Enviro-Flo Advances Residential Sewage Treatment Technology with NuWater BNR Series Aerobic Treatment Unit

Enviro-Flo, Incorporated of Flowood Mississippi has been a manufacturer of aerobic treatment systems since 2001. Their company philosophy of designing simple, easy to maintain systems has helped to keep them competitive during the lean years of the recent building slow-down. Company President Joe W. Lacey II has not rested on his laurels, however, choosing to invest in new ideas and technologies even in the face of the recession. This strategy has recently borne fruit with the popularity of the most recent addition to the Enviro-Flo lineup, the **NuWater BNR Series** Aerobic Treatment Unit.

History:
Since the young age of 12, Joe W. Lacey II worked evenings and weekends in the Jackson Mississippi area with his father, who sold and installed many septic systems, including Aerobic Treatment Units. During a discussion with an ATU manufacturer rep, a young Lacey had asked how the systems treat the waste. The answer the rep gave him was "it's magic". The manufacturer rep may have been kidding, but he also may have been covering for his own lack of understanding. Lacey became a Biology pre-med student in the Jackson area, on his way to receiving his Bachelors of Science with extended studies in microbiology. It was during Lacey's studies of microbiology that he realized what makes these systems work. He immediately gained a keen interest in the different aspects of sewage treatment, and began tinkering with how to develop a better system. Out of this tinkering, he discovered many things, such as how too much air in a digester may cause excessive suspended solids to pass the clarifier, as well as how the shape of the digester can optimize mixing and eliminate "dead zones". Lacey's efforts culminated in the design of the first NSF 40 system approved from Mississippi, the Enviro-Flo E-500 ATU.

Mr. Lacey's tinkering has not stopped, with research and development an ongoing process. In an effort to see if he could design and construct a system that would meet the needs of states that are now requiring Nitrogen removal, he went back to the drawing board. He knew that to gain Nitrogen reduction, one had to first have a complete understanding of the nitrification/de-nitrification process. After months of studying it became apparent that this was indeed a three-step process, beginning in the plumbing where ammonification begins. This is where most of the nitrogen in waste is converted into ammonia and ammonium. This process also takes place every day in typical septic tanks. Next Nitrification begins under aerobic conditions utilizing nitrifiers to convert the ammonia and ammonium into nitrite then nitrate. This process only takes place with sufficient dissolved oxygen and is a very rapid process. At this point you should have a waste stream with higher than normal levels of nitrite and nitrate. De-nitrification is a process that utilizes heterotrophic bacteria, which require an endless carbon supply to survive. Part of the carbon source comes from sludge recirculated from strategic locations. These facultative bacteria live in the trash or septic tank and get their oxygen from the dissolved oxygen in the water or from free nitrate molecules. Once the oxygen in the water is depleted and nitrate becomes the primary source of oxygen, then de-nitrification begins. Once oxygen is removed from nitrate it is reduced to nitrous oxide and nitrogen gas. Free nitrogen makes up a large portion of the air we breathe and has no direct impact on the environment.

Mr. Lacey knew that the first two steps of the treatment sequence were easily attainable with an anaerobic trash tank and a well-designed digester. Mr. Lacey designed a digester with fine-bubble diffusers to give excellent oxygen saturation and even mixing of the aerated zone. He combined this with the same up-flow "still" clarifier that he used on his other systems. This point is typically where most ATUs conclude their treatment, leaving the treated waste still high in the Nitrates, which are soluble in water, and particularly dangerous due to their ability to flow to drinking waters and cause eutrophication in lakes and streams.

The difficult next step was, in order to gain nitrogen removal, he needed an anaerobic treatment process with after the digester with a sufficient carbon source. To overcome this difficulty, he devised a clever strategy of a sludge return that returns a percentage of the treated waste back to the trash tank for additional anaerobic treatment. This recirculation results in a conversion from Nitrates back to Nitrogen gas, which vents harmlessly back through the house plumbing.

The design resulted in a process that not only reduces the nitrogen in the waste through this process, but also works so efficiently with residential waste that it has a resulting bacteria die-off in the still clarifier. Third party testing showed that the system removed fecal coliforms to under 1000 colonies / 100 ml, allowing it to qualify for Washington Treatment Level "B" without add-on disinfection.

Process:
The NuWater BNR Wastewater Treatment System is designed for treating domestic wastewater generated by normal household activities. The system consists of a single tank utilizing the extended aeration activated sludge process. The system is capable of producing an effluent, which meets or exceeds applicable state standards.
Treatment begins when wastewater from the home flows into the pretreatment zone of the system. Here, the organisms begin to break down and convert the waste into gases and additional microbes. This is also where nitrate is converted to nitrogen gas. The partially broken down waste then enters the treatment area, or aeration chamber. In the treatment area, waste is continually exposed to microbes for the remainder of the treatment process. The digestion action of the aerobic microbes results in a lower concentration of pathogenic bacteria.
After average retention time in the aeration zone of 24 hours or more, the mixture enters the clarifier where calm conditions enable separation of microbes, solids, and treated wastewater. The microbes that settle out of the water sweep back into the aeration chamber where they are again beneficial in wastewater treatment. The proprietary airlift provides for a portion of the treated wastewater to be returned to the pretreatment zone for additional treatment and de-nitrification. The result of aeration and quiescent separation, followed by recirculation is an effluent that is clear, odorless, and low in nutrients which may be discharged according to local health regulations.

Approvals:
The NuWater BNR Series ATU has successfully undergone third party laboratory testing to meet NSF/ANSI Standard 40 as well as NSF/ANSI Standard 245 (nitrogen removal). Aside from the standards 40 and 245 testing, the system was tested concurrently for fecal removal per the State of Washington guidelines. The laboratory NSF/ANSI 40 report concludes that not only does the system reduce nitrogen, but also reduces fecal coliforms substantially, even prior to the UV light.
In March of 2011, Enviro-Flo Incorporated received State approval for use of the newly designed treatment unit. The test data supported the approval for Washington Treatment Level "A" after the UV light, but more significantly, that it meets treatment level "B" prior to the UV light.

Unique Washington Applications:
In addition to typical Treatment level "B" applications, sites that the NuWater system is ideally suited for include the following scenarios:
Scenario 1) Repair sites needing to meet the requirements of Table 9 repair guidelines.
Previously, options for non-conforming repair sites were often limited to sand-based treatment systems. This sometimes created a space crunch if the site didn't have the room for the sand-based installation. The ability of the NuWater BNR to meet treatment level "B" without the need for UV makes it uniquely suited for the difficult back yard non-conforming repair sites. The difference between a sand-based disposal unit versus an ATU to Drip Irrigation can make a big difference in the livability of a property.

Scenario 2) Sites with poor soils, down to as little as 12 inches of available treatment soil.
In this scenario, the latest mound guidelines allow for use of "disposal only" mounds when following treatment level "B". This can result in a very low profile sand mound using as little as 60 cubic yards of sand for a 3-bedroom mound. The key is that the guidelines allow for the mound to have only 12 inches of sand below the bed provided there is 12 inches of treatment soil below. A popular option is to use a single row of "Low Profile" gravelless chambers for the bed, resulting in a bed size of 34" by 72 feet for a 3 bedroom, which gives the mound a base size of approximately 17.5 feet X 86.5 feet on a flat site.

Installation & Maintenance
Enviro-Flo Incorporated requires that each person wishing to become part of the network of providers certified to install or maintain the NuWater BNR system must first attend a NuWater class and receive certification to do so.
Certified installers within the NuWater network are required to provide the first 2 years of maintenance with the cost of each system. Certified Maintenance Providers are expected to have understanding of not only how to maintain the NuWater treatment unit, but also have expertise and provide for the maintenance of the disposal components following the treatment unit as part of the contract with the property owner.

Look for class schedules in upcoming WOSSA literature, at the WOSSA Conference, or inquire with nearest NuWater Distributor.