnormally high loading conditions
- Has outstanding serviceability

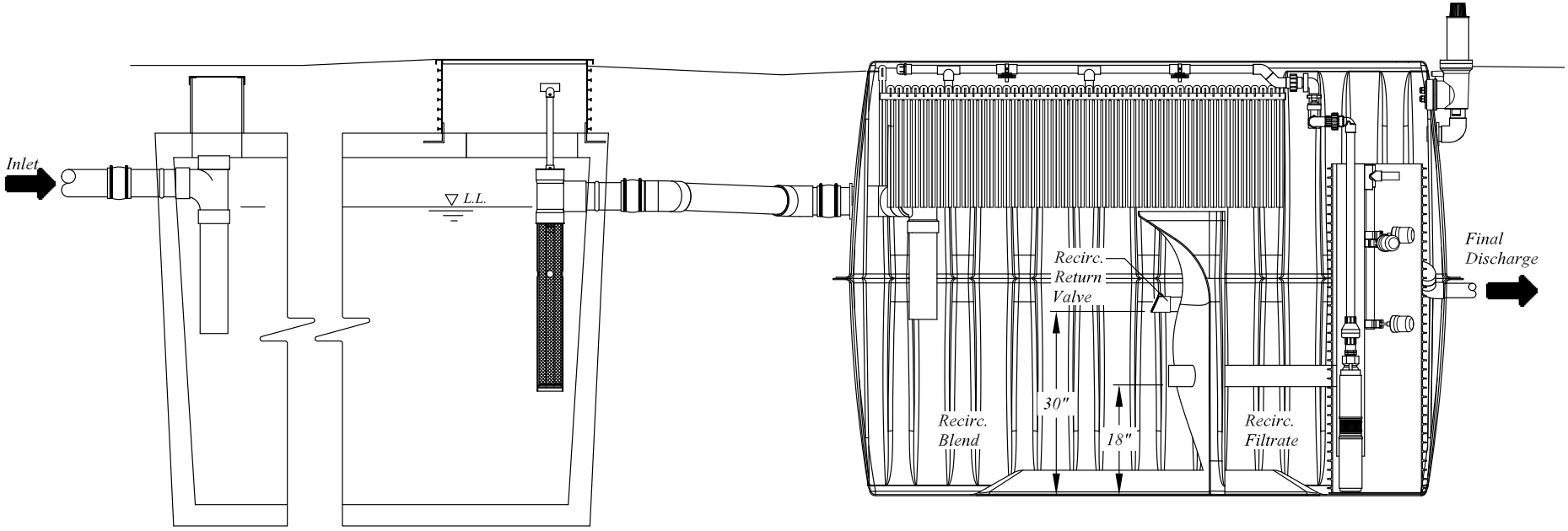
AdvanTex® Overview - AXRT

Main Components

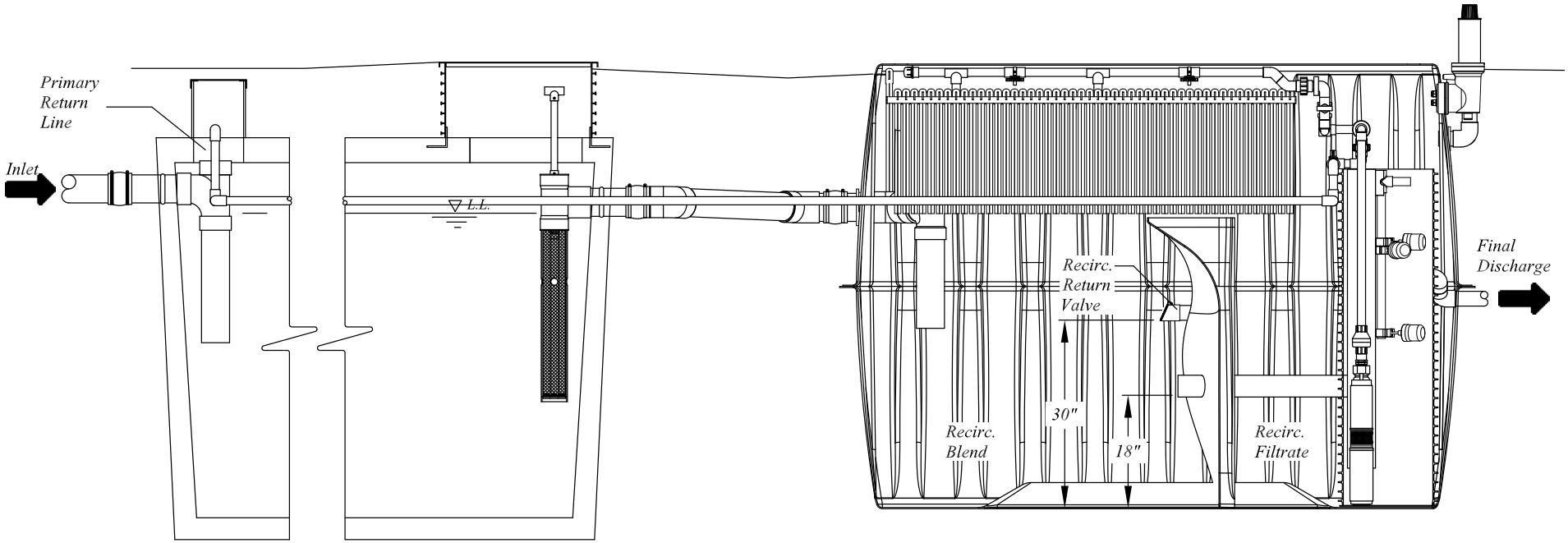
- Control Panel
- Primary Tank
- Vented Effluent Filter
- AdvanTex RT Filter
- Pump System
- Recirc-return valve
- Passive Vent



Mode 1: Standard Configuration - AXRT



Mode 3: Maximizing Nitrogen Reduction - AXRT

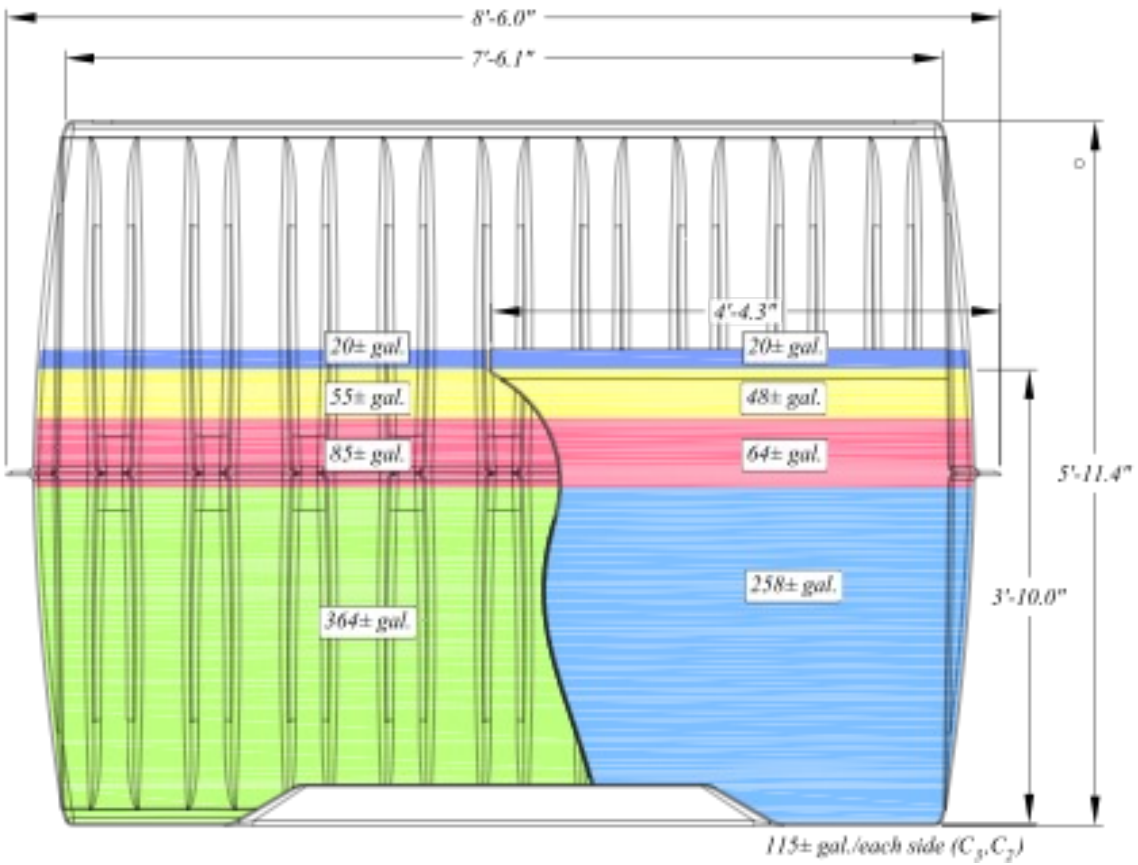


AXRT Processing Tank Requirements Residential

- Septic tank meeting Orenco Minimum Tank Requirements
  - 1000 gallon for AX20RT
  - 1250/1500 gallon for AX25RT
- Must have effluent filter
- Must be structurally sound and watertight
- Tank must be approved for use with AdvanTex® by Orenco and meet Orenco's General Specification Guidelines

AXRT Liquid Level Settings

- Pre-set at Factory
- Surge volume 210 gallons total
  - 135 to override float
  - 75 gallons above override
- Total emergency storage 500 gallons



AX20RT Recirculation Ratio

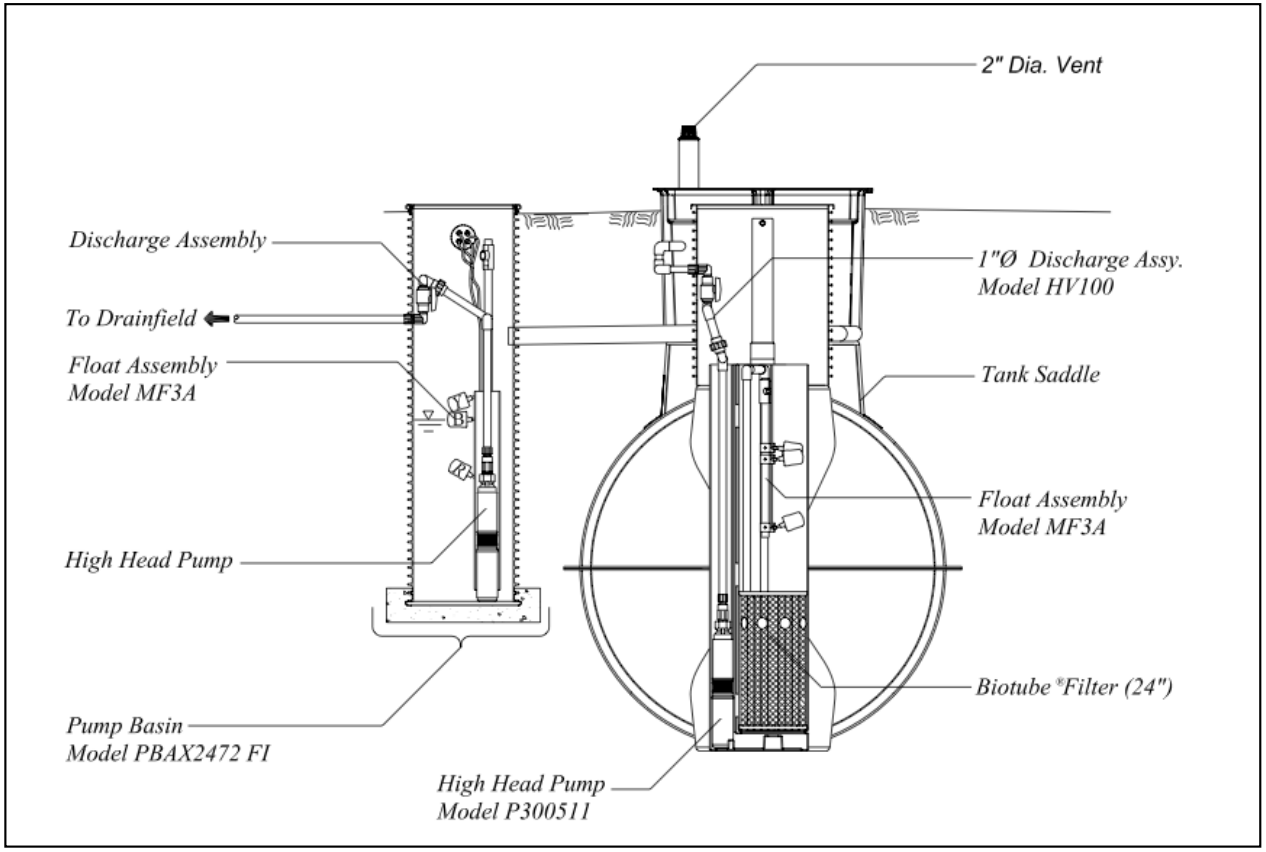
- Initial timer settings based upon expected average daily flows
- Initial recirculation ratio 4:1
- Recommended timer settings
  - typical “on” time for AX20RT is .8 min
  - “off” time varies depending on flow
  - View Vericomm® point data to check actual flows at three-month checkup
  - Reset recirculation ratio, if necessary

Discharge Options AX20/AXRT

- Gravity Discharge
- Pump Discharge
  - Pump Basin
  - Dosing Tank
  - Filtrate Blend Chamber (AXRT)

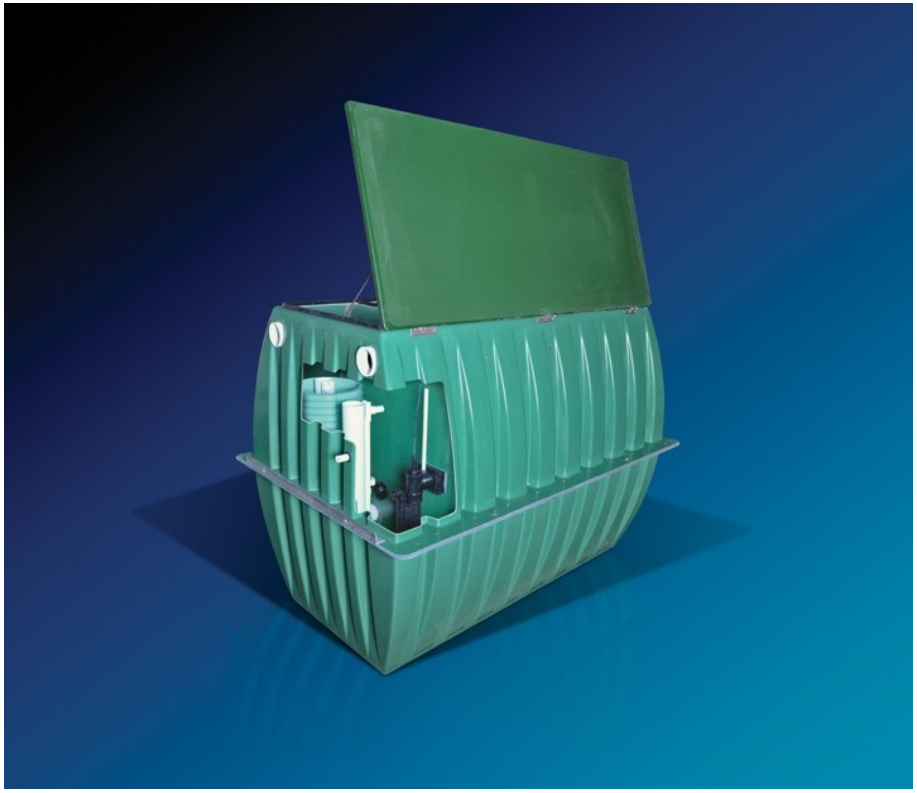
AX20 Discharge Equipment

- Pump Discharge to Final Dispersal
  - ~ 10, 20, 30 and 50 gpm options
  - ~ Pump Basin
  - ~ Pump Tank



AXRT Discharge Equipment

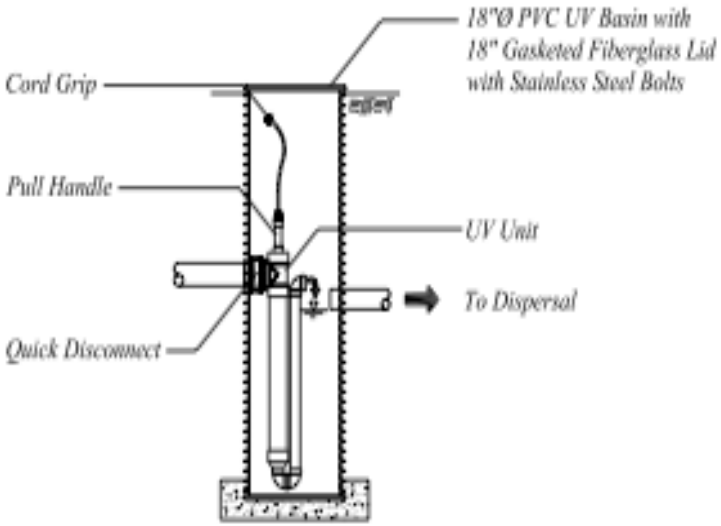
- Pump Discharge to Final Dispersal
  - 10, 20, 30 and 50 gpm options
  - “Off” float is the only float that is adjustable
  - Approximately 8 gal/in



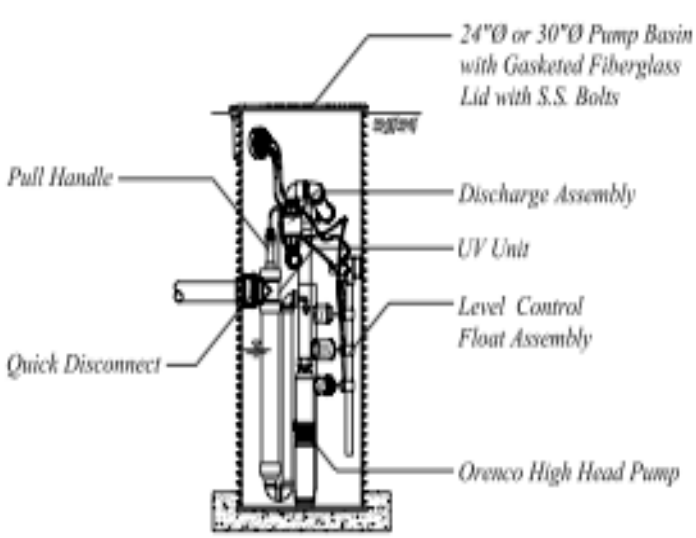
Disinfection

- Orenco UV Disinfection
  - UL Recognized
  - 360º contact zone
  - 99.999% bacteria reduction (5 logs)
  - Ballast in control panel
  - NSF comparative testing meets or exceeds other residential UV units

AX20 UV Discharge Equipment



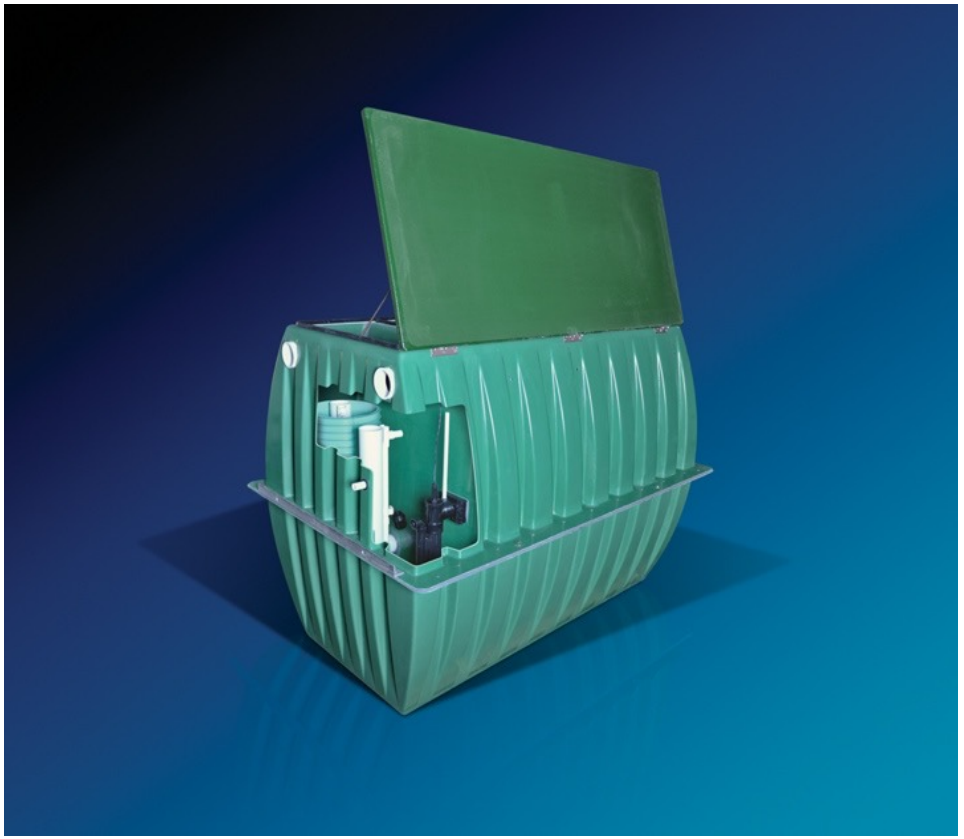
UV Basin: Gravity Discharge Option
Side View



UV Basin: Pump Discharge Option
Side View

AX20RTUV Discharge Equipment

- Orenco UV Disinfection
  - Standard RT body
  - Additional baffle
  - Orenco UV unit
  - Approximately 4 gal/in



Power Requirements

- Recirculation pump
  - ~ Runs approximately 30 to 60 min./day at 9 Amps, 115 volts
  - ~ $2.00 to $4.00/month at national average electrical rate of $0.13/kWh

Plumbing Considerations

- Ensure that water softener backwash does not go into the processing tank
- Water softener backwash disrupts the tank's digestive capabilities and can cause solids carryover
- Be sure that all gravity pipes slope properly
- Ensure there are no dips or "bellies in any gravity pipes that could stop air flow

Compact Install

- Because AdvanTex® has a compact footprint, it is ideal for small sites
- This photo shows a finished installation with a number of at-grade components
  - Filter pod
  - Access risers
  - Pump basin

Lids Nearly Flush with Lawn

- Lids available in two colors
  - ~ Green (standard)
  - ~ Brown

Landscaped Systems

Landscaped Systems

Additional Options

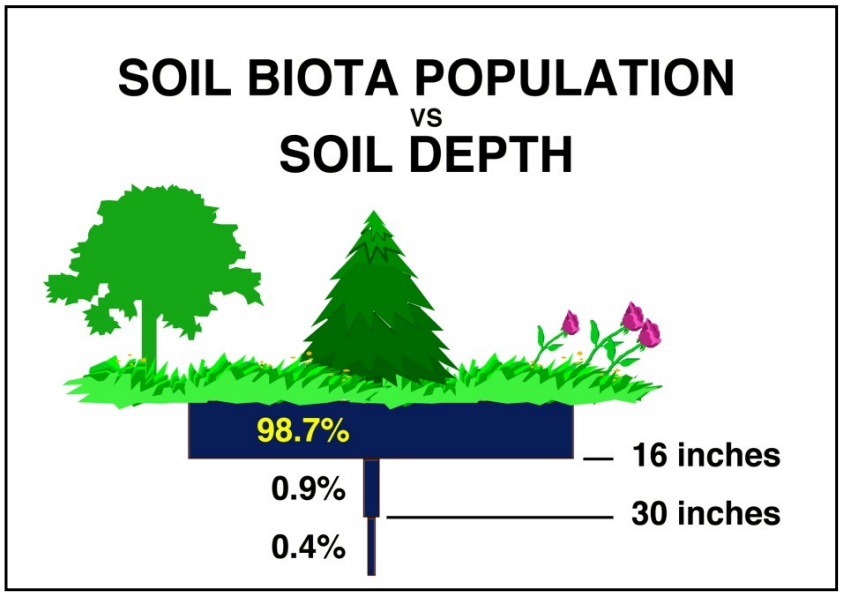
Effluent Reuse

Water Reuse Technologies Using Shallow Soil Distribution

- Shallow effluent dispersal
- Shallow gravelless
- Landscape irrigation
- Conventional drip irrigation

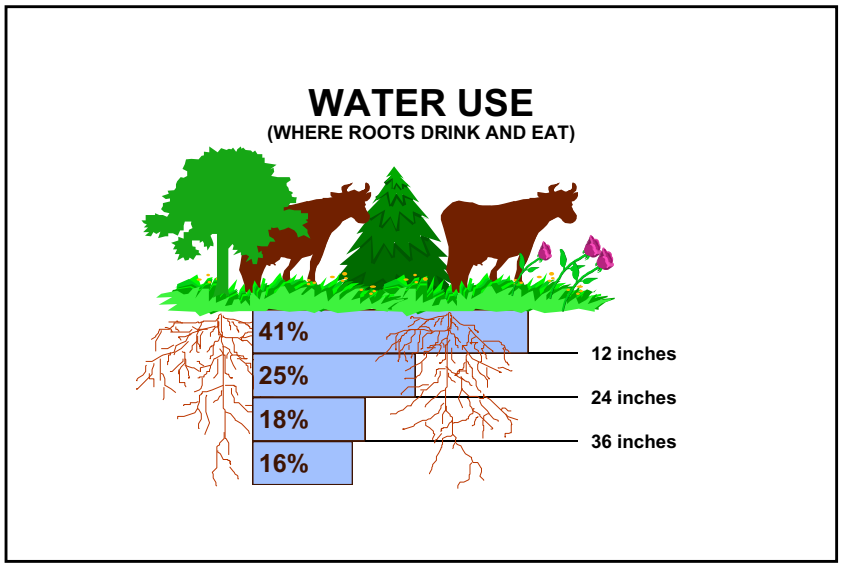
Shallow Effluent Dispersal is Better

- Final treatment of effluent takes place in the top 16" of soil, where soil biota and roots are concentrated



Shallow Effluent Dispersal is Better

- 41% of plant roots are concentrated in the top 12" of soil



Shallow Pressurized Dispersal System

- Improved soil infiltration
- Optimized treatment
- Easy installation
- No rock required
- Less impact to site

Shallow Gravelless Drainfield

Inspection Port

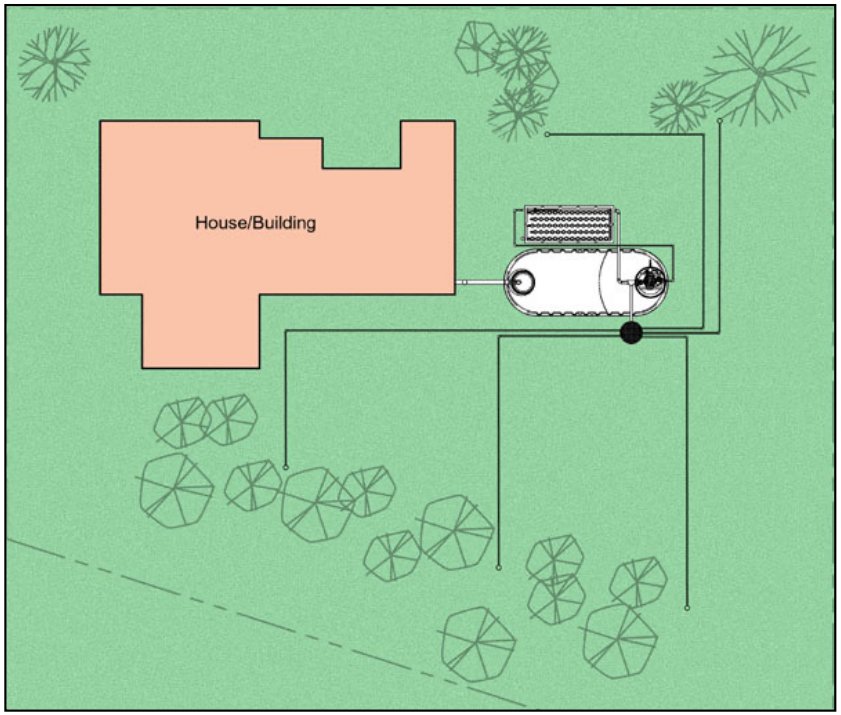
- Note shallowness
- No ponding

Shallow Gravelless Drainfield

- No biomat formation
- Enhanced soil structure

Landscape Irrigation

- Puts the effluent where plants can use it
- Uses PVC pipe with orifice distribution
- Requires less maintenance and cost than conventional drip tubing



Landscape Irrigation

- Main PVC “transport”
- Spot irrigation “drainfield laterals”

Landscape Irrigation

- Irrigating a shrub

Conventional Drip Irrigation

- Drip tubing for large area or turf irrigation

Comparison of Drainfield Reductions