VOLUME 6 ISSUE 3

.September 30, 2015

Down the Pipeline

BEDFORD REGIONAL WATER AUTHORITY

We All Need Water

This headline is becoming more and more prevalent in all of our news venues.

Since we do not live in the American West, it can be difficult for us to understand the battles that are being fought over water rights. It's a different story for those who live in places like California, Colorado, Arizona, Nevada, and New Mexico. Americans in general are used to getting all of the water, and anything else, that they want. But eventually and inevitably, some resources simply run out.

In Rancho Santa Fe, California, a wealthy community insists upon its right to use enough water in order to keep its lawns and gardens green and beautiful. This is despite new water restrictions implemented due to lack of rainfall. Are those people right?

Actor Tom Selleck trucks in water by the tanker load to water his avocados. This despite the area's mandatory water use cut-backs of up to 36%. Is he right?

This makes one wonder which is more important? Avoiding having to live with a brown lawn or unproductive fruit trees versus entire communities of people who are faced with living without any water at all.

Here in Virginia we just went through a very dry period where there was little to no rain for much of the central part of the state. I know that I had cracks in my front yard that went as deep as a foot and half. But I still had water coming from my well. Thankfully we have seen significant rainfall this past week which will replenish the very low soil moisture levels that were present.

Perhaps all of us should be mindful of the fact that our climate is changing and that we all must become better at conserving water. We need to stop wasting water and taking it for granted. We need to reduce our usage and recycle what we do have.

This also ought to force us to consider the new water treatment plant that will be built at Smith Mountain Lake as a necessity. It is a necessity in that we must provide the means to deliver water to all those in need wherever they live in Bedford County, Roanoke County, Franklin County, and Campbell County. By becoming interconnected all of us have an increased opportunity to not run out of one very precious commodity: clean drinking water.

Inside this issue:

Microbeads found in most New York effluents

Many beauty and personal care products contain microbeads. A new study shows that these small, plastic abrasives systematically pass through wastewater treatment plants throughout New York and enter waterways, according to a news release from the office of New York Attorney General Eric T. Schneiderman.

That office compiled the research research report, *Discharging Microbeads to Our Waters: An Examination of Wastewater Treatment Plants in New York.* Researchers discovered microbeads in 73% of facilities and in 74% of the samples from those facilities across the state.

The majority of plastic abrasives are irregular microbeads. This study focused upon spherical or speckled microbeads which only make up 6% of all microbeads in consumer products. The suggestion rises up that an even larger number of microbeads journey through treatment facilities and into our environment.

Findings also suggest that the problem cuts across many regions of the state, and more rigorous wastewater treatment at some facilities may not be effective at removing these microbeads. A Microbead Free Waters Act was sent to the state legislature to prohibit the distribution and sale of personal cosmetic products containing microbeads less than 5 millimeters in diameter.

Prohibiting these microbeads from entering the treatment plants will protect public health, wildlife health, water quality, and even the health of marine life within the coastal zones.

I wonder what these plastic abrasives can potentially do to the gills of fish? If they are small enough to be ingested by crustaceans, will we be consuming them unknowingly?

If these microbeads are present in the state of New York, how about here in the Commonwealth of Virginia? People here definitely use personal cosmetic products each and every day. Food for thought.

BPA contamination in surface waters

Atmospheric releases of bisphenol A may contribute to contamination in local surface water according to researchers from the University of Missouri and the US Geological Survey.

The chemical is used in plastic storage and beverage containers and can increase BPA in nearby environments. BPA concentrations were ten times higher in water near atmospheric discharge sites the study found.

These concentrations of BPA were well above levels shown to cause health effects in aquatic species.

The research report, “Characterization of Missouri surface waters near point sources of pollution reveals potential novel atmospheric route of exposure for BPA and wastewater hormonal activity pattern,” has been published in the journal , *Science of the Total Environment.*

ROAD MAP TO NUTRIENT RECOVERY

Beyond simply removing nutrients, wastewater treatment plants also can reclaim nutrients. Recovery not only prevents nutrients from entering water bodies but provides a source of these nutrients for reuse. The most obvious way of recovering nutrients is through biosolids. EPA estimates that about 7 million tons of biosolids are produced yearly in America. Around 60% of this total is applied to agricultural land, with only about 1% of crops actually fertilized with biosolids.

Utilities of the future are using the nutrient removal processes to produce marketable nutrients, energy, electricity, and vehicle fuels. Phosphorus used for fertilizer is a finite substance, with some people estimating that demand will strip supply within the next century.

There are other types of products that can be recovered, such as metals, heat, and potable or drinking water, which may bring financial rewards and benefits to help offset utility costs.

Solid fertilizer can be created from biosolids. Soil blends and composting are potential phosphorus recovery products. Compost is an excellent soil conditioner for new and established lawns as well as for landscaping in general.

Struvite can be a problem in the pipes of treatment plants that digest the sludge. Yet this material can be recovered and both phosphorus and ammonium can be simultaneously recovered, producing a high-quality fertilizer from a sidestream process.

Water reuse can occur via irrigation which also removes phosphorus and nitrogen from the treatment plant's discharge effluent. Structural materials can be obtained from carbonates and phosphorus compounds (gypsum). Proteins and other chemicals, such as ammonia, hydrogen peroxides, and methanol, can be recovered.

The ultimate question then becomes: "Why should we continually throw away valuable resources and materials that can be recovered and reused?" When we are faced with uncertain rainfall, why not buy in to reusing our water over and over again? It saves water, it extends the volume of potable source water in our reservoir, and reflects being a good steward of our environment.

Water Investment Needed Now

The United Nations report, *Water in the World We Want*, describes the potential threats of not achieving water– and sanitation-sustainable development goals, as well as benefits and strategies for achieving these goals around the world.

This report reveals that substantial water investments will be needed to avoid a rise in conflicts related to water and sanitation. Water is rapidly becoming a prime commodity around the world. What one nation has plenty of, another may desire to have, creating physical conflict.

Within 10 years, researchers predict that 48 countries will be classified as water scarce or water stressed. By 2030 global demand for fresh water will exceed supply by 40%.

It therefore makes little sense for Americans to complain about having to spend millions of dollars each year to replace, rebuild, or retrofit, existing water and sanitation pipelines. We should not complain about spending millions each year on installing brand new pipelines to protect the health of our neighbors and our environment. Fresh water supplies must be protected, produced, and replenished. The new paradigm has finally arrived!

Guidance on Hauled Waste

The National Pretreatment Regulations state that the discharge of hauled waste is prohibited except at points designated by the wastewater treatment plant.

The treatment plant should have the following information on record for all haulers prior to granting approval to discharge:

- Name of business
- Name of Owner
- Address and phone number
- Type/s of waste hauled
- Volume of load
- Number and capacity of vehicles
- Address/s of origin of wastes hauled
- Where other wastes disposed of
- Description of waste hauled

Treatment plant operators should require haulers to obtain a permit. Sample collection should be done to ensure compliance with pretreatment standards. This should at least include pH, visual observation of odors and color, and a grab sample for analysis. Proof of authorization to discharge at the POTW should be maintained in the hauling vehicle at all

Not all screens are created equal?

Regulations, maintenance issues, and advances in treatment processes have led to smaller openings for screens. The smaller openings have resulted in hydraulic issues that some current methods of cleaning can't solve.

Each manufacturer or application has its own peculiarities that the manager of the facility needs to review. Opening size not only affects the hydraulics but also the amount of debris that will be removed from the wastewater.

Many membrane bioreactors have primary coarse screens in their headworks, followed by a fine screen prior to the flow entering the activated sludge basins or MBR tanks. The coarse screen removes the majority of the larger material and associated attached grease. Grit removal typically is the next preliminary treatment process in which grit that can plug a 1-2 mm fine screen is removed.

Environmental regulations have mandated better screening technologies. State and local biosolids regulations require only very small quantities of recognizable manufactured inert materials.

MBR technology requires very fine screening, sometimes as small as 1 mm in order to protect the membranes from fouling and being damaged. In general, clogged pumps and rags wrapped around mixers and air diffusers increases the cost of operation due to lost efficiency and added maintenance.

As screens become covered in removed debris from the incoming wastewater, there is a blinding factor that accounts for the headloss created. In the autumn, rainstorms can flush lots of leaves through the collection system to the treatment plant. This can result in 100% instantaneous blinding factor.

Screening equipment typically is engineered to handle flows that will occur in 20-30 years. But unusual weather events may very well challenge brand new equipment to continuously work effectively as designed.

Cleaning mechanisms are important in maintaining screen capacity. Periodic cleaning brush adjustments are necessary. It is necessary to observe spray water patterns on the panel periodically in order to verify that the entire screen surface is being cleaned uniformly.

It is crucial to verify that water actually is flowing to the spray water system. Strainers on the lines can plug up and prevent the flow of water to the strainers. The spray nozzles themselves can also become plugged with suspended material.

It is important to recognize the need to seal the edges of rotating plates and elements, even though this is difficult. If material can bypass the screens, problems will ensue.

Hair and rags can pass by the edges of a screen causing fouling of the MBR membranes, as well as diffusers and mixers. Thus, seals of some kind are required to prevent bypass of the unit.

Providing seals does not automatically solve the problem either. If improperly installed, seals will allow debris to bypass the seal and flow downstream to other treatment processes.

Some applications will benefit from the installation of multiple screens in series. For example, a coarse rotating screen could be used to remove large particles of debris after having passed previously through a bar screen to remove sticks, cans, bottles, etc. After the coarse rotating screen there could also be a fine rotating screen to remove even smaller clumps of material before the water flowed into an equalization tank. Scraper blades could be installed so that they "float" with any imperfections in the surface of the screen. Scraped material could then be directed to a bulk storage tank for disposal.

Such an installation would be useful in any meat rendering facilities (poultry, beef, pork). This arrangement would progressively remove skin, bones, feathers, and fat globules. It would also work in a fruit processing plant where there would be regular production of peelings, stems, leaves, and cores with seeds.

Screens may also be stationary with the water flowing downward over the surface of the screen. These types of screens require either manual removal of accumulated material (to reduce headloss) or else some system of automatic scraper that routinely removes all accumulated material to a disposal trough or belt conveyor.

Commercial laundries employ such units in their pretreatment facilities to remove lint created from the large amounts of clothing that they wash each day. They also effectively remove clothing labels and tags that come loose during the wash process, as well as any buttons.

"The need to clean screens can't be overlooked since dirty screens are inefficient."

Industrial Pretreatment

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INDUSTRIAL PRETREATMENT: Metals Removal

Common metals can be removed from wastestreams by either hydroxide precipitation or sulfide precipitation. Hexavalent chromium is not removed by hydroxide precipitation and cyanide will interfere with the precipitation processes' ability to remove other dissolved metals.

The first step in this process is to determine the optimum pH for precipitating each type of metal you wish to remove. Optimum pH for zinc removal is around 10.5 and remaining zinc concentration would be 0.2 mg/l. Optimum pH for chromium +3 is around 7.5 with remaining concentration around 0.2 mg/l.

The use of jar testing helps to determine the minimum pH adjustment needed to reach optimum precipitation of any particular metal.

When utilizing a lime slurry or caustic soda, mixing with the wastewater is required. Settling of the resultant colloidal solids must be helped with the addition of a polymer or coagulating chemical. This will encourage coagulation, flocculation, and sedimentation of the metal hydroxides.

Another effective method for removing many heavy metals is the addition of soluble sulfide salts such as ferrous or sodium sulfide. This causes precipitation of the metals as insoluble sulfide compounds. These compounds are less soluble over a wider range of pH values. Most complexed metals can be precipitated by this sulfide process.

Unfortunately, this sulfide process has several severe limitations. If the pH drops below 8.0 toxic hydrogen sulfide gas can be produced and released into the air. Using ferrous sulfide helps reduce this problem.

Using sulfide is more expensive than hydroxide. Sulfide can not be present in the effluent, so it means oxidizing it with either chlorine or peroxide before discharge to the POTW or the receiving waters.

Another possible drawback is the disposal of the precipitated solids. The high cost of sulfide chemicals could be another drawback to using them, as well

Zinc recovery could also be accomplished through electrodialysis or even evaporation when treating small volumes of wastewater.

One other possible means of treatment to remove metal ions from a small wastestream might be using a series of resin cartridges designed to remove metal ions. These would most likely contain some form of activated carbon.

Jar testing is the way to go with any of these options for removing metals from the discharge stream. Its small scale is economical, and several different options can be tested one after the other.