



Operation and Maintenance Manual

SeptiTech Wastewater Pretreatment System

Residential Processor Units

STAAR 0.5 / STAAR 0.75 / STAAR 1.0

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SeptiTech • 69 Holland Street, Lewiston, Maine 04240
P: 207-333-6940 F: 207-333-6944 • www.septitech.com • info@septitech.com

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1. Introduction

This document describes the operation process and maintenance procedures used to control and maintain operation of the SeptiTech Wastewater Pretreatment System.

The SeptiTech pretreatment unit is comprised of a concrete or plastic tank, pumps, media, and required process piping. Each processor is controlled by a programmable logic controller (PLC), which can control the processor automatically or manually through the use of an operator interface terminal (OIT).

Operation of the processor can be divided into two process loops:

- The Treatment Loop – controls treatment of wastewater through operation of recirculation pumps that circulate water through the media in the processor tanks and operation of discharge pumps that discharge the treated wastewater to the disposal system.
- The Sludge Return Loop – periodically pumps solids produced by the SeptiTech treatment process back to the primary tank(s) for settling that are situated immediately upstream of the SeptiTech treatment unit.

In addition to the two process control loops, there is an alarm control loop that detects abnormalities and/or faults in the process loops and triggers an alarm sequence that notifies both the operator via audible and visual alarms. In addition, SeptiTech offers the option of a complete telemetry package, which includes telemetry, that will activate and call the SeptiTech on-call service department whenever there is an alarm. The telemetry package also allows for SeptiTech service personnel to remotely connect to the treatment system in order to diagnose the problem.

2. Treatment System Design and Operating Theory

SeptiTech uses an enhanced recirculating biological trickling filter system in a treatment process that is optimized to remove a high percentage of BOD, TSS, and nitrogen from wastewater through an aerobic treatment process. The SeptiTech processor is added to a conventional system between the septic tank and disposal system (typically a leach field). The treatment capacities of each of the SeptiTech residential models are based on the number of bedrooms of the home that the treatment system is to be installed on. The table below shows the capacities of each system.

Table 1: SeptiTech Processor Treatment Capacities

Processor Model	Bedrooms
STAAR 0.5	4
STAAR 0.75	6
STAAR 1.0	8

The SeptiTech processor model that should be used depends on several factors:

- Hydraulic loading (number of bedrooms, state codes)
- Biological loading (Biochemical Oxygen demand (BOD), mg/L)
- Nutrient removal (if required)

Initially, raw wastewater passes through a baffled septic tank, sized according to local state codes, where a portion of the solids and grease are separated out. Wastewater flows (typically via gravity) from the septic tank into the reservoir of the processing tank beneath the trickling filter. The SeptiTech treatment process uses unique characteristics of a patented filter media to construct a trickling filter in which the treatment occurs in the mixed-liquor as it passes through the filter. The filter consists of high surface area media situated over a reservoir into which the percolate drains. Within the reservoir is a pump that distributes a combination of percolate and newly added wastewater from the baffled septic tank to the top of the media bed.

The surface area of the media provides the living space for the bacteria to grow while the open spaces within the media allow air to freely pass through, providing ample oxygen to support the microorganisms. The percolate from the filtering process drains into the treatment reservoir for further recirculation or discharge. 2 times per day, a portion of the wastewater off of the bottom of the tank within the reservoir is pumped back to the septic tank for solids removal. Nitrification of the ammonium in the wastewater occurs in the liquor as it passes through the media, and denitrification of the nitrified wastewater takes place within the septic tank (refer to section 3.2 for further details on the denitrification process)

A programmable logic controller (PLC) controls the timing and sequence of the recirculation of wastewater in the lower collection reservoir, as well as the recycle of a portion of the waste back to the septic tank. The PLC also controls the discharge to the leaching system. A more specific description of the process is provided below:

3. Treatment Loop Description

The treatment loop consists of two independently functioning processes:

- Recirculation Loop during which the contents of the process chamber are distributed over a column of treatment media and allowed to trickle back down to the underlying reservoir; and
- Denite Mix Loop (Optional Configuration) during which nitrified wastewater is pumped from the processor tank back through a specially modified septic tank.
- Discharge Loop during which wastewater is pumped from the processor tank.

3.1. Recirculation Loop

Wastewater from the septic tank enters the processor and collects in a reservoir at the base of the tank where it mixes with previously treated water. Wastewater is pumped up to the treatment area above the reservoir where outside air is passively drawn into the wastewater stream. Oxygenated wastewater is uniformly sprayed over the media by low-pressure spray nozzles. The microbes residing within the media bed break down pollutants in the wastewater as it migrates

downward through the media and back into the reservoir below. The wastewater is circulated through the filter media many times in a 24-hour period by the recirculation pump.

Oxygen is supplied to the processor through venturis installed within the recirculation pump discharge header prior to the nozzles. The nozzle of the venturi causes the velocity of the water to increase, thus causing a decrease in pressure across the venturi. This pressure drop draws air into the system through an outside air supply pipe that sticks up above the ground surface.

A programmable micro-logic controller (PLC) activates the recirculation program that self adjusts these operations based on actual wastewater flow into the processor (as monitored by the PLC). The processor constantly evaluates the water usage and meters out the effluent discharge to the disposal system in equal doses over a 24-hour period (a dosing schedule can also be customized to the project specification).

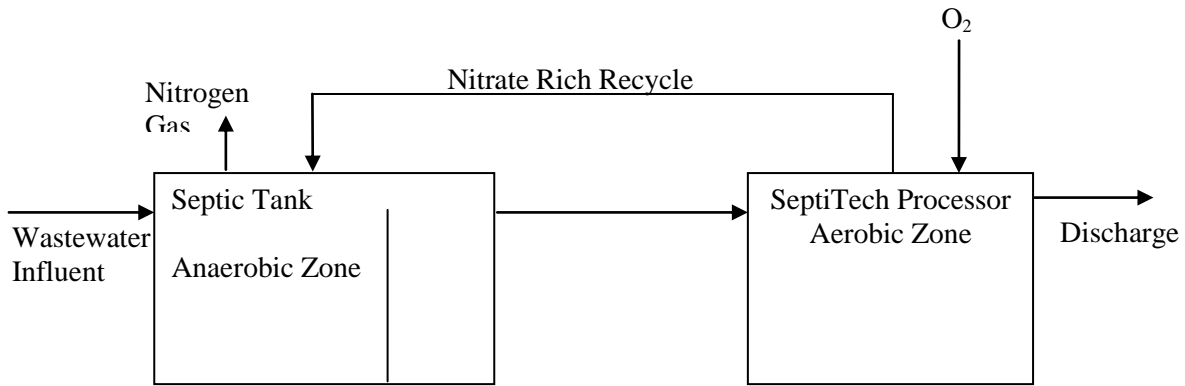
SeptiTech processors are sized based on the number of bedrooms with additional capacity to accommodate wastewater surges (morning and evening flows, special events, etc). Under surge conditions, the PLC senses the increased flow into the system and adjusts the treatment process to gradually accommodate the accumulated surge flow while maintaining treatment effectiveness. If the PLC senses reduced flow, it will automatically ratchet the system down, and after several days enter “sleep mode” during which time the processor only operates long enough to maintain the microbe culture.

SeptiTech processing starts automatically with any wastewater input. The recirculation system then remains in operation, continuing to automatically reset as necessary, as long as wastewater is discharged into the processor or until the entire accumulated surge flow has been discharged.

3.2. Denite Mix Loop (Optional Configuration)

Wastewater within the process chamber of the system undergoes several treatment processes. A few of these processes include the biochemical oxidation of organic matter and the nitrification of influent ammonia; both of which are aerobic processes (i.e. require the presence of oxygen). In order to achieve a reduction in the total influent nitrogen concentration, the influent ammonia must be nitrified from ammonia to nitrate within the aerobic SeptiTech processor tank. Then, the nitrified wastewater must be introduced into an anaerobic environment (i.e. no oxygen) in order for the nitrate within the wastewater to be converted to nitrogen gas. Once nitrogen gas is formed, it simply is released into the atmosphere through the natural venting of the septic tank.

SeptiTech offers an optional denitrification configuration, in which the solids pump-back pump is utilized to recycle nitrified wastewater from the processor tank back to the septic tank. There must be a baffle wall installed within the septic tank. Figure 1 summarizes the nitrogen removal processes in schematic form.



DENITRIFICATION

Within the septic tank, baffles are installed to increase the hydraulic residence time and to ensure that the amount of dissolved oxygen in the water is sufficiently reduced to form the anoxic zone needed for denitrification. Carbon from the incoming waste stream is utilized to convert the recycled Nitrate to Nitrogen gas from the processor. Incoming ammonia passes through unchanged to the SeptiTech processor (Aerobic Zone).

NITRIFICATION

The SeptiTech processor is rich in dissolved oxygen. BOD is reduced and ammonia is oxidized to Nitrite and then to Nitrate. Water within the processor is recycled back to the head of the anoxic zone in the septic tank which is rich in Nitrate. The recycle percentage can be adjusted anywhere in the range from 100-400% of the discharge volume in order to optimize the total nitrogen removal.

Figure 1: SeptiTech Denitrification Process Description

3.3. Discharge Loop

After completing the prescribed treatment process in the processor, the treated wastewater flows into the final reservoir of the treatment tank known as the decant chamber. Within the decant chamber, a submersible pump is installed in order to discharge the treated wastewater out of the processor tank. The pump is sized in accordance with the pump operating requirements that are specific to each job. The length of operating time that the pumps run can be adjusted to match the daily flows that the treatment system receives during an average 24-hour period in order to “tune” the system to achieve effective treatment of the wastewater.

The discharge pumps are operated based on a timed program. The default program is to have the discharge pump run once every hour throughout the day for a set amount of time in order to meet the daily flow. Both the pump activation cycle and pump run time can be adjusted from the OIT panel or from off site at the SeptiTech facility if the telemetry package option is used. Similar to standard pump stations, there are float switches (see section 6.7) within the decant section of the processor tank. However, these switches are used as safety switches rather than pump control switches.

4. Sludge Return Loop

Microbes have a short life cycle, flourishing and dying within several hours. Due to the unique physical characteristics of SeptiTech's media, the wastewater and microbes do not wet or strongly adhere to the media surfaces, thereby reducing the potential for the media to clog. Biological growth on the treatment media builds up and eventually sloughs off into the reservoir of water underlying each of the process chambers.

The accumulated solids in the bottom of reservoir are collected and returned to the head of the primary septic tank via a submersible pump-back pump to settle out of suspension. These solids are removed when the septic tank(s) are pumped out during the regularly scheduled septic tank maintenance (every 2-5 years).

The pump-back pump is operated twice each day at twelve-hour intervals. The total pump back flow is based on the daily flow as determined by the PLC. Initially, pump back will be set to equal 100 percent of the discharged flow divided equally between the two pumping schedules.

5. Alarm Control Loop

Alarm control loops are provided in the control logic to alert the operator or SeptiTech to abnormal events or conditions in the process tanks or in the control system. In the event that an alarm condition is detected by the control system, the following actions are triggered:

- Activation of audible alarm horn located on the front of the control panel
- Activation of alarm light located on the front of the the control panel
- Activation of *optional* Telemetry, which will notify pre-programmed contacts and report that an alarm condition has occurred for the SeptiTech treatment system.

When there is an alarm condition, a fault flash code utilizing the red reset button on the front of the panel enclosure is activated. When there is an alarm, the control panel will signal the fault through an audible horn and through a red light. In order to silence the alarm, the owner/operator must push the reset button. This will silence the horn and start the flash code sequence. The owner/operator must count the number of times the red reset button flashes. There will be a delay at the beginning of each flashing sequence. For example, a low float fault will have 2 flashes. The reset button will flash twice, pause, flash twice, pause, etc.

The flash code will continue to flash for 24-hours. If the fault condition is still true at the end of the 24-hour period, the alarm will sound again and the owner/operator will have to push the reset button to silence. If the fault condition is no longer true, the flashing light will stop.

The flash codes and the associated fault condition are listed below:

Fault Flash Codes

- 0 - NO FAULTS**
- 1 - HIGH FLOAT FAULT**
- 2 - LOW FLOAT FAULT**
- 3 - DISCHARGE PUMP FAULT**
- 4 - RECIRCULATION PUMP FAULT**
- 5 - RETURN PUMP FAULT (Pump Back / Denite Recycle)**
- 6 - UV FAULT**

See section 7 for more details in reference to alarms and troubleshooting.

6. System Components

6.1. Concrete Tank

SeptiTech residential processors come housed within a precast concrete tank or within a plastic tank. The capacity of the concrete tank depends on the processor model that is being used. The concrete tank capacities are as follows:

Table 2: SeptiTech Concrete Tank Information

SeptiTech Model	Concrete Tank Capacity*
STAAR 0.5	1,000 Gallons
STAAR 0.75	1,250-1,500 Gallons**
STAAR 1.0	1,500 Gallons

** Tank capacities and dimensions may vary depending on precast concrete provider.*

***Tank capacity of 1,250 or 1,500 gallons depends on availability from precaster.*

All tanks come equipped with two (2) 24-inch diameter plastic access hatches that are rated for pedestrian loading. Figure 2 below displays the plastic hatches typically used.



Figure 2: Typical Plastic Access Hatch

Picture courtesy of www.fralo.net

Heavy duty traffic loading (H20) is also available in which case 24-inch diameter steel frames and manhole covers are used. The hatches are installed in order to have access into the tanks for installing the processor within the concrete tanks, for performing maintenance, and for retrieving samples. The majority of the processor components can be maintained or replaced through the hatches without having to enter into the processor.

6.2. Plastic Tanks

In addition to concrete tanks, Septitech residential processors can also be installed within plastic septic tanks. FRALO, Infiltrator, Graf, etc. can be used as SeptiTech processors. The size and capacities of the plastic tanks used are listed in Table 3, and Figure 3 displays a typical FRALO tank.

Table 3: SeptiTech Plastic Tank Information

SeptiTech Model	Plastic Tank Capacity*	Plastic Tank Dimensions*
STAAR 0.5	1,000 Gallons	118" L x 62" W x 51" H
STAAR 0.75	1,250 Gallons	148" L x 62" W x 51" H
STAAR 1.0	1,500 Gallons	177" L x 62" W x 51" H

** Tank capacities and dimensions may vary depending on manufacturer.*



Figure 3: Typical Fralo Plastic Tank

Picture courtesy of www.fralo.net

All tanks come equipped with two (2) 24-inch diameter plastic access hatches that are rated for pedestrian loading. Plastic tanks can only be used for non traffic areas, and H₂O loading design is not available.

The access hatches are installed in order to have access into the tanks for installing the processor within the concrete tanks, for performing maintenance, and for retrieving samples. The majority of the processor components can be maintained or replaced through the hatches without having to enter into the processor.

6.3. Piping & Fittings

The piping and fittings installed within the treatment processors are constructed of Schedule 40 and/or Schedule 80 PVC.

6.4. Media

The treatment processor contains polystyrene bead filter media that occupy the upper portion of the treatment unit. Due to the nature of the media, microbes present in the wastewater do not strongly attach to the media, but are rather entrained within the wastewater as it flows through the media. In this suspended state, the microbes use and transform the nutrients and organic materials provided by the constant supply of fresh wastewater to form new cell mass. The open spaces within the media allow air to freely pass through, providing ample oxygen to support the microorganisms.



Figure 4: SeptiTech Bead Media

6.5. Disinfection (Optional)

SeptiTech provides the option of disinfection with the pretreatment systems using Ultraviolet (UV) light to disinfect the wastewater. The processor discharge pump conveys the treated wastewater through the disinfection unit. The rated flow rate of the UV disinfection unit is 10 gpm. The UV disinfection unit that SeptiTech uses is a system manufactured by Emperor Aquatics model 025050/50 which is rated for 25 gpm @ 20 psi. (www.emperoraquatics.com)

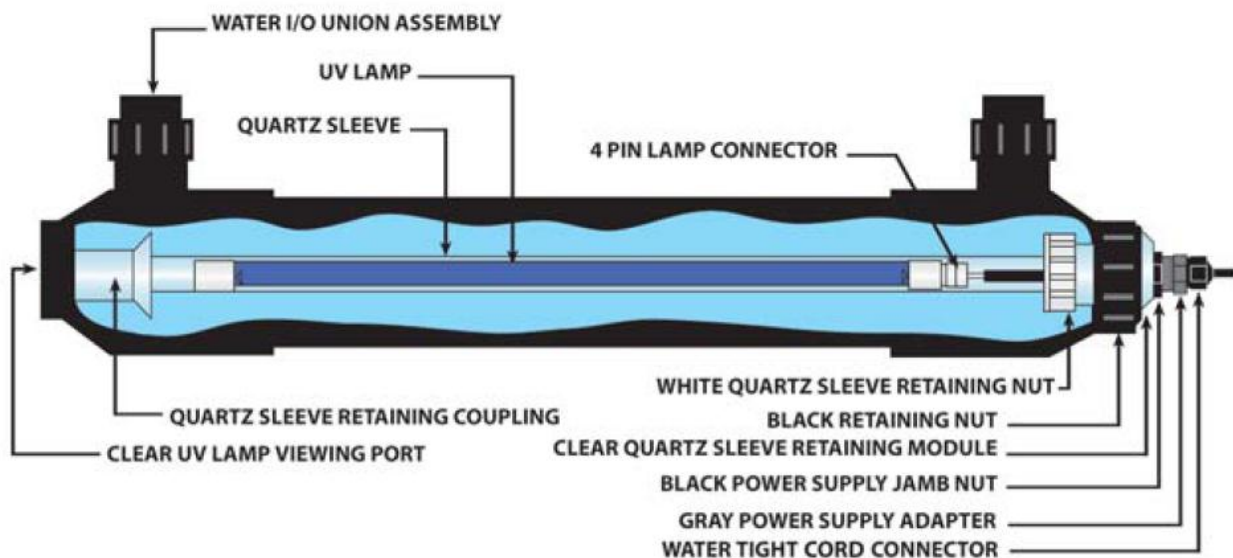


Figure 5: Emperor Aquatics UV Disinfection Unit

6.6. Pumps

SeptiTech has several pumps within the processors each with a specific function in order to provide the treatment performance required. The various processes in which the pumps are used are as described below:

- **Recirculation** – The recirculation of the wastewater from the reservoir portion of the processor up to the spray manifold that distributes the water over the top of the media.
- **Pump-back** – The removal of solids from the bottom of the tank back to the head of the primary septic tank
- **Discharge** – Submersible pump that discharges treated water from the processor to the disposal system.

The pump manufacturers that SeptiTech uses are Tsurumi America, Inc. and ITT Goulds/Xylem. The pumps are constructed of stainless steel and fiberglass reinforced plastics (FRP) making them highly resistant to corrosion. The impellers are also constructed of FRP allowing for the passage of solids, stringy materials, and resistance to wear when pumping abrasive materials.



Figure 6: Tsurumi VANCS Series Submersible Pump (Typical)

Picture courtesy of www.tsurumiamerica.com



Figure 7: GOULDS Series Submersible Pump

Picture courtesy of www.goulds.com

Table 4 lists the model numbers of the *standard* pumps that SeptiTech uses for each of the above processes for each SeptiTech model.

Table 4: SeptiTech Standard Pumps (Rev. 8/23/13)

Processor	SeptiTech Standard Pump Models			
	Recirculation Pump	Pump-Back Pump	Discharge Pump	
STAAR 0.5	Tsurumi OM3	Goulds LSP03	Goulds LSP03	
STAAR 0.75	Tsurumi 50PN2.25S	Goulds LSP03	Goulds LSP03	
STAAR 1.0	Tsurumi 50PN2.40S	Goulds LSP03	Goulds LSP03	

In addition to the above standard discharge pumps, other models with various pumping capabilities are available that can be used on a case-by-case basis in order to meet pumping requirements depending on the project. Pumps are available in 120/230 volt arrangements.

6.7. Float Switches

SeptiTech uses float switches within the decant portion of the processor for process safety and to aid in the pump control process. These float switches are mechanical devices and do not contain mercury. The switches that SeptiTech uses are manufactured by Alderon Industries (www.alderonind.com).



Figure 8: Typical Mechanical Float

7. Alarms and Troubleshooting

The following table outlines SeptiTech alarm conditions and the associated reasons that could have caused the alarm to be generated.

Table 5: Alarm Descriptions and Troubleshooting

Alarm	Description	Problem	Solution
High Float Alarm	High Float stayed on for 7200 seconds (default Alarm Delay)	1. High Float hung up unable to fall back freely	Move Float to allow free access
		2. Discharge Line broken/unhooked	Check with contractor
		3. Discharge Line blocked/frozen	Check with contractor
		4. Continuous high flow in excess of design	Reduce flow to normal
		5. Float failed	Replace Float
		6. Input failed on PLC	Replace PLC
Low Float Alarm	High Float came on while Low float stayed off	1. Low Float hung up - not able to raise freely	Move float to allow free access
		2. Float Input failed on PLC	Move Wire #4 from X1 to X7, or replace PLC
		3. Float failed	Replace Float
Discharge Alarm	Discharge Pump told to run but no feedback (X Input)	1. Circuit Breaker tripped	Reset Breaker if continues replace Pump
		2. Failed neutral connection	Check connections
		3. Relay failed	Check voltage out of Relay, check Relay Pins
		4. Failed Current Sensor	Replace Current Sensor
		5. Pump failed open windings	Replace Pump

		6. Circuit breaker Off	Turn on Circuit
		7. Input failed On PLC	Replace PLC
Recirculation Alarm	Recirculation Pump told to run but no feedback (X Input)	1. Circuit Breaker tripped	Reset Breaker - if continues Replace Pump
		2. Failed neutral connection	Check connections
		3. Relay failed	Check voltage out of Relay, check Relay Pins
		4. Failed Current Sensor	Replace Current Sensor
		5. Pump failed open windings	Replace Pump
		6. Circuit Breaker off	Turn on Circuit
		7. Input failed On PLC	Replace PLC
		8. Thermal trip	Add water, check Float levels
Alarm, With or without Fault Screen	Alarm sounding, reset button ineffective	1. Control Panel fuse blown	Replace Fuse if Continues Check for Shorts
		2. Relay failed	Check Voltage out of Relay, Check Relay Pins
		3. Failed neutral connection (missing or loose)	Check connections or add wire
		4. Wire #20 missing or loose (CR1 - Y0)	Tighten or add wire
		5. PLC stalled	Cycle power
		6. Button failed	Replace Button

7.1. Troubleshooting Guide: Frequently Asked Questions/Problems

7.1.1. Odor

- Check to be certain system is vented properly through building vent stack. Is there an impediment blocking air flow like a pump station or a septic tank effluent filter that doesn't allow free airflow? A pump station will require a separate ventilation line. More drastic measures include a separate vent for the septic tank or cut into the line between the septic tank and processor.
- Is the customer's vent positioned properly and is it tall enough? We have had very good luck eliminating most odors with simple vent pipe extensions.
- Sometimes a carbon stack filter can be inserted onto the vent stack to alleviate odor. These are typically available through a plumbing supply house.
- Are the system access ports tightened properly? Contact SeptiTech service for sealing suggestions.
- Be wary of natural downdrafts conditions. Septic odor can often be traced to poor vent pipe positioning and downdraft air currents.
- Make sure the customer locates the precise position of odor if possible. We have had some cases where odor has arisen from sources not associated with the system such as old buried septic tanks.

7.1.2. Power

- Can power be shut down? Customers should know that for seasonal businesses and applications where power may be suspended for extended periods of time, that the system will rebound quickly when power is applied. However, be certain that your customer is not planning to shut the power off regularly, since the system controller automatically accommodates for low/no flow status.
- Why did the alarm sound when the power comes back on? When system power is turned on it takes the PLC, 15-seconds or so to “boot-up,” much like a computer. In this timeframe, the alarm will sound because the PLC, which controls the alarm function, is not yet operating.

7.1.3. Customer Maintenance

- SeptiTech systems are designed to operate without routine customer maintenance. While septic tanks must be pumped at regular frequencies (3-5 Years) and the effluent filter cleaned yearly (if installed), the SeptiTech processor is not to be pumped as the Sludge return loop eliminates the need for pumping. An annual inspection of the SeptiTech Processor is suggested.

7.1.4. Air Intake

- The air intake pipe should be maintained in such a way to keep it clear of materials that could block airflow. (eg. deep snow, entangled brush).
- If an ear is placed next to the air intake pipe, you may be able to hear the sound of the water sloshing about in the processor.
- However, if installation directions were not followed and there is no positive pitch in the processor sloping toward the processor, or if there is a dip in the air line, there is a chance that water can accumulate in the air intake pipe. This is not good and a loud “gurgle” may signify such a condition. Usually, the contractor must be notified to correct this problem. Also, the strength of the air intake (during recirculation pump operation) may be weakened if there is water in this pipe, which you can test by placing a small piece of paper against the air intake pipe. Suction from the air intake should be able to hold a small piece of paper in place.

7.1.5. Pump Life

- We use high quality Tsurumi and Gould pumps for all of our systems. However, lifespan of pumps is very hard to estimate due to conditions beyond our control. For instance amount of system use as well as quality of power (i.e. our pumps generally do not like “dirty power”) can affect pump lifespan. In general, our pumpback and discharge pumps operate less than recirculation pump(s) during normal system operation and should last many years. Our recirculation pump(s) under normal use should last 3-5 years or longer.

7.1.6. Access Lids.

- It is important to understand that access lids must be easily accessible by SeptiTech service personnel and must not be buried.

7.1.7. Can I drive over my system?

- No! Not unless you specifically specify and install an H-20 rated system. This is a special order from SeptiTech.

7.1.8. Care of System.

Proper care of system mirrors proper care for any onsite septic system and is reflected in the Customer Use section of the owner's manual. This is detailed below:

- Pumping Septic Tank:
SeptiTech® recommends that you pump your septic tank once every 3-5 years and have the effluent filter (if installed) cleaned yearly. Note: the septic tank is not the same unit as the SeptiTech® processor. SeptiTech® processors should never require pumping.
- Use of Bleach:
Your septic tank and SeptiTech® treatment system relies on bacterial action to work. Therefore, please avoid the heavy use of bleach as much as possible. If bleach must be used, use it sparingly and spread out its use over time so the bacteria in the system are not all depleted. Likewise, do not flush antibiotic pills into the system as they can also kill the bacterial action in the septic and processor tanks.
- Disinfecting a Well:
Occasionally a contaminated well needs to be disinfected (usually with chlorine). If you need to do this, do not run the chlorinated water through your septic system. Open the outside water faucets and let the water run for several hours or as long as necessary to flush the chlorine out of the well. Pump the well for several hours after you no longer smell chlorine, in the meantime don't use any water in the house.
- Trash & Garbage Disposals:
Always keep sanitary napkins, cigarette butts, coffee grounds, paper towels, excessive cooking grease, paints and non-biodegradable materials out of the system. Use of sink grinders (garbage disposals) can result in heavy and inconsistent load of organic materials into the system and are therefore not recommended.
- Discharges from Potable Water Treatment Systems:
Discharges from water treatment systems, such as water softeners or water filtration systems that require back flushing, are not considered wastewater and should never be pumped into a septic system. This flow can and should to be diverted into a separate, properly constructed dry well (refer to state and local codes).
- Plumbing Fixture Maintenance:
Plumbing fixtures such as toilet bowl fill valves and faucets should be maintained to insure that leaks do not cause excess water to enter the septic system.
- Additives:

Refrain from using toilet tablets or products such as *Drain-O* as these products will deplete necessary bacteria from the septic system. Never use septic tank additives of any kind. Most are harmful to the system and don't have any positive effect.

- Alarm:
The computer in your SeptiTech® control panel monitors all the important functions of the SeptiTech processor. It will set off an alarm if any of several events occur such as a failure to discharge water from the tank. Press the re-set button to silence the alarm and call your local SeptiTech distributor for service.

7.1.9. System Operation Information

- a. Most Control Panel functions are designed to be accessed by a SeptiTech-trained professional and are therefore password protected to prevent unauthorized access

8. O&M Agreements/Checklists

Some States and regions require an advanced treatment system owner to enter into an O&M agreement with a certified maintenance provider. Inspection frequency and coverage detail will vary according to State or regional regulation. The following represents an example of a typical SeptiTech O&M Agreement between a customer and a SeptiTech authorized service provider.

Agreement for Operating and Maintenance (O&M) Services For SeptiTech On-Site Wastewater Treatment System

Agreement is made on *(date)* _____ between:

(Client)

and (Authorized Service Provider)

Name _____

Name of Service Provider

Address _____

Address of Service Provider

City, State, Zip _____

Address of Service Provider

1. For the duration of this contract beginning *(date)* _____ and concluding *(date)* _____ (1 year), the Service Provider shall operate and maintain the SeptiTech wastewater treatment system installed at *(site)* _____, in accordance with conditions imposed by _____

SeptiTech and _____ (name of regulatory agency with system oversight).

2. Sample of discharge effluent if required as a result of visual inspection and field measurements as follows: (examples):
 - a. Carbonaceous Biochemical Oxygen Demand (CBOD₅):
 - b. Total Suspended Solids (TSS):
 - c. Nitrogen/Ammonia:
 - d. Fecal Coliform:
 - e. Dissolved Oxygen:
3. Service Provider agrees to submit annually to the Owner, a report including an operation and maintenance summary and analysis of water quality sampling, if required.
4. Service Provider shall perform on a regularly scheduled quarterly service inspection the following maintenance procedures:

SeptiTech Service Check Sheet

Date: _____ Time: _____ Rep: _____

Remove lids & covers on processor. Visually inspect media & spray pattern. _____ (Initial)

Exercise entire system in maintenance mode. _____ (Initial)

- a. Recirculation pump(s)
- b. Pumpback pump(s)
- c. Discharge pump(s)

Perform maintenance/cleaning tasks, as necessary, based on visual inspection. _____ (Initial)

- a. Spray headers
- b. Media
- c. Screen

Take effluent sample from decant chamber _____ (Initial)

Record following values from controller read-out (Discharge Pump) _____ (Initial)

Days Runtime: _____
Hours Runtime: _____
Seconds Runtime: _____

Record controller program version: _____ (Initial)

Record: pH _____ Units DO _____ mg/l Turbidity _____ NTU _____ (Initial)

List parts and supplies used: _____

_____ (Initial)

Return system to “run” mode _____ (Initial)

Re-install covers and lids on processor. _____ (Initial)

Check air intake muffler for obstruction and proper draw. _____ (Initial)

General Notes and Remarks: _____

_____ (over)

5. Owner agrees to immediately notify SeptiTech in the event of a system failure, alarm event or malfunction. SeptiTech agrees to take immediate corrective action to remedy the situation.

9. Sampling Protocol

Some states or regions require effluent sampling on a prescribed frequency. SeptiTech’s sampling protocol is provided as follows:

9.1. Non-UV Systems

Sample will be taken using a gravity-filled sampling bottle to collect a grab sample directly from the effluent wet well directly under the discharge side access port. This location represents the endpoint of the treatment process just prior to discharge. The following sampling protocol shall be used to collect samples:

All samples should be collected in accordance with protocols described Standard Methods for the Examination of Water and Wastewater, 18th edition, APHA, AWWA, WPCF, 1992. These sampling procedures are outlined below for grab samples:

9.1.1. Sampling Equipment and Supplies

- Sample Bottles of appropriate size and material – Recommend obtaining bottles from the laboratory that will perform the analyses. If required, bottles may contain appropriate chemical preservative or it can be added after samples are collected.
- Sampling Device – Sample dipper that can be plunged below the water surface to retrieve a representative water sample and exclude any floating matter.
- Field Preservation – Appropriate preservatives for specific analytes if not provided in sampling containers, sufficient ice to reduce and hold samples at 4 degrees Centigrade until delivered to the laboratory.
- Documentation – Field notebook or data sheets to record pertinent collection information, sample labels and Chain of Custody sheets.

9.1.2. Grab Sample Collection

- Open hatch over discharge/decant wet well and observe/note appearance of water and floating or suspended matter on sampling sheet
- Prepare sample labels and affix to bottles
- Plunge sample dipper below water surface (2-3 inches) and allow to fill
- Retrieve and pour contents into respective sample bottles, cap bottles and place in cooler with ice
- Several retrievals may be required to obtain the necessary sample volume
- Transport to the laboratory as soon as practicable per respective holding times for the target analytes as shown in the Sample and Preservation Holding Time Table on Page 24.

9.1.3. Documentation

- Fill out the chain of custody sheet with all pertinent collection data and list all analyses to be performed in the appropriate columns on the form.
- Deliver to the lab within the specified holding times and sign per protocol of laboratory sample custodian. Retain a copy of the custody sheet for your records.

9.2. UV Systems

SeptiTech systems that include UV disinfection units shall be sampled as follows:

- a. Pre-UV sampling will follow the sampling protocol listed above. (Sample will be taken using a gravity-filled sampling bottle to collect a grab sample directly from the effluent wet well directly under the discharge side access port. This location represents the endpoint of the treatment process just prior to discharge through the UV disinfection chamber.)
- b. Post-UV samples shall be drawn through a ¼” ballcock and Tygon tubing. Sampling protocol is as follows:

All samples should be collected in accordance with protocols described Standard Methods for the Examination of Water and Wastewater, 18th edition, APHA, AWWA, WPCF, 1992.

9.2.1. Sampling Equipment and Supplies

- Sample Bottles of appropriate size and material – recommend obtaining bottles from the laboratory that will perform the analyses. If required, bottles may contain appropriate chemical preservative or it can be added after samples are collected.

- Sampling Device – ¼-inch ball valve fitting (supplied by SeptiTech) and Tygon tubing
- Field Preservation – appropriate preservatives for specific analytes if not provided in sampling containers, sufficient ice to reduce and hold samples at 4-degrees Centigrade until delivered to the laboratory
- Documentation – Field notebook or data sheets to record pertinent collection information, sample labels and Chain of Custody sheets

9.2.2. *Grab Sample Collection*

- Open hatch over discharge/decant wet well and observe/note appearance of water and floating or suspended matter on sampling sheet
- Prepare sample labels and affix to bottles
- Cut new section of Tygon tubing
- Install ball valve and Tygon tubing in discharge pressure port
- Using the auto-handoff switch located on the inside front panel of the PLC panel, turn on pump and open valve to allow water to run for 60-seconds. Then open sample collection container, put Tygon tubing into sample collection container, fill container and immediately cap container and place in cooler with ice.
- Transport to the laboratory as soon as practicable per respective holding times for the target analytes as shown in the Sample and Preservation Holding Time Table.

9.2.3. *Documentation*

- Fill out the chain of custody sheet with all pertinent collection data and list all analyses to be performed in the appropriate columns on the form.
- Deliver to the lab within the specified holding times and sign per protocol of laboratory sample custodian. Retain a copy of the custody sheet for your records.

SeptiTech Inc.

70 Commercial Street Lewiston Maine 04240 - 207 333-6940 - info@septitech.com

Sampling Preservation/Holding Times/Volumes			
	Wastewater		
INORGANICS	container ¹	preservation ²	holding time ^{3,4}
Alkalinity	P, G - 200 ml ⁵	cool 4°C	14 days
Ammonia-N	P, G - 100 ml	H ₂ SO ₄ to pH<2, cool 4°C ⁷	28 days
BOD ₅	P, G - 1000 ml	cool 4°C	24 hours
CBOD ₅	P, G - 1000 ml	cool 4°C	24 hours
Chloride	P, G	cool 4°C	28 days
COD	P, G - 60 ml	H ₂ SO ₄ to pH<2, cool 4°C ⁷	28 days
Color	P, G - 100 ml	cool 4°C	48 hours
Conductivity/specific conductance/salt toxicity	P, G - 100 ml	cool 4°C	28 days
Hardness	P, G - 60 ml	HNO ₃ to pH<2 ⁶	6 months
Nitrate-N	P, G - 60 ml	cool 4°C	48 hours
Nitrite-N	P, G - 60 ml	cool 4°C	48 hours
Oil & Grease	1000 ml amber glass, teflon lined cap	H ₂ SO ₄ or HCl to pH<2, cool 4°C	28 days
Orthophosphate-P	P, G - 100 ml	Filter immediately, ¹⁰ cool 4°C	48 hours
pH	P, G - 100 ml	none required	immediately ⁶
Phosphorus, total	P, G - 100 ml	H ₂ SO ₄ to pH<2, cool 4°C ⁷	28 days
Total Kjeldahl Nitrogen (TKN)	P, G	H ₂ SO ₄ to pH<2, cool 4°C ⁷	28 days
Turbidity	P, G - 100 ml	cool 4°C	48 hours
SOLIDS			
Settleable solids	P, G - 1000 ml	cool 4°C	49 hours
(TDS)	P, G - 200 ml	cool 4°C	7 days
Total suspended solids (TSS)	P, G - 1000/200 ml	cool 4°C	7 days
Total solids	P, G - 200 ml	cool 4°C	7 days
Total volatile solids (TVS) and Loss on Ignition (LOI)	P, G - 200 ml	cool 4°C	7 days
BACTERIOLOGY			
Total Coliform	P, G - 200 ml	cool 4°C	6 hours ⁷
Fecal Coliform	P, G - 200 ml	cool 4°C	6 hours ⁷

Sample Acceptance Criteria

Sample Documentation - The laboratory provides chain of custody forms for complete documentation including sample specific comments and the following information: client specific information, sample id, sampler name, sampling date and time and location, sample matrix, type of container and preservation, analytical parameters and custody signatures with date and time
Sample Labeling – Samples must be assigned a unique identifier documented with indelible ink on a secure sample label and on the chain of custody form. Water resistant, permanent labels are available.

Temperature- EPA and MADEP require solid and aqueous samples be cooled to 4°C.

Notes:

1 P = high density polyethylene, precleaned (HDPE), G = glass, precleaned

2 Immediate preservation in the field is preferred. Preserve each aliquot at time of collection for composite sampling, if possible. When using an automatic sampler, cool sampler to 4°C until compositing is completed.

3 Holding times listed are the maximum that samples may be held before analysis or extraction.

4 Holding times listed start at time of sampling for grab samples and end of composite period for composites.

5 The volumes listed may be reduced or increased depending analyte combinations, detection limits and sample specific quality control. Contact the laboratory for minimum volumes for specific analytical combinations.

6 EPA defines "immediately" as within 15 minutes of collection. If not possible, analyze within 15 minutes of arrival at laboratory.

7 Deliver samples to the lab as soon as possible if 6 hours is not achievable. Add 0.008% sodium thiosulfate if the presence of residual chlorine is indicated by potassium iodide test paper.

10. SeptiTech Warranty Agreement

Period of Coverage

SeptiTech warrants each treatment unit sold to be free of defects in material, workmanship and performance for a period of two years from date of delivery.

Obligations of SeptiTech

SeptiTech at their sole expense will service and repair the installed unit including all parts and labor that show evidence of defect or unacceptable performance for any reason when operated within design parameters, provided that all financial obligations of the owner/purchaser are in compliance with the Purchase & Sale Contract.

Exclusions

This Warranty does not apply to SeptiTech units that have been tampered with or altered by unauthorized persons, improperly installed or have been subject to external physical damage or acts of God. Further, this Warranty does not cover systems that have been flooded by external means or damage done by altered or improper wiring or overload protection. Additionally, this Warranty does not apply if the system has been operated beyond its maximum design capacity or permit, if the approved design has been altered after the fact, or if the system has been contaminated with disinfecting tablets, pipe cleaners, excessive use of bleach or other chemicals injurious to biological growth. All alarms must be called in within 24 hours. Lastly, it is imperative that the system is initially “started up” by either a SeptiTech employee or authorized representative or the warranty will not be valid.

Other Provisions

This Warranty only applies to the SeptiTech treatment processing system and does not include any wiring, plumbing, drainage, disposal or leaching systems. SeptiTech also reserves the right, to furnish a component part which, in its judgment, is equivalent to the company part replaced. Further, owner agrees to provide to SeptiTech with clear access to the processor covers on a year round basis.

Under no circumstances will SeptiTech be liable for direct or consequential damages including but not limited to lost profits, lost income, labor charges, delays in production or idle production time or habitability which results from any defects in material and/or workmanship of SeptiTech’s system or units. This Warranty is expressly in lieu of any other expressed or implied warranties. Further, any implied warranties for merchantability and fitness for a particular purpose are hereby disclaimed. This Warranty provides the owner/purchaser specific legal rights. You may have other rights, which vary from state to state.