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Dear Professional:

We appreciate your interest in SeptiTech. Hopefully the enclosed information will answer many of your questions. We are always available to answer additional questions, do on-site visits, or meet you in the field or in your office. Thank you for the opportunity to explain how SeptiTech's technology can assist you.

SeptiTech Patented Technology

SeptiTech treatment technology is designed to solve septic problems on most difficult sites by cleaning wastewater to very high levels before discharge to a leach field. A few of the resulting benefits include:

- SeptiTech treated water is so clean that a leach field will not foul up or fail.
- Rapid system start-up (less than 1 week for single digit BOD/TSS numbers) makes it the ideal system for seasonal homes.
- Most States allow a smaller and less expensive leach field with SeptiTech treatment technology.
- No owner maintenance required. No filters, no chemical additives, no records to keep or report.
- SeptiTech technology can be used in conjunction with virtually any subsurface disposal system, including proprietary systems such as driphose.

Treatment Process

SeptiTech uses a patented enhanced recirculating biological trickling filter system to clean wastewater; the enclosed process science sheet summarizes this technology. A Programmable Logic Controller (PLC) is custom designed to optimize the removal of pollutants from wastewater. All systems *consistently* remove 98+% of pollutants (as measured by $CBOD_5$ and TSS) and SeptiTech technology is an industry leader in the removal of E. coli from the wastewater stream. In addition, processors with dedicated denitrification units are available for total nitrogen reduction down to 14 mg/L and below. Effluent from SeptiTech processing looks like fresh water and is virtually odorless. A test result summary sheet from ETV/EPA is included in this package. SeptiTech technology is also NSF 40 and 245 certified.

Leach Field Reductions

In various states, SeptiTech has successfully requested and received approval for a reduction in the square footage of required leach field necessary to effectively dispose of SeptiTech-treated effluent. Approvals for reduction are based on empirical studies showing the correlation between acceptable loading rates and various soil types under a range of effluent quality, and the ability of time dosing to increase the infiltrative capacity of soils.

Leach fields are designed with water loading rates to fit a variety of soil types taking into account the daily flow volume, depth to limiting factor, and strength of the effluent. When pretreatment produces a highly treated water, such as of the quality that SeptiTech can achieve, numerous studies have

demonstrated that there is virtually no biological mat formation and effluent loading rates can approach natural soil infiltration rates.

Typically, states allow septic effluent loading rates ranging from 0.2 to 0.7 gpd/sq ft[1] (gallons per day per square foot). James Converse has recommended loading rates for highly treated water that range from 0.4 to 13 gpd/sq ft depending on soil types[2]. SeptiTech's state approvals dictate a conservative loading rate equivalent on the very low end of these measures for both clay type and well drained soils.

SeptiTech's controlled timed dosing has also been found to reduce the potential for hydraulically overloading soil. Research shows that to maximize the soil infiltration rate, leach fields should be lightly flooded evenly, frequently and sparingly with small doses of water on frequent intervals and allowed to rest in-between.

Residential Systems

SeptiTech's residential systems are available in either HDPE or concrete tanks. Beginning with the residential model STAAR 0.5 that treats up to four bedrooms, the SeptiTech residential line includes models that treat up to eight bedrooms. (See residential system technical specification sheet for details). Residential systems also require a 2-compartment septic tank sized to code. Installation is straightforward and no more difficult than installing a standard septic tank.

Commercial & Engineered Systems

Commercial SeptiTech models include Models STAAR 1.2, STAAR 1.5, STAAR 3.0 and STAAR 4.5 (see commercial system technical specification sheet for details). Commercial systems use the same treatment technology as the residential units and are set in reinforced concrete tanks sized according to flow volume and loading strength. All tanks are sealed and buried to assure odorless, noise-free operation. SeptiTech has commercial systems installed and operating in schools, apartment buildings, island communities, restaurants, inns, retail stores, business parks, subdivisions, multiple-family housing units and a brewery.

Engineered systems are custom designed by SeptiTech to address more unique situations. For instance, SeptiTech engineered systems are for larger flows (up to 200,000+ gpd), for high-strength wastewater characteristics (e.g. a microbrewery in Maine with influent BOD_5 of 2,700+ mg/l) and for situations where specific effluent parameters must be met (e.g. Total Nitrogen for residential denitrification systems of <19 mg/l). SeptiTech will evaluate system needs and provide an estimate in a timely manner.

System Controller

Both commercial and residential systems rely on a Programmable Logic Controller (PLC) to control the treatment process. The units are built and programmed by SeptiTech technicians. The PLC ensures consistent high levels of treatment and minimizes energy consumption for all levels of flow. The PLC includes:

a. Custom software package that continuously evaluate incoming flows and determines recirculation, pump-back, and discharge cycles for the most effective treatment. The PLC controls all system functions as well as monitors and sets alarms for high float, low float, float failures, all circuit breakers, all pumps, and if UV is applied (optional), UV bulb failure, and UV bulb intensity. Discharge dosing to soil absorption field is also managed to accommodate low permeability soils and shallow depths to limiting zones.

[1] Tyler, E.J, and J. Converse. 1994. Soil Acceptance of Onsite Wastewater as Affected by Soil Morphology and Wastewater Quality.

[2] Tyler, E.J, and J. Converse. 1994.

b. Telemetry programmed to automatically notify SeptiTech should there ever be a problem with the system (standard on commercial; optional on residential). SeptiTech provides highly responsive 7-days per week, 24-hours per day service coverage.

c. Telemetry to accommodate regularly scheduled SeptiTech off-site system monitoring as well as provide flow and operational summary (standard on commercial; optional on residential).

Maintenance[3]

SeptiTech systems are essentially operationally maintenance free. Designed to be operationally simple, the system is manufactured of non-corrodible materials such as stainless steel fittings and hardware, PVC piping, high-density polyethylene or pre-cast concrete tanks, and industrial hardened electronics (PLC). All pumps have been carefully selected to be of the highest quality and longest service life possible. There are no chemicals to add, filters to clean, or media to replace. The pump-back mitigates the need to ever pump the SeptiTech processor. (Note: periodic pumping of the primary septic tank is still required). As such, annual maintenance entails a diagnostic review of the PLC, visual inspection of the processor vessel and internal parts, a check of the effluent clarity to assure the system is operating at maximum efficiency, and a visual check of the disposal area.

Warranty

A two-year parts and service warranty combined with the best customer service in the industry is standard with every unit and a reasonably priced extended warranty is available following the two-year warranty.

Experience

SeptiTech has installed systems serving thousands of facilities. These include systems with flows ranging from 200-gpd to 76,000-gpd. A winner of the EPA's environmental technology award, the company has earned a stellar reputation for consistent high-level treatment, innovation, versatility, and customer-friendly solutions to wastewater problems, highly dependable operation and top-flight service.

Thank you for your interest in SeptiTech. We look forward to working with you to *solve* your septic problems!

[3] State-specific maintenance requirements vary. Please consult SeptiTech for requirements in your state.

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The Process Science of the SeptiTech® System:

Summary

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 aerobic and anaerobic degradation. The SeptiTech processor is added to a conventional system between the septic tank and final soil absorption system (typically a leach field).

Initially, raw wastewater passes through a baffled septic tank, sized according to state code, 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 though the filter. The filter consists of a bed of highly permeable hydrophobic 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.

SeptiTech residential models use polystyrene hydrophobic bead filter media, which occupy the upper portion of the treatment unit. Due to the hydrophobic 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. The percolate from the filtering process drains into the reservoir for further recirculation (approximately 70 times/day) or discharge. Several times per day, a portion of the wastewater in the reservoir is pumped back to the septic tank where denitrification occurs. Nitrification of the ammonium in the wastewater occurs in the liquor as it passes through the media.

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

How the Standard SeptiTech® System works:

Step 1 Wastewater is discharged from the home or business to a partitioned septic tank where solids settle and begin to undergo anaerobic decomposition. The decanted effluent flows into the SeptiTech processor tank for treatment.

Step 2 Wastewater from the septic tank enters the processor and collects in a reservoir at the base of the tank where it mixes with 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 media consists of polystyrene beads that provide a hydrophobic surface and an exceptionally high treatment area to wastewater volume ratio. The microbes residing in the pore spaces of the filter beads break down pollutants in the wastewater as it migrates downward through the media and back into the reservoir below. The wastewater can be circulated through the filter media 70 or more times in a 24-hour period by the recirculation pump.

A programmable micro-logic controller (PLC) activates the recirculation and discharge pumps through a 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 soil absorption system in equal doses over a 24-hour period (a dosing schedule can be customized to the project specification).

SeptiTech processors are sized based on the projected design flow 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 ratchet the system down, and after several days enter "sleep mode" during which 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.

Microbes have a short life cycle, flourishing and dying within a few hours. Due to the unique physical characteristics of SeptiTech's patented media, the wastewater and microbes do not wet or strongly adhere to the media surfaces, thereby reducing the potential for the media clogging. Instead of being stationary, the microbes migrate along with the wastewater increasing their degradation effectiveness. Dead microbes are flushed through the media with the wastewater and drain into the reservoir at the base of the processor tank. A "pump-back" system periodically pumps them back to the septic tank for additional anaerobic digestion (denitrification). As such, sludge and flock do not accumulate and the processor does not require pumping.

Step 3 After completing the prescribed treatment process in the processor, the treated water is time dosed to the disposal field to insure small frequent dosing of the field and proper absorption by the soil. In addition, pressurized delivery to the field allows placement of the disposal trenches all in one area or in several mini-disposal areas on the same lot.

Step 4 Finally, SeptiTech disposal trenches lie nearer to the surface of the ground than in a standard leach field to enable the action of soil microbes to further polish the effluent.

In addition to our standard biological trickling filter processor, SeptiTech systems can provide enhanced pathogen destruction and can further reduce total nitrogen through the use of complimentary ultraviolet (UV) sterilization and Denitrification processes, respectively.

UV Sterilization

Typical residential wastewater carries fecal coliform at a concentration of 10^7 to 10^9 colonies per 100 milliliters (col/100 ml) of wastewater[1]. Standard SeptiTech processors reduce this concentration to levels ranging from less than 10 to 1,000 col/100 ml.

However, in certain applications (e.g., close proximity to surface water, water supply wells, irrigation disposal, etc.) a further reduction of *bacteria and viruses* may be desired. Due to the clarity of the effluent from the SeptiTech processor, UV sterilization technology can be used to destroy the majority of the pathogens remaining. This technology is currently installed in over sixty SeptiTech systems in a number of states including several coastal islands. Fecal coliform concentrations typically range from non-detectable to 0.5-col/100 ml and average 0.1-col/100 ml. Actual concentrations depend on variations in wastewater strength and clarity. To produce a more consistently low coliform concentration (less than 0.05 col/100 ml), SeptiTech has developed an enhanced UV process that is being used in several commercial systems.

Denitrification

For critical resource areas that exhibit a high degree of sensitivity to the effects of nitrogen loading, SeptiTech has developed a denitrification process to further enhance total nitrogen removal during pretreatment. The SeptiTech denitrification systems have been proven to remove a larger percentage of total nitrogen by combining the nitrifying capabilities of our aerobic biological trickling filter system with an enhanced denitrification procedure.

The SeptiTech nitrogen reduction technology first nitrifies wastewater by the SeptiTech aerobic trickling filter process. Nitrification of the ammonium (NH_4) in the wastewater occurs in the processor as it passes through the media. Nitrified wastewater is then passed into an anoxic (>2 mg/l dissolved oxygen) environment where a culture of anaerobic bacteria satisfies their need for oxygen by chemically stripping the oxygen off other compounds, such as NO_3. To promote denitrification within the anoxic environment, SeptiTech has developed zones of submerged media with the required conditions of temperature, alkalinity, and BOD levels. Similar to the aerobic process, the denitrification process is self-adjusting based on demand and controlled by the PLC to provide consistent results.

SeptiTech's nitrogen reduction technology has completed a full year of verification testing under the US EPA Environmental Technologies Initiative, Source Water Protection Program. This testing was designed to verify nutrient reduction of the SeptiTech treatment technology and was being conducted by the Barnstable County Department of Health at the Massachusetts Septic System Test Center in Bourne. During the testing, the SeptiTech system was loaded with influent wastewater from a sanitary sewer. SeptiTech's nitrogen reduction capability was measured by constituents that demand oxygen for treatment (BOD and CBOD), and nitrogen species (TKN, NH_4, NO_2, and NO_3). Operational characteristics such as labor to perform maintenance, maintenance tasks, durability of the hardware, noise and odor production were also monitored. Effluent testing showed CBOD5 and TSS was 98% removed. Average Total Nitrogen in effluent was 14 mg/l. A full report for this testing is posted on the EPA (www.epa.gov/etv) and NSF (www.nsf.org/etv) web sites.

SeptiTech is also ASNI/NSF-40 and 245 certified. Information on these certification programs is available on the National Sanitation Foundation website; http://www.nsf.org/.

[1]Design Manual - Onsite Wastewater Treatment and Disposal Systems, Environmental Protection Agency, Washington, D.C. 1980.

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GENERAL NOTES

- Tank(s) shall not be installed at a depth greater than 24-inches. Tank installations requiring a depth greater than 24-inches from top of tank to finished grade need prior approval from SeptiTech.
- Tank risers required to bring the aluminum hatches on commercial systems to grade are the responsibility of the Contractor.
- Tank(s) shall be installed with a minimum of 12-inches of compacted crushed stone bedding. Select fill shall be used for backfilling around tanks.
- Water Testing: Contractor is responsible for water testing the concrete tank(s) once the tank(s) installation has been completed and allowed to set overnight (if required). Water testing shall be conducted in accordance with ASTM C1227.9.2.
- Contractor shall be responsible for providing clean water for the testing and filling the tanks.
- Exterior Piping: Contractor is responsible for supplying and installing all exterior piping per SeptiTech installation drawings.
- Air Intake Piping: Air intake snorkel shall be installed within 100 feet of the processor tank. Air intake piping shall be installed such that a positive pitch is provided away from the processor tank.
- Pipe Insulation: Contractor is responsible for insulating all piping exterior to the SeptiTech processor including the discharge line from the processor to the disposal field.
- Tank Insulation in cold climates: After concrete tanks have been installed and water testing is completed, contractor shall insulate the top and sides of the processor tank below frost depth (4-feet min.) down the sides of the tank with 2" rigid foam (blue) board insulation and then complete backfilling. Contractor is responsible for installing insulation over the top of the forcemain from the SeptiTech system to the disposal field when shown on approved plans.
- Electrical: All electrical work is the responsibility of the contractor's licensed electrician and is not provided by SeptiTech. System Controller should be installed in a heated building where an ambient temperature range of 60 to 90 degrees F is maintained. If the control panel must be located outside, please notify SeptiTech, Inc. so a heater may be installed within the enclosure
- SeptiTech Commercial sized processors can also be built to 3-phase power requirements. If 3-phase is required, please specify type of 3-phase power (208v / 230v) and notify SeptiTech at the time of placing Order.
- Internet Connection Commercial Telemetry : Owner is responsible for installing an Internet line to the processor control panel for remote access by SeptiTech. SeptiTech prefers the Internet connection because it is faster and less expensive in terms of electrical components. line must be installed and working in order to have any work performed under warranty. Any work performed on the system without the installation of the Internet line connection shall be at the expense of the Owner.
- Float elevation shown on plans are approximate. The SeptiTech Processor high and low water elevations are a function of the tank working volume and such final elevation of floats will be determined by SeptiTech during Start-Up Services.
- Tank Fabrication of the SeptiTech Processor tank needs to be submitted to and approved by SeptiTech prior to fabrication and delivery to the project site. Contact SeptiTech Engineering at 207-333-6940.

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POWER REQUIREMENTS

RESIDENTIAL

Models	Control Circuit	Mechanical Circuit	
	110V	110V	220V
STAAR 0.5	2 Amps	10 Amps	5 Amps
STAAR 0.75	2 Amps	10 Amps	10 Amps
STAAR 1.0	2 Amps	15 Amps	10 Amps
Options			
Heater and or UV		Add 5 Amps	Add 5 Amps
Discharge Pump Upgrades			
2.4		Add 5 Amps	Keep as Same
2.75		Add 5 Amps	Keep as Same

STAAR™
Smart Trickling Anaerobic/Aerobic Recirculating Filter Systems

COMMERCIAL

Models	Control Circuit	Mechanical Circuit	
	110V	220V	208V 3 Phase
STAAR 1.2	2 Amps	15 Amps	10 Amps
STAAR 1.5	2 Amps	15 Amps	10 Amps
STAAR 3.0	2 Amps	20 Amps	10 Amps
STAAR 4.5	2 Amps	20 Amps	15 Amps
Options			
Heater		Keep as Same	Keep as Same
UV		Add 5 Amps	Keep as Same
Discharge Pumps Upgrades			
2.25		Keep as Same	Add 5 Amps
2.4		Add 5 Amps	Add 5 Amps
2.75		Add 5 Amps	Add 5 Amps

NOTE * All systems require two separate power circuits
Circuit #1 is 110v used for the controls
Circuit #2 is 110v/220v/208v depnding on system size and pump power requirments