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The latest advance in wastewater treatment.

Flush But Don't Forget

By Richard Lincoln

Septic Systems and Indian River

If you are like most of us, once you flush the john you forget it. This works until either the drain field plugs and ponds or the toilet sends it back up to you and the house. Then it's panic followed by copious amounts of cash to make it better. The purpose of this brief white paper is to provide some basic knowledge regarding septic systems and explain how new technologies can save us all a great deal of money and stress while improving the local environment as well as improving sewage collection and treatment for our homes and businesses of Indian River and beyond. But, first things first.

My Background

My name is Richard Lincoln and my wife Sheree and I moved to Indian River this past year. We have started a small business called Arts and Adventure Paddle Sports where we rent and sell kayaks, canoes, paddle boards and custom wood boats. We also have a small fine arts gallery and retail shop. The bottom line is, Sheree and I have a significant personal and business stake in the water quality and well being of the river and lake ecosystems of Indian River and of this region.

I am retired from the food industry where I spent 24 years in various technical and management positions. My degree is in the Biological Sciences and in a past life (just out of college) I worked at three sewage treatment facilities. I was a research technician for the EPA in two of these facilities (Wyoming and Grandville MI) and, for the city of Fremont MI, I served as the Assistant Superintendent for their waste water treatment plant. This facility processes about one quarter of a million gallons of sewage daily on a one hundred and twenty acre site. Additionally, I am certified by the State of Michigan to operate a lagoon type system similar to the lagoon system at Burt Lake State Park. Although I am not an engineer, my education and background allows me to hold my own in any discussion regarding the science of what's going on in the septic tank.

Today's Septic System

There is a tongue in cheek saying in the scientific community that goes something like this; "Just because one doesn't understand scientific principles doesn't mean one won't be affected by them." This being said, let us take a little peek at what is going on once that toilet gets flushed.

Currently nearly 25% of households in the United States rely on some sort of onsite wastewater treatment system for their treatment of domestic wastewater. This treatment usually includes some form of septic tank (collection) and drain field or leech field (dispersal). Conventional septic systems are designed for the removal of solids in the tank portion and the removal of nutrients and pathogens through the passage of the effluent from the tank through the drain field into the leech field soil. This can happen rather effectively when the systems are new, well designed, and installed and maintained correctly. However, there is a weasel in the henhouse. By their nature, septic systems are designed to fail and this failure begins as soon as the systems are operational.

How so?

Septic tanks operate in what scientist's call an "anaerobic" environment. This means literally without oxygen and occurs when the microbial oxygen demand exceeds the available oxygen supply (septic tank environment). The bacteria living in our gut and in the septic tank are also anaerobic. These bacteria called e-coli (and others) are the ones responsible for breaking down the solids in the septic tank. Again, when everything is working well the process moves forward. The problem is that the anaerobic process is quite slow and somewhat inefficient, compromising the effectiveness of the entire system. Additionally, those same e-coli that break down the solids also secrete a slime like material that begins to clog the drain field and leads to premature failure of the system.

It’s at this point of septic system failure that home owners spend millions of dollars annually on additives for the septic tank. Everything from enzymes to special bacteria is being sold as a preventive or a fix for septic system failures. The problem is that these additives will not save an anaerobic septic system from failure. It is like tuning up the family minivan for a race against a Ferrari. It simply won’t work.

Although drain fields and septic systems can fail for a number of reasons, eighty percent of drain field and leech field failure is directly caused by the e-coli and the resulting tar like biomat, along with accumulated solids, clogging the drainage piping at the drain field soil effluent interface. A typical septic system and drain field will last from just a few years to over twenty years and beyond. Longevity being a function of design, construction, maintenance, usage and the limitations of the anaerobic process.

It's Always about the Money

I don't have to tell anyone who has replaced a drain field or septic tank how expensive this process is. A typical drain field costs anywhere from $3,000 on up and replacement may have to be repeated throughout ones lifetime. Additionally, septic tank pumping is recommended every

three years and new state regulations are making it difficult for pumping services to get rid of the collected waste. You can't just spread it over the land anymore. The predicted result is the projected doubling of the current pumping costs in the next 1-3 years.

So what can we do about this built in septic system design failure and the associated expenses?

There's a New Sheriff in Town (Oxygen to the Rescue)

Fortunately there is hope. With the limited effectiveness and expenses of current anaerobic septic system design, coupled with poor function and high failure rate, regulatory agencies are beginning to look for wastewater treatment technologies that lower emissions of solids, pathogens and nutrients and minimize the negative effect on the residential and small business check book. In the past fifteen years there has been significant research incorporating oxygenation systems as retrofits to onsite septic systems. These systems, ATU's (advanced treatment units), work by pumping oxygen through a diffuser into the septic tank and adding a special bacteria to the system.

So what is the big deal about oxygen?

Oxygen is one of those great elements that loves to share and grab electrons from other molecules. This process is called oxidation and in so doing, oxygen has the ability to reduce long chain carbon (organic) based compounds (carbohydrates and proteins are two examples of these) into smaller molecules and compounds releasing energy in the process.

On a greater scale it's the same process that causes a piece of metal to rust or allows a wood fire to burn. This is essentially how many metabolic processes work in our own bodies as well. In fact, for plants, animals, and most bacteria, oxygen is the staff of life.

It just so happens that if you add oxygen and a bacteria from the bacillus family to a septic tank, one can significantly improve the efficiency of the septic system process. So much so that even failed systems can and in most cases will be brought back to life, saving thousands of dollars in the process. I have witnessed this first hand. Because these bacillus bacteria are aerobic vs. anaerobic, they have the ability to chew up solids, remove the biomat and even stabilize nutrient loading. These bacteria are so plentiful that they are very easy to come by and are not toxic to humans. Conversely, oxygen is so toxic to anaerobic bacteria that e-coli and potential pathogens cannot survive in any viable numbers.

These oxygen diffuser systems are so effective that research has consistently reported a greater than 95% reduction in solids, and a greater than 95% reduction in fecal coliforms (e-coli). Even more importantly, new installations incorporating oxygen diffuser technology can add drip irrigation in place of drain fields, saving additional thousands of dollars in construction and drain field installation charges…..isn't science wonderful?

Translation Please

More oxygen means:

Less solids and less drain field failure
Less coliform bacteria, less disease causing pathogens and no biomat build up
Less septic tank pumping and less pumping costs
No more expensive additives
Less nutrients and less problems in our lakes and streams
Less installation and construction costs

Win....Win....Win....Win....Win!!!

Why Haven't These Systems Taken Over?

It's simple. While decentralized systems are making inroads (both world wide and in the US), large sanitary engineering firms have done a very effective job in promoting large centralized sewer projects. We have one such sanitary sewer project proposed for Indian River. The fact of the matter is that big systems mean big concrete, big buildings, big pipes, big pumps and big salaries translating into big money and potentially big problems. All of this with no better water quality than a decentralized septic tank retrofitted with an oxygenated commercial unit.

The following is an example of how an after market system (designed by the SludgeHammer Group) would compare to the expenses associated with hook up to the proposed sanitary system for the Home Town Inn of Indian River:

Sanitary Sewer Charges:

To hook up to the proposed sewer system for Indian River, the Home Town Inn was assessed a whopping total of $176,000 and an additional $500 / month O&M fees.

The estimate from the SludgeHammer Group for a complete oxygenator and diffuser retrofit designed specifically for the Home Town Inn is less than $12,500 WOW!!! While the cost difference seems wild, this illustrates one of the issues with a centralized sewer systems. And remember, this does not include hook up fees or the costs for abandoning the old septic field.

How Would Indian River Benefit?

I estimate that for the cost of just the USDA grant money (1.5 million dollars) all of the proposed sewer district could be retrofitted w/ a SludgeHammer oxygenator and diffuser system at no cost to the individual property owners. This is based on an estimated REU assignment of 400 for the sewer district and a average cost of less than $2500 per REU for the SludgeHammer unit. There would even be enough left over to do Burt Lake State Park.

Even if the sewers go through, those folks outside of the sewer district should be looking at installing these systems. Currently, as septic systems begin to fail, the County Health Department will be enforcing new standards that will require big money to meet. Not to mention that all of these systems are ticking money bombs that will need to be dealt with sooner or later.

Who is Doing What in Oxygen Diffuser Market

There are a number of players in the oxygen diffuser market. Like anything else, there are differences that need to be researched. LET THE BUYER BEWARE! However, there are a few companies that seem to set themselves apart from the others. The SludgeHammer Group appears to be one of these. SludgeHammer has acquired NSF (National Sanitation Federation) certification. This is very important due to the research required to meet NSF requirements and standards.

SludgeHammer is also certified under MARPOL (Marine Pollution Convention). This organization sets the standards for marine shipping discharge and went into force in 1983. To date, 150 countries have signed the MARPOL convention and are subject to it‘s discharge requirements.

What Do We Do Now?

Get as much information as you can
Come to an informational meeting (call me at 231-760-0103 for details)
Come see an oxygen diffuser system in operation (call me)
Begin a dialog with County Health officials to endorse ATU type systems for Cheboygan County

Again, I am pleased to answer any questions that you may have regarding this very important issue. We truly have an opportunity to positively affect our community, our environment and our pocket books by flushing but not forgetting what is going on in our backyards.

Best regards,

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