Septic Medic Test vs Control Laboratory Results:

EXPERIMENTAL SUMMARY

A comprehensive, test vs. control laboratory study was conducted to confirm the superior results attainable in septic tanks using Septic Medic. This rigorous test was performed for 60 consecutive days in a laboratory setting using Septic Medic treated (TEST) and untreated (CONTROL) septic systems. The results were excellent:

- ***Discharge quality was at least 21% improved in Total Suspended Solids (TSS) with Septic Medic.***
- ***Discharge quality was at least 30% improved in Chemical Oxygen Demand (COD) with Septic Medic.***
- ***Discharge quality was at least 65% improved in Oil and Grease (a measure of fat content) with Septic Medic.***
- ***Sludge Production was at least 36% reduced with Septic Medic compared to the control tank.***

These improvements, though large and exciting in themselves, do not tell the full story. These numbers were calculated from the beginning through the end of a 60-day laboratory study. However, the results as taken over the last 30 days of the study were even more impressive in Septic Medic's favor.

However you look at it, these impressive improvements in pollution control mean dramatically improved effluent quality and reduced sludge production. And with this improved efficiency, your system will run more efficiently for many years. And that is good for both the environment AND your bank account!

Please continue to read about this exciting study in the pages that follow, and you will see just why we are so excited about Septic Medic!

I. Introduction

A septic tank that is operating properly should purify the water so that the downstream drain field does not plug up with organic waste. The septic system should also be odor free. Sludge production and sludge disposal costs should be minimized so that excess pumping is not required to keep the tank working well.

Unfortunately, many septic systems fail to flow properly, require excess and expensive pumping, and have odor problems (sulfide or rotten egg smell).

Septic Medic is designed to dramatically improve the biomass in the septic tank, so that all of these treatment objectives can be met routinely and inexpensively. Proper use of Septic Medic restores free-flow and efficiency to sluggish septic tanks. This lab study was designed to see how much difference there was between septic tanks treated with Septic Medic and those without treatment.

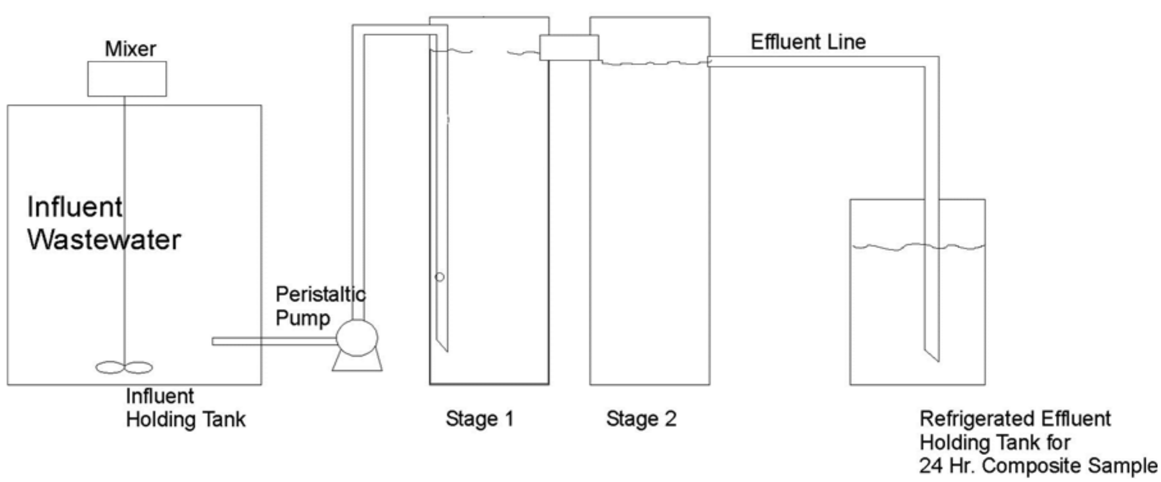
II. Objectives

This study was designed to to answer two specific questions:

- To what extent can Septic Medic improve effluent discharge in septic systems?
- To what extent can Septic Medic reduce sludge production in septic systems?

To ensure that the study met rigorous scientific procedures, two parallel, identical systems were set up. This way, one would act as a test (treated with Septic Medic), while the other would act as a control (without product added).

A schematic of one of the two identical systems is presented below:



The dimensions of each of the main tanks (Stage 1 and Stage 2) was 1 and ½ feet square by 4 feet tall, with a total working volume of about 40 gallons each

(80 gallons collectively). Two stages were used to act as a baffle (as you would have in a sophisticated septic tank). Stage 1 would provide a settling zone and the initial biodegredation of the COD, solids, grease, and scum, while Stage 2 would be a polishing zone.

As stated above, one system was used as a test tank while the other was used as a control. A common holding tank was used for mixing and dispensing wastewater to the test and control septic tanks. Treated wastewater from each experimental system flowed to a refrigerated holding tank so that 24-hour composite samples could be taken.

Raw sewage (untreated) was obtained from a local wastewater treatment plant to use as feed to the test and control septic tanks. The wastewater typical domestic sewage, with a relatively high amount of oil and grease present due to the existence of several cafeterias that discharged into the sewer system.

This raw wastewater was immediately transferred to a 500-gallon holding tank. The holding tank was used to feed both of the parallel, identical pilot plants for one week. At the end of each week, the wastewater was replenished. The average composition of the wastewater was as follows:

Average Influent Wastewater Composition

Parameter	Average Value
Suspended Solids	585 mg/l
Soluble COD	140 mg/l
Total COD	785 mg/l
pH	7.3 pH units
NH3	24 mg/l
PO4	4 mg/l
Oil and Grease	72 mg/l

III. Pollutant Removal and Sludge Reduction Theory

Pollution removal occurs when microorganisms consume the COD (chemical oxygen demand) that is present in the wastewater. However, this proceeds most rapidly with simple, soluble types of organic pollution. More complicated wastes, such as particulate organic matter, paper, fats, and other polymers, are much slower to break down.

The main impediment to rapid pollution removal is that the microorganims are surrounded by cell walls, and do not have mouths to ingest food. Instead, food (pollution), must pass through the pores in the cell wall before it can get inside the microorganisms. This means that much of the pollution (food for microorganisms) is too large to enter the cell, and this material is much slower to biodegrade than simple, soluble food types which can enter the cell directly.

Basically, in order to purify the water as rapidly as possible, the microorganisms must solubilize the large food particles and polymers into simpler, easier to consume substrate. Until this happens, the pollution removal remains at a standstill – regardless of the apparent health of the biomass.

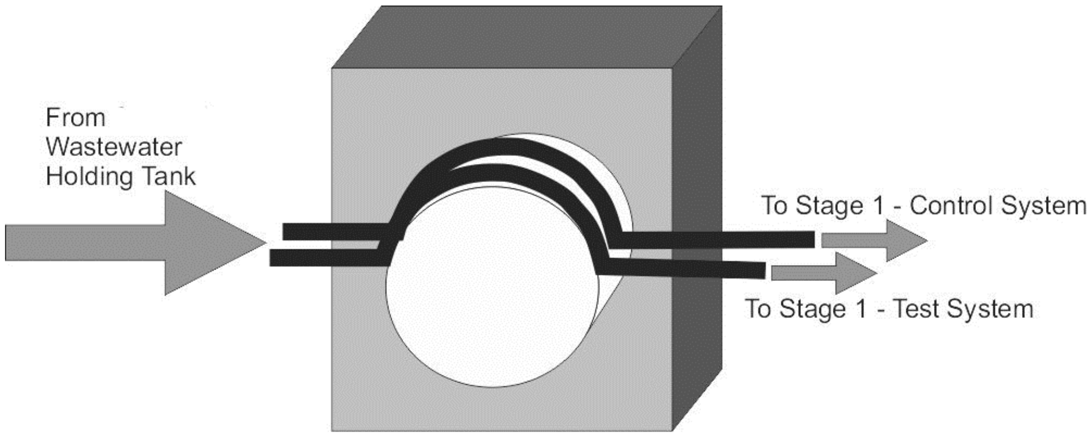
Sludge is produced in septic tanks and package plants in two ways. First, sediment (sludge) from the incoming sewage that is heavier than water falls to the bottom of the tank (mostly Stage 1 in this case). Second, as microorganisms consume soluble waste, the biomass reproduces. Additional sludge is formed this way.

The key to Septic Medic performance is that the Septic Medic bacteria provide huge numbers of bacteria that rapidly solubilize these large, complex materials. The result is that the pollution is removed faster as more of the waste gets into the cells earlier.

This solubilization activity not only dramatically improves organic pollutant removal (reduces COD), but it also prevents premature, excessive sludge build-up. (Note: despite the enhanced sludge digestion you get with Septic Medic Power Pack, you must still follow all local, state, and federal guidelines governing required pumping frequency!)

IV. Equipment Operation

Wastewater was fed to each laboratory system three times a day, at the rate of 10 gallons per addition (30 gallons per day to each system). As the working volume of the simulated septic tank / package plant was about 80 gallons, each train had approximately 2.67 days of retention time (which mirrors that of many household septic tanks. To ensure that both systems had identical wastewater feed, a peristaltic pump was used to transfer wastewater from the storage tank to Stage 1 as shown in the schematic below:



(Note dual feed system for ensuring identical wastewater feed to test and control)

The pump is designed as a dual-feed, identical flow rate system. With this equipment, the test and control septic tanks received identical wastewater flow each day.

IV. Experimental Procedures

A. Start Up

To start the system up, 10 gallons of well mixed activated sludge from a local sewage plant was added to the test and control Stage 1 tanks. The peristaltic pump was used to transfer raw wastewater into the test and control systems until both Stage 1 and Stage 2 in each system was full.

At this point, the influent wastewater feed of 10 gallons, three times per day, to each laboratory train was begun. At this point, the parallel, identical systems were considered started up and the experiment was ready to commence.

B. Operation

The peristaltic pumping system was used to add 10 gallons per day to each system, three times each day. The total addition per day per system was therefore 30 gallons, giving a hydraulic resident time of 2.67 days.

C. Septic Medic Dose

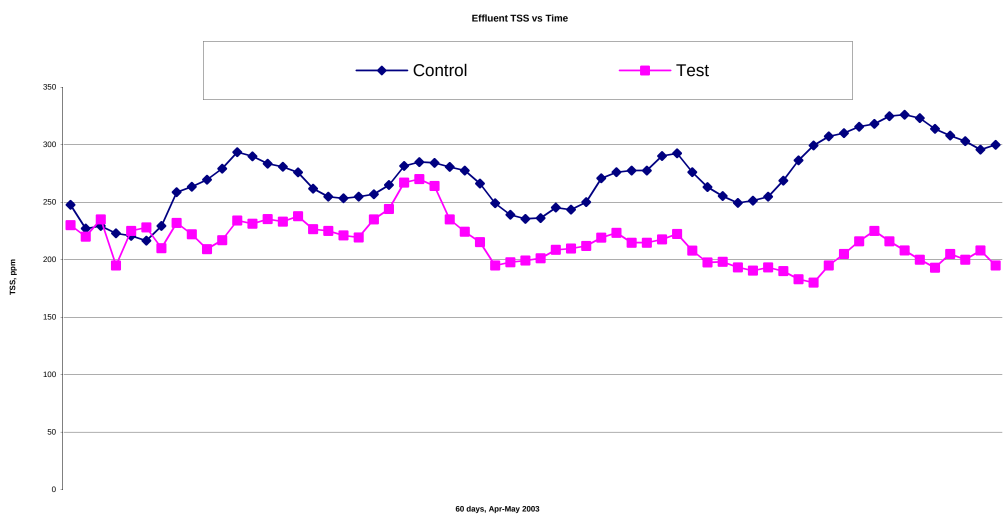
The test system received a dose of 1 oz of Septic Medic a week. The dosing began immediately at system start up, and was repeated every other week, during the course of the study. A total of 3 ounces of Septic Medic were added to the test system during the 6-week study. This is equivalent to adding about a quart of Septic Medic in a typical 1000 gallon household septic tank over a month's time.

D. Test Procedures

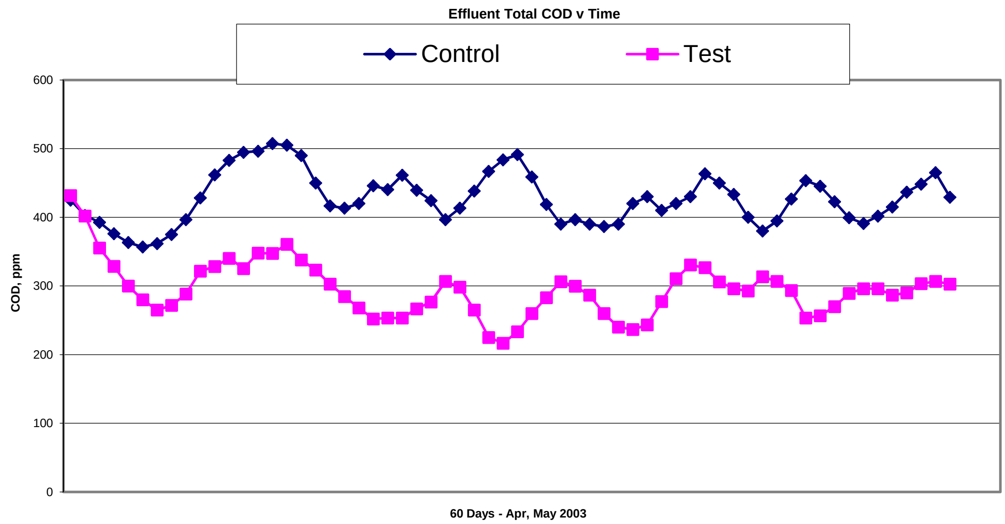
Effluent from each system flowed to a refrigerated holding tank, so that 24-hour composite samples could be conveniently taken. At the end of each 24-hour period, the holding tank contents were blended to give uniform samples for testing. System influent and effluent were tested Monday through Friday for each of: Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), and Oil and Grease. Tests were performed according to standard methods for each of the parameters.

V. Results

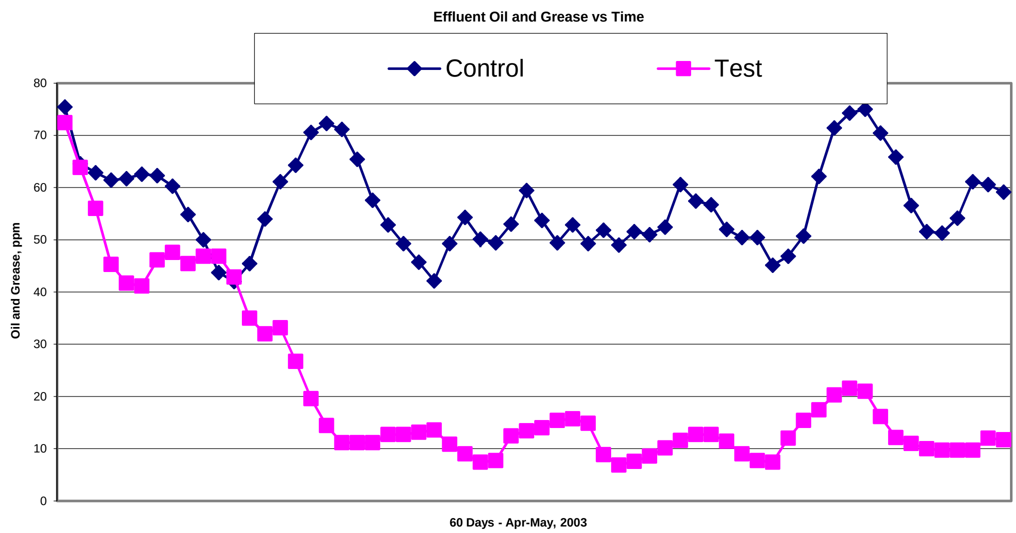
The chart below is a summary of effluent suspended solids vs. time for the test and control laboratory systems. The chart shows continuously improving performance on the Septic Medic treated side. Over the 60 day run, control TSS averaged 281 ppm compared to 223 ppm in the test side. This is an improvement of 21%.



The next chart is a summary of effluent Total COD vs. time. As with effluent SS performance, the test side consistently outperformed the control side. The average effluent COD on the control side was 429 ppm, compared to 303 ppm on the test side. This is a reduction of 30% due to Septic Medic treatment.



Effluent Oil and Grease results are shown in the next chart. This is the most impressive set of results. Oil and grease on the control side averaged 59 ppm, compared to only 21 ppm on the test side, or a 64% reduction!



To calculate the sludge production results, we had to determine all of the following values:

- Total mass of solids at the beginning and end of the study in each set-up
- Total solids load to each system throughout the study
- Total solids discharge from each system throughout the study

Once all of these values were determined, we could calculate the total sludge production using the following equation:

Sludge Production **=** ***(Final Solids Mass – Initial Solids Mass) less (Solids load to system –discharge from system)***

To calculate the initial and final mass of solids in each system, Stage 1 and Stage 2 were well mixed, then sampled. The initial solids inventory at the start of the study was 355 grams of solids in both the test and control systems. (The starting inventory was largely the result of using sludge from a wastewater treatment plant).

We then have the following values for the test and control systems:

Parameter	Test	Control
Final Inventory of Solids between Stages 1 and 2	2105 grams	2071 grams
Solids load to each system due to influent SS Throughout the study	2625 grams	2625 grams
Effluent solids discharge from each system Throughout the study	1519 grams	1914 grams

Putting all of the data into the sludge reduction equation for test and control gives the following sludge production result:

Control Side Sludge Production = (2071-355)-(2625-1914) = <u>1005 grams</u>
Test Side Sludge Production = (2105-355)-(2625-1519) = <u>644 grams</u>

Therefore, the test side showed 36% less sludge production compared to the control side. This occurred even though the inventory of solids in the two sides was nearly identical at the beginning and end of the study. This means that nearly all of the sludge reduction was manifested as improved effluent solids.

VI. Discussion

From the various charts and calculations, it is clear that the Septic Medic treated system had significantly better effluent performance and lower sludge production than did the control system. The table below is a summary of the key parameters:

Final Study Values

	Test	Control	Improvement
Total Suspended Solids (TSS, ppm)	223	281	21%
Chemical Oxygen Demand (COD, ppm)	303	429	30%
Oil and Grease (Fats, etc., ppm)	21	59	64%
Sludge Production (grams)	644	1005	36%

These data prove that use of Septic Medic has a beneficial effect in the septic tank environment. The reduced pollutant content of the effluent will have several advantages, including reduced load on the drain field, reduced odors, less puddling. The bottom line is that with Septic Medic use, your septic tank will discharge cleaner water to the environment than it would otherwise.

Further, it is clear in each of the three charts that the relative performance of the Septic Medic tank improved compared to the control tank as the experiment continued. The data above show averages for the entire run. However, as the Septic Medic data were clearly improving towards the end of the experiment, the results can be interpreted as the low end of expected improvement. Just as the experiment continued to improve toward the end of the 60-day run, so will your own experience with Septic Medic.

For further information or answers, please contact us at the address, email, or phone shown below.