

The Wastewater Insight



COLLECTION SYSTEMS

What is growing in your Collection System?

Anything and everything that is dumped down the drain winds up in the sewers and lift stations, from grease, garbage, toilet paper, human waste and food to industrial waste. Fast Food restaurants are adding significant loading to a collection system.



A collection system is not a sterile environment. As long as there is food for the bacteria to grow, they will grow in the collection systems. The real control is in making sure the right types of bacteria grow in

the collection system.

Basically, the collection systems can be thought of as one large holding tank or Equalization tank prior to the Wastewater Treatment Plant. Many municipalities have miles and miles of pipes, and numerous lift stations prior to a wet well, and then the actual wastewater treatment plant. Maintenance on these pipes can be costly and time consuming, as well as incur some safety concerns.

Bacteria, if given even the slightest chance, will grow anywhere there is sufficient food. Typically, there always is some type of small biofilm in all sewer collection pipes. Usually the growth is slow, due to low BOD loading and high flow of water causing enough movement or even pressure from the lift stations. The biofilm is relatively small, and sloughs off quickly with rain and normal flow. In effect, a miniature RBC unit can be created in the collections systems with the right conditions. Typically, the flow is enough to cause the biofilm to slough off without causing problems.

In cases where easily degradable organic compounds are discharged to a system, a very rapid biomass growth can occur. If the industrial or institutional discharger uses large amounts of rolling or cutting oils, Grease or sugars in the processes, has dipping baths where biofilms are allowed to grow, or septic water is allowed to be collected in tanks onsite, and then this is discharged into the sewers, the bacteria in the system will quickly grow on these types of substrates. If the optimum environment is not present, such as sufficient N, P or lower pH, or sufficient mixing and Dissolved air, then a slimy biofilm will develop instead of floc.

MYSTERY BUG OF THE MONTH

We started this month out with a new **Mystery Bug of the month!**



Check out our website for more photos of our new mystery bugs!!!!

WWW.EnvironmentalLeverage.com

Remember, bacteria need what we call the Critical 5 regardless of whether they are in the pipes, in a holding tank, the sewers at the plant or the final wastewater treatment plant.

Ok, so what exactly are the "Critical 5 plus one"? I have never heard of that.

There are 5 critical measurements that should be monitored and controlled to effectively run a biological treatment plant efficiently; Temperature, DO, Ammonia, Ortho-phosphate and pH.

- Acceptable environmental parameters for biological activity including:

<u>PARAMETER</u>	<u>ACCEPTABLE</u>	<u>OPTIMUM</u>
Dissolved Oxygen	>0.5 mg/l	1.0 - 2.0 mg/l
Temperature	50 - 95° F	77 - 95 ° F
PH	6.0 - 9.0	7.0 - 7.5
Ammonia Residual	1.0 - 3.0 mg/l	2.0 - 3.0 mg/l
Ortho-phosphate Residual	0.5 - 2.0 mg/l	1.0 - 2.0 mg/l

Typically most sewers have a pH of around 7-7.5, mixing and flow through the pipes generally give enough DO to the system. Temperature is not usually able to be changed, but is not too bad. Since most pipes are well below the freezing level underground, activity will slow in the winter, but never freeze

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up. N and P are high in normal household waste due to human biosolids, but when high industry or institutional, such as hotels, restaurants or strip malls with fast food restaurants are around, then these variables can get out of line and cause problems.

What are you growing in your pipes?

Let's take a look at some pipes, wet wells, collections systems and lift stations and see just what can happen.

Here you can see not only grease in the water, but growing on the walls of the pipe and up into the collection system.



In these two lift stations you can see a grease ledge on the side of the lift station, and growing around the pipes, chains and floats.



In some lift stations, hard grease balls or "floating turtles" will form. These can block up pipes and cause problems with pumps if allowed to grow too large and cause obstructions.



Some lift stations can get significantly crusted with thick grease and solids.



Lift stations can be extremely small or up to 5 million gallons a day! Obviously, the larger the lift station or wet well, and the longer the holding time in the vessel, the

more solids and grease and biofilm that can build up.





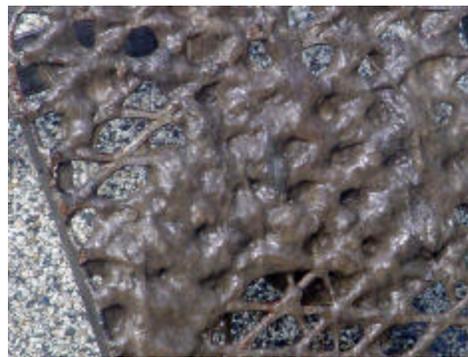
Some lift stations even have multiple chambers,



This is a manhole 20 feet from a small restaurant. Look at how much grease and solids are built up in this small area. This restricts the flow and eventually may cause problems in the restaurant with back-ups. The solution- a small amount of bacteria were mixed in a bucket of water and poured directly on the surface of the grease to clean out this manhole. It worked! Continual dosage will be required weekly, though since there is no source for recirculation an it gets washed out periodically. Ongoing maintenance kept the manhole from ever building up so many solids again though!



Here is a case of a stretch of over 1-2 miles that a city had where the pipes were growing a large biofilm directly in the pipes and had to jet out the lines weekly.



Significant levels of slime were visible, and sometimes long "ropes" of slime and biomass could be seen snaking through the pipes.



The biofilm, if not jetted out weekly, would build up enough to block off the mains and the laterals.

The City had an industrial facility that manufactured metal parts. One of the things used when cutting metal parts is rolling and cutting oils. Their wash water was discharged in the pipes and sent to the city wastewater treatment plant. They actually had two plants in this city, and at both locations, the same thing occurred in both parts of the lines directly after the plant discharges.

If any industrial plant has a very high BOD loading, or even one with simple sugars that are easily degradable, and ample time in the pipes to grow, you will get significant growth in your pipes and lift stations. In this case, the flow was low, but the loading was high, so ample time was allowed in the pipes for the bacteria to grow. The problem in this case was there was not enough N and P since it was mostly industrial waste instead of human waste, so a nutrient deficient condition arose, along with septicity, causing the growth of filaments and high polysaccharide slime, which developed into a thick, slimy biomass film.

Slime and long filaments formed a majority of the growth along the bottom and sides of the pipe, similar to growth on a RBC unit.

Sooner or later it would slough off, and travel a bit down the pipes, until it eventually ran into the part of the sewers where household waste joined the stream. Now large chunks of tissue paper and waste mixed in with the stream, causing larger buildups of biomass, until eventually there were 6-7 ft long solid masses of debris, slime and biofilm.

Blockages were common, and line jetting was 1-2 times a week in the summer when temperatures were warm and growth was significantly higher.

How do you get around these types of situations instead of jetting a line out manually weekly which is not only time consuming, but costly?

Pretreatment is possible- chemical, biological and mechanical methods are ways to address these scenarios. Obviously each plant and problem must be looked at and the correct response for each situation evaluated. Numerous options are available.

1.)A DAF unit can be installed onsite at the plant to not only float out any oils, but add aeration to the stream, so no septicity would occur in the lines, addition of Nutrients can then be added to the stream as it leaves the plant if necessary.



2.)Pretreatment onsite. A small tank can be placed onsite to pretreat the organics prior to addition to the collection system. The typical flows from this plant appeared to be only 45-65,000 gallons per month. This is extremely small. The cost to install a small holding tank, with a mixer for aeration, add some nutrients, a small dosage of bioaugmentation and knock out some of the oils or organics

would be extremely cheap and time saving compared to jetting out a line. Since the flow is so low, a small tank would work easily. The life span of normal floc forming bacteria is 20 minutes to 2 hours. It does not take long to quickly degrade organics if in the proper environment. The TSS from the floc formation should have no problem traveling through the pipes, and there would be no blockages in the future. Nutrients must be added though, or slime will form in the tanks, and then again in the pipes!

3) Numerous options are available for mixing and aeration of pre treatment tanks, holding tanks or lines. A walk through the plant is recommended to look at the process, see where water is being held, what types of chemicals are used onsite, and how beneficial reuse may be used onsite.

Mixing and aeration of tanks can cause less septicity, growth of fungi and slime forming bacteria. One cheap, method that does not require maintenance is the installation of Venturi-type injectors in the incoming pipes to make sure that adequate aeration is in the tanks. No moving parts are involved, so very little maintenance is ever required. We have used these at many pretreatment tanks to supplement oxygen to a system.



Mazzei injectors added to high flow lines - Mazzei® Injectors are high-efficiency, Venturi-type, differential pressure injectors with internal mixing vanes. When a sufficient pressure difference exists between the inlet and outlet ports of the injector, a vacuum is created inside the injector body, which initiates suction through the suction port.

Mazzei® Injectors For Primary or Supplemental Aeration

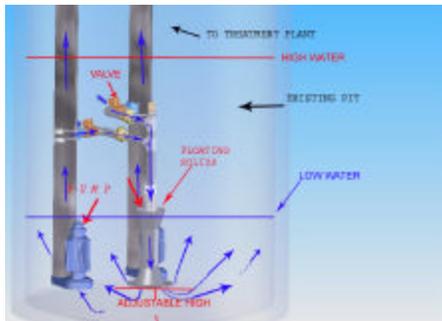
Works great at depths less than 5' Utilize standard water pumps for quiet, high-efficiency aeration, Models for 0.125 cfm through 358 cfm

Mazzei injectors are the answer for increasing DO levels for water treatment in situations where the use of conventional blower/diffuser aeration would be inefficient, impractical or very expensive. Typical applications where injectors are being used for aeration include ponds or lagoons that are too shallow for surface aerators, STP effluent streams needing a boost in DO, and ammonia and H2S stripping.

4.) Add nutrients to the drains onsite and hope there is sufficient air and mixing in the pipes, at least this would cause less slime growth, and hopefully more floc formation. I would not add bioaugmentation products to the drains, unless you add sufficient nutrients. You already have easily degradable compounds in this sewer, more bacteria without sufficient nutrients would only make it grow faster and develop more slime. A dual program must be implemented if you decided to add bacteria and nutrients. Nutrients alone can be added, but not bugs alone.

5.) Add bleach to the drains at the industrial plant, to kill off any slime that has formed in holding tanks, and make sure that very little biological growth can occur in the sewer pipes, and that all treatment takes place only onsite at the Wastewater treatment plant.- not the best option, but at least a option

6.) Grit removal with mechanical equipment, either screening, a small cone settling tank or even a plate and frame clarifier. This could include Recovery of metals and coatings, or even just removal from the sewer system would be an improvement.



7.) Automatic Pit Evacuator(APE).

"A stationary inductor, the Automatic Pit Evacuator (APE) recirculates 5-12% of the flow and derives its power from

discharge pipes of existing pumps in lift stations, force mains and wastewater treatment plants. Recirculation occurs through a venturi orifice fixed in an open-ended housing.

The stainless steel device is installed in a stationary position suspended in the water column from piping. The APE is passive with no moving parts. Classified as a preventative maintenance device, the APE produces 5.7-6.2 mg/l dissolved oxygen (DO) entrainment through 80% of each pump cycle. Atmospheric DO is entrained during the venturi effect through a sleeve attached to the piping. Oxygen transfer rates (lb O2/hp-hr) for Jet Aeration are valued at 2.0-3.0. Typical Alpha values (varying with atmospheric conditions) are rated at 0.75. DO entrainment produced by the device offers on site H2S abatement, preventing damage to capitol facilities and equipment.

8.) Some collection systems just need a little help with Mother Nature. The small addition of bioaugmentation products can significantly impact the amount of grease and slime build up in a system. Sometimes, a small amount of nutrients are required to be added with the bioaugmentation products if N and P levels are low. Some plants hang bioaugmentation blocks into the lift stations, some add dry product to the wetwells, some restaurants add liquids down the grease traps and some plants use bioaugmentation in their jet trucks to get a handle on the grease and slime. Many options are available.

9.)The Best option would be some type of beneficial reuse program or recapture and reuse onsite of side streams. Without auditing their plant, and knowing exactly their process, or the chemicals involved, this would be hard to speculate at. We work with many outside companies that do this. One man's garbage is another mans treasure.

Odor Control issues in lift stations and wet wells

Wet wells at the plant can become septic and cause growth of filaments and spirillum



We have had some cases where the flow is so low, that the water in the lift stations or wet wells becomes septic and causes odor control issues for the municipality.

Alternative odor control technologies in addition to some of the above solutions mentioned

1.) Peroxide addition- almost always very expensive and destroys some of the biomass cells when added, but kills some of the non desirable bacteria, destroys COD and adds O2 to the water. High BOD Demand can make this a very expensive option.

2.) Sodium nitrate addition- Sometimes, when mechanical means are not available due to location and electricity, air volatilization issues, chemical means can supplement oxygen to a biological system. Typical rule of thumb is 1.4 lbs of oxygen per lb of BOD. When oxygen is not available, Sodium nitrate can be supplemented, (or any form of nitrate- we have just found the dry sodium nitrate is the cheapest, and safest for handling purposes). Typical dosing rule of thumb 2 lbs of sodium nitrate required per lb of supplemental oxygen needed.

3.) Praxair- injection of pure oxygen to supplement current system- additional information at Environmental Leverage Inc. The Praxair® In-Situ Oxygenation (I-SO™) System dissolves oxygen into wastewater for biological treatment. New environmental regulations require wastewater treatment facilities to reduce hazardous air pollutants due to stripping actions of air spargers and surface aerators. With the development of Praxair's I-SO System, we've combined the advantages of oxygen usage with a low-cost, high-efficiency dissolution process, reducing air emissions and increasing wastewater treatment capacity with minimum capital expenditure.

4.) Pine Blocks or mist systems- Some plants hang pine blocks in the lift stations to overcome any minor odors that are emitted, and some plants set up elaborate mist systems with essential oils to mix with the air, and destroy any airborne odors.

5.) Carbon Filters- Some plants have used extensive carbon filters for odor control at lift stations or primaries.

Obviously, there are tons of issues with Collection Systems, lift stations, wet wells and wastewater treatment plants.



We hope this issue has at least made you think of some possible things that might be going on in your system, a few options that are available to you besides constant maintenance. Sometimes a small amount of preventative maintenance or proactive treatment can eliminate some of the repetitive maintenance.

Call us if you have any questions or have problems with your lift stations and wet wells! We are more than happy to help come out and troubleshoot.

Back by popular demand:

The collage features several items: a brochure titled 'Air Treatment' with a photo of a facility, a brochure titled 'Biological Wastewater Treatment' with a photo of a tank, a brochure titled 'Storm Water' with a photo of a storm drain, and a screenshot of the company's website showing various services and contact information.

We are having a one day General Operators and Lab personnel Wastewater training class in Bartlett, IL on September 19th, 2006

Activated Sludge Process Control
September 19th, 2006
Village of Bartlett
1150 Bittersweet Dr
Bartlett, IL 60103
630-837-0155

Registration Fee- Full Course- \$150 Each Participant will get a training CD worth \$250.00 with registration.
There are a few spots still open for last minute attendees

Contact us for a registration form. Class size limited and they do tend to sell out.

A few other opportunities to come and see a short training session :

- September 26th-Guest Speaker Illinois Association of Water Pollution Control Operators Miss-Rockford Section in Freeport
Zooglea Bulking vs Filamentous Bulking
- October 6th IAWPCO Mt. Vernon Guest Speaker- Filamentous Bulking vs Zooglea Bulking

Misc. websites

Information is great, but how do you find it? Sometimes surfing the web can be frustrating and time consuming. We try to put some of the more interesting sites and useful information we find into our newsletters so you can find your way easier!

<http://cfpub.epa.gov/npdes/wetweather.cfm>

Wet Weather Discharges

Proposed Policy Peak Wet Weather Discharges from Municipal Sewage Treatment Facilities

EPA is proposing for public comment a new policy for addressing very high or "peak" flow events at municipal wastewater treatment plants that are a result of significant storm events.

WHERE CAN I FIND MORE INFORMATION?

The links presented below provide more information related to the three NPDES program areas that address wet weather discharges, the Urban Wet Weather Flows Federal Advisory Committee, and wet weather flows research.

- [Storm Water Program Combined Sewer Overflow Program Sanitary Sewer Overflow Program Urban Wet Weather Flows Federal Advisory Committee Wet Weather Flows Research](#)



<http://www.epa.state.il.us/>

The [eDMR System](#) has been developed so that NPDES permittees with a computer and an Internet connection can complete, sign, submit, edit, and re-submit eDMR forms on-line.

<http://www.epa.state.il.us/water/edmr/index.html>

Municipal Wastewater Assistance Program the Illinois EPA
<http://www.epa.state.il.us/water/municipal-wastewater-assistance/>

For more information on the program and participating communities in your area, contact the regional municipal assistance coordinator at the Illinois EPA regional office nearest you.

Region 5

4500 S. Sixth St. Rd.
Springfield IL 62706
(217) 786-6892

<http://www.abccert.org/articles/vswsgdbk.pdf>

The [Very Small Water System Operators' Guidebook to Preparing for Certification](#)

A [web-based practice exam](#) for ABC Very Small Water System is also available.

<http://www.abccert.org/pdf/abcwwfctable05.pdf>

ABC Formula/Conversion Table
for Wastewater Treatment, Industrial, Collection and
Laboratory Exams

http://www.neiwpcc.org/PDF_Docs/finalwebomr.pdf

Optimizing Operation, Maintenance, and Rehabilitation of Sanitary Sewer Collection Systems.

<http://www.neiwpcc.org/clarifier.htm>

Clarifier software

Environmental Leverage Inc. offers consulting services, beneficial reuse, training and bioaugmentation programs that can help reduce your surcharges.

Contact our office today to find out how you can start saving money and become more efficient at your plant!!!

Many times we have suggested articles for the next months issues. Sometimes we change what we will be featuring based upon critical issues that surface during our contacts with our customers. We hope this does not inconvenience you. If you have a specific topic you are interested and do not want to wait to see if it shows up in our newsletters, call us direct. We do have over 20 gigabytes of information on file on every subject around on water and waste issues.

COMING IN THE NEXT MONTHS

**Sequencing Batch Reactors
Fall and Winter**