BEDFORD REGIONAL WATER AUTHORITY

Volume 6 Issue 2

.June 25, 2015

DOWN THE PIPELINE

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A NEW VISION FOR WASTEWATER

In years past, the water sector within our nation has worked to ensure safe drinking water and the discharge of clean water to creeks, streams, and rivers. But today that mission is expanding, the perspective is changing. Water, nutrients, energy, and other resources all converge at the water resource recovery facility. The question has now become: "What to do with them?"

We are now faced with the challenges and opportunities for nutrient recovery. But there is a lack of funding and an abundance of risk-averse attitudes toward new technologies that can recover phosphorus and nitrogen as "products."

So the water industry is slowly looking at water from a new angle, but it has not changed its essential function. It is a revolutionary process taking place, make no doubt about it. It is like rebuilding an airplane while you're still flying it! Great care must be taken to not cause things to totally crash.

Why is resource recovery so important? Phosphorus supplies are finite in nature. Unless we seriously begin recycling it, we will run out of it. Then there will be no more fertilizer, there will be no way to provide our crops the necessary nutrients they must have to grow. Nitrogen is present in surface waters in excess, needing to be reduced to avoid algal blooms and oxygen -deficient waters.

Here is how wastewater must be looked at today:

WASTEWATER IS A "RE-

N—nutrient recovery to produce and sell a desirable fertilizer product.

E—energy production & efficiency for plant energy.

W—water resource management to achieve sustainability for all users.

- able" resource.

THE FIRST LINE OF DEFENSE

Water and wastewater operators play critical roles in maintaining community health and safety.

According to Dr. Adrianus Vlugman, "All people working in water and wastewater sanitation are primary health care workers. It's right in the word itself. "Sanitas" is the Latin word for health."

The problem with water and wastewater infrastructure is that it is "out of sight and out of mind." That thought pattern rolls over to how the public thinks of the operators and maintenance personnel that provide them with clean water to drink. These workers continually put themselves in harm's way: confined spaces, trench work, toxic gases, pathogen-infested materials, so that others can be safe. It is time to give all of these people a hearty thank you!

CLAMPING DOWN ON WATER LOSS

With any conveyance system of liquids, as it ages it begins to leak and break. It must be repaired continually.

The Natural Resources Defense Council has been looking at how well states and utilities are measuring and reporting water losses and then setting reduction targets.

The NRDC states that aging water pipes nationwide experience some 237,000 breaks per year, resulting in $2.8 billion per year in lost revenue and higher rates for consumers. Here in Bedford County we experience our share of pipe breakage and lost revenue with the resultant higher rates.

The NRDC says that we need to be strategic about investments in water loss reduction which includes main replacement. There simply isn't enough money to replace all of the pipes that break and/or leak in a year, not to mention in a decade or even in 20 years.

In an age of increasing demand for potable water, lost water is the least of the problems. There is service disruption, potential for traffic disruptions, potential property damage, and the cost of emergency repairs and overtime. There is always the possibility for contamination that accompanies a substantial reduction in distribution system pressure.

Something normally overlooked is that water lost from the system carries with it all the energy that's embedded in the water supply, from the point of withdrawal, through treatment process and out into the distribution system. Energy is typically added at every stage of that process. Energy equals money in today's society.

So a step to be taken to control water loss is to perform a water audit. Accuracy is very important, data validity must be evaluated and established. One must set as solid a factual foundation as possible with regard to water losses. This is necessary in order to identify and adopt cost-effective strategies for dealing with the issue.

The BRWA has begun the process of water accountability in all of its systems. The Authority wishes the public to know and understand the types of water losses it is experiencing and the strategies it is implementing to resolve these losses long-term. The public is required to be engaged for these issues are not readily visible to the passerby. But they still must be repaired and/or replaced.

Since the water distribution system and the collection system are underground, it requires technology to inspect the pipelines for leaks and breakage. Technology has evolved over the last 10 to 15 years. One does not have to walk the entire system. One can use closed circuit television to camera pipes for defects, cracks, roots, and collapse. One can also use a smoke-producing machine in manholes to discover any holes in pipes that have created surface openings. One can also use acoustical devices to map out where there are blockages within pipes.

But as an authority, we can only repair and replace so many feet of pipe each year. This project must be strategically planned out over 20 or 30 years. Each year the worst sections must be addressed.

It appears that pressure management in the distribution system is becoming more of a factor in controlling water loss through leaks. It is a bandaid solution of short duration, helping to limit loss until the leak can be repaired.

BRWA is striving to monitor closely percent loss of water in each of its service areas. An acceptable level of water loss (for the present) has been established so that we have a target to aim at.

All of this effort is simultaneous with the construction of the new water filtration plant at Smith Mountain Lake with the associated pipeline to interconnect the Lake with the Town of Bedford and with Forest.

BRWA, as are most utilities across the nation, is striving to deliver as close to 100% of its produced water as it possibly can.

On the wastewater side, the collection system is meant to convey only polluted water from residences and businesses to the wastewater treatment plants. Any rainwater, surface runoff, or groundwater that enters the collection system gets treated as well. But it can't be budgeted for since the rate of inflow and infiltration can't be calculated. So extra water is a budget buster and causes a loss of money.

Why does it cause this loss in money? Each gallon of water that enters a treatment plant uses energy. It gets pumped, screened, aerated, distributed, and chemically treated as it flows through the plant. Energy equals money.

If too much rainwater enters the system, the plant can overflow due to being overloaded hydraulically. You, the public, must continue to report broken lines, both water and sewer, to the BRWA.

WATER QUALITY STANDARDS TRIENNIAL REVIEW INCLUDING AMMONIA UPDATE

DEQ's triennial review of its surface water quality standards is still underway. The proposed changes have finally cleared executive review and are scheduled to be published on June 29, 2015 which will begin the comment period and hearing process.

The greatest challenge for all municipal wastewater treatment plants is the proposed more stringent, freshwater ammonia criteria. This is especially going to impact facilities without nitrification processes discharging to streams with minimal dilution. But impacts should be evaluated by all wastewater treatment plants regardless of size or existing treatment technology of the plant. It is expected that as the criteria is proposed that ammonia limits will be one third to one half of what they currently are in existing discharge permits.

The other troubling aspect of this criteria is that any septic system or package plant that discharges to a creek will have to meet the new limits as well. The current estimated cost for them: roughly $500,000 per system in order to reach compliance.

This proposed criteria incorporates the presence of a freshwater mussel species that is found virtually everywhere. The criteria depends upon temperature and pH. This could very well create a closer focus on warm weather diurnal pH cycles, affected by algae growth, it could drive permit limits very low.

At this time DEQ anticipates this criteria becoming finalized sometime in early 2016.

TOXICS RELEASE INVENTORY

In March, DEQ issued its annual TRI, listing types and amounts of chemicals released and reported by over 400 industrial operations in the state. Facilities released a total of 36 million pounds of chemicals into the land, air, and water during 2013, which is a 10.3% increase from the previous year. The increase in air releases results mainly from emissions from paper and chemical manufacturing, while the increase in land releases are due mainly to releases from electric utilities. This report also includes data about releases of a group of chemicals known as persistent bio-accumulative toxics, which can remain in the environment for long periods of time. Releases of these chemicals totaled 219,721 pounds in 2013, an increase of 6.1%. This is the first time in five years that emissions have increased rather than decreased.

JAMES RIVER STUDY UPDATE

This study has reached the point where major technical work products are expected over the next 6 months. These include chlorophyll criteria recommendations, model calibration and completion, and load scenario model runs for use in the alternatives analysis and related regulatory negotiations.

Within the next 6-12 months James River facilities ought to be able io determine whether further nutrient reductions are necessary at their facilities. There is also a December 2016 deadline as to whether to appeal EPA's December 2010 James River Allocations, which are based on a faulty model unilateral changed by EPA since the 2005 state regulations were adopted.

What is Wastewater Treatment? Part Three

One of the simple tests that operators conduct, if close attention is paid to it, can gain valuable insight into the biological treatment process and help them maintain high quality effluent.

As often as this test is run, the final results seemingly never vary. Why run it at all? It is all in the way that it is run. Run properly, it can alert the operator to oncoming poor treatment plant performance.

What is this test? It is the settleability test. It is an analysis of the settling characteristics of the activated sludge mixed liquor suspended solids (MLSS). The idea of this test is to provide a place where the MLSS can quietly separate from the water. These solids consist mostly of bacteria with some organic and inorganic debris mixed in.

During the first five minutes of this test, the bacteria clump together, forming large clumps (floc). The floc are slightly denser than the water, which helps with settling and compaction. The floc slowly settle towards the bottom of the clear container, squeezing out the clear water.

Operators hope to see perfect settling: not too fast, not too slow. They want to see large floc that strain all solid material from the water as they settle to the bottom.

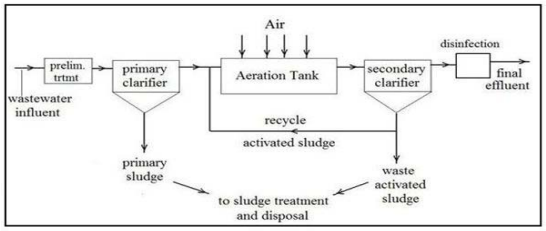
To get the maximum information from this test, one must do it properly. Thoroughly mix the sample, pour it slowly into the settleometer, and turn on a timer (set to 60 minutes). Every five minutes record the level of solids in the container. Observe the settling conditions; watching the formation of the floc and the speed of the settling. Do this for the first 30 minutes of the test. Then collect readings every 10 minutes over the next 30 minutes. The test is done after one hour, but if the test is allowed to sit for another hour it can be determined if the solids rise to the top or not.

What does the operator not want to see during this test?

- Settling too rapidly. Floc does not really clump together, it drops like a rock to the bottom and filters out very little other material .Could be an older biomass.
- Settling too slowly. Solids form floc slowly, compaction is poor; there is very little actual thickening of the solids. The clear water segment on top may be very, very, small. Could be a very young biomass.
- Rising solids during the test, especially the first 30 minute period.
- Rapid settling of solids, leaving a dirty, brown and turbid layer of water, especially if the last test looked completely normal. Could be caused by deflocculation, which can happen with a toxic shock or excessive solids loss from over-wasting solids or from high flows during a large rainstorm.

When good floc settles, it frequently forms into pancake shaped globs. As it does this it facilitates the squeezing out of water between the large flocs. As one observes the floc settling, the water can be seen streaming up through the floc to the top of the container. Good floc color is a golden brown with the water having a slight golden color to it.

The operator can create a settling curve using the five minute recordings, this gives an approximate idea of how the solids are settling out in the actual clarifier. Stable solids should remain settled at the bottom of the settleometer about two to three hours.



Activated Sludge Wastewater Treatment Flow Diagram

If the settled solids begin to rise to the surface prior to two hours, the operator must increase the solids return pumping rate from the clarifier.

At the Central WWTP in Bedford, denitrification is designed to take place in the mixing boxes at the beginning of each aeration basin, not in the final clarifiers. This requires the operators to monitor and maintain the proper solids return rate for each clarifier 24/7. Doing this prevents solids from rising to the surface of the clarifiers and leaving the plant in its effluent.

The operator may also use the results of the 30 minute settling to calculate what is known as the sludge volume index (SVI). This calculated value provides another indicator of settled solids quality and to a lesser extent, the quantity. An index value between 80-120 generally indicates a good biosolids mass. By trending daily results of the SVI an operator can see when an increasing or decreasing SVI value is moving towards being out of the optimum operating range for the plant. SVI results can be plotted on a graph and compared with loading, food/mass ratio, respiration rate, and even weather.

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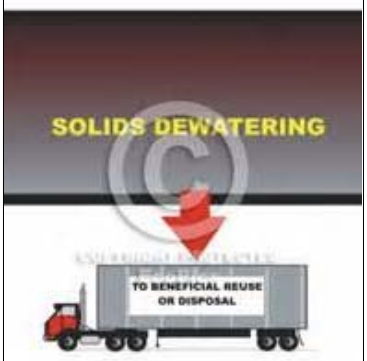
INDUSTRIAL PRETREATMENT
WASTEWATER TREATMENT



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"AS LONG AS IT FLOWS, WE WILL TREAT IT."

INDUSTRIAL PRETREATMENT: POLLUTION CONTROL

The Water Authority, initially through this quarterly newsletter, has been reaching out to the industrial community with the message "We all need to practice greater pollution prevention." With that still firmly in mind, the industrial pretreatment program continues to search for more ways to improve pollution prevention Why?

Prevention is less costly , in the long term, than attempting to deal with the polluted water after the fact. So the pretreatment program seeks to provide workshops and training for businesses who wish to work towards reducing the amount of pollution they discharge into the collection system. These sorts of venues provide an informal atmosphere where pollution prevention can be discussed and solutions to specific problems possibly worked out. It may be possible in the future to link industries with companies that manufacture and design recycling and waste minimization equipment.

There may come a time when we offer pollution prevention forums. These would be used to explore issues of mutual interest to its members.

Beginning in 2016 there will be public recognition of pollution prevention achievements during the past calendar year. Some of the metrics to be used in judging industrial users will be:

- Wastewater pretreatment processes used.
- Percentage of process water being recycled
- Percentage of waste residuals being reused/ recycled
- Available trained staff and financial resources
- Innovative ideas used to reduce pollutants in its discharge
- System/s used for effectively recording and tracking compliance monitoring data
- Types of spill control employed to prevent accidental discharges
- Ability to remain current with applicable environmental laws
- The environmental/ economic benefits derived from implementing pollution prevention methods.

The industrial pretreatment program also will be compiling and distributing prevention information. This will vary from technical documents on specific techniques to best management practices (BMPs) or even household hazardous waste management.

Perhaps one day we can even help match waste from one industry with other facilities that can use that waste in another process.