COUNTY OF HENRICO
DEPARTMENT OF FINANCE
PURCHASING DIVISION
CONTRACT EXTRACT
NOTICE OF AWARD/RENEWAL

DATE:	December 15, 2023
CONTRACT COMMODITY/SERVICE: *(include contracting entity if cooperative)*	Biological Testing Services
CONTRACT NUMBER:	2247A
COMMODITY CODE:	992.26
CONTRACT PERIOD:	January 1, 2024 through December 31, 2024
RENEWAL OPTIONS:	2 Additional 1 Year Period through 2026
USER DEPARTMENT:	Public-Utilities-WRF
Contact Name:	Erica Duncan; James Grandstaff; CC: Bentley Chan
Phone Number:	804-501-7618; 804-501-7689; CC: 804-501-4280
Email Address:	Dun061@henrico.us; gra@henrico.us; CC: cha70@henrico.us
HENRICO COOPERATIVE TERMS INCLUDED:	Yes
SUPPLIER: Name:	Aquafix, Inc.
Address:	P.O. Box 8682
City, State:	Madison, WI 53708-8632
Contact Name:	*Kevin Ripp; Joshua Poulin
Phone Number:	888-757-9577
Email address:	bugman@teamaquafix.com; Josh.p@teamaquafix.com;
ORACLE SUPPLIER NUMBER:	38836
BUSINESS CATEGORY:	Small Business
PAYMENT TERMS:	Net 30
DELIVERY:	As needed and requested
FOB:	Destination
BUYER: Name:	Leisel O. Collins, CPPB, VCO,VCA
Title:	Assistant Division Director
Phone:	804-501-5687
Email:	COL119@henrico.us

This contract is the result of a competitive solicitation issued by the Department of Finance, Purchasing Division. A requisition must be generated for all purchases made against this contract and the requisition must reference the contract number.

PRICE SCHEDULE – CONTRACT NO. 2247A

Ref No.	Category	Product / Service Name	Product Code	2022 Unit Price	Unit of Measure	2022 Volume Discount Pricing
0	Microscopic analysis with digital results summary report	Microanalysis & Filament Origins	Lab WW M&F	$ 437.75	each	
0	Microscopic analysis with digital results summary report	Proactive Microanalysis Program	Lab PMA Plan WW	$1,236.00	each	
1 and 5	Bioaugmentation and Anaerobic digestion and "soft sediment" reduction	Bug Juice	BJ:2.5 gal case (5 gal	$ 76.22	gal	
			BJ:55 gal	$ 70.04	gal	
			BJ:275 gal	$ 65.92	gal	
2	Fat, Oil, Grease, reduction	Bug On A Rope	BOAR:1 brick	$ 164.80	brick	
			BOAR: Case (4 bricks)	$ 576.80	case	
2	Fat, Oil, Grease, reduction	Qwik-Zyme L	QZL:2.5 gal case (5 gal total)	$ 40.17	gal	
			QZL:55 gal	$ 32.96	gal	
			QZL:275 gal	$ 29.87	gal	
3	Carbon reduction	GreaseZilla Liquid	GZL:2.5 gal case (5 gal total)	$ 41.20	gal	
			GZL:55 gal	$ 35.02	gal	
			GZL:275 gal	$ 31.93	gal	
4	Excessive "foaming" elimination	DeFoam 3000	DF3000:2.5gal case (5 gal	$ 49.44	gal	
			DF3000:55 gal	$ 42.23	gal	
			DF3000:275 gal	$ 41.72	gal	
6 and 9	Micro and macro-nutrients, biostimulants and biocatalysts and Active methanogens bacteria	Anaerobic Food Supplement	AFS:30 lb, Bulk Pail	$ 8.70	lb	
6 and 9	Micro and macro-nutrients, biostimulants and biocatalysts and Active methanogens bacteria	Biogas1	BG1:5 gal	$ 26.78	gal	
			BG1:55 gal	$ 20.09	gal	
			BG1:275 gal	$ 18.54	gal	
6	Micro and macro-nutrients, biostimulants and biocatalysts	Boost N Lock	BNL:50 lb, Bulk Bag	$ 2.83	lb	
			BNL: Bulk Bags (2000 lb Pallet)	$ 1.80	lb	
6	Micro and macro-nutrients, biostimulants and biocatalysts	Counter Quat	CQ:2.5 gal case (5 gal total)	$ 42.23	gal	
			CQ:55 gal	$ 24.72	gal	
			CQ:275 gal	$ 24.72	gal	
6	Micro and macro-nutrients, biostimulants and biocatalysts	Foam Buster	FB:30 lb pail (with 1 lb packets)	$ 10.83	lb	
			FB:50 lb bulk bag	$ 6.95	lb	

7	Odor neutralization and sulfide reduction	DAZZeL Sewer Sweetener	DZSS:2.5 gal case (5 gal total)	$ 36.05	gal	
			DZSS:55 gal	$ 26.78	gal	
			DZSS:275 gal	$ 25.75	gal	
7	Odor neutralization and sulfide reduction	De-Sulph-A-Nator	DSN:2.5 gal case (5 gal total)	$ 38.11	gal	
			DSN: 55 gal	$ 32.96	gal	
			DSN:275 gal	$ 31.93	gal	
	O2 and Odor Control	OxyFresh	2.5 gal case (5 gal total)	$ 27.30	gal	
			55 gal drum	$ 19.57	gal	
			275 gal tote	$ 16.48	gal	
8	Active nitrifying and heterotrophic "seed" bacteria	VitaStim Dyanmic DUO	VSDD: Case (1 gal VSAA, 1 gal VSN)	$ 566.50	case	
10	Biological supplements	Accelerator 7	ACC 7: 50 lb, Bulk Bag	$ 5.41	lb	$4.89/lb - 20 bag pack $4.38/lb - 40 bag pack
11	EPA registered biolarvacide and bioaugmentation products	AQUABACxt	ABXT: 2.5 gal case (5 gal total)	$ 71.07	gal	

Freight costs by package size for shipping products. Note: Larger shipments are subject to bulk freight discounts. Bulk freight discounts are passed through to the customer.

Liquids		**Dry Products**	
Size	Freight Cost	Size	Freight Cost
275 gal	$484.10	2,000 pounds	$391.40
55 gal	$175.10	1,000 pounds	$244.11
5 gal	$61.80	500 pounds	$173.04
		50 pounds	$62.83

Ref No.	Category	Full Description
0	Microscopic analysis with digital results summary report	Microscopic analysis of biological samples to identify and quantify the following: 1. Major and minor filaments and subspecies (Gram and Neisser staining); 2. Extracellular polymeric substances and zoogloeal colonies; 3. Metazoan and protozoa organisms; and 4. Assess and characterize floc structure, sludge age and oxygen penetration. Includes providing digital summary report of microscopic analysis results, treatment recommendations, and suggested dosing rates and schedule of appropriate bioaugmentation products within 4-days of receiving a sample from the County.
1	Bioaugmentation	Bioaugmentation products demonstrated to facilitate (through biological conversion)
2	Fat, Oil, Grease, reduction	A 75% reduction in volume of fats, oil, grease and volatile fatty acids
3	Carbon reduction	A 300 ppm reduction in carbon (Chemical as measured by the COD parameter)
4	Excessive "foaming" elimination	The eliminating excessive "foaming" conditions in both aerobic and anaerobic treatment systems
5	Anaerobic digestion and "soft sediment" reduction	Anaerobic digestion of organic compounds and reduce "soft sediment" depth / depth of accumulated solids
6	Micro and macro-nutrients, biostimulants and biocatalysts	Micro and macro-nutrients, biostimulants and biocatalysts products demonstrated to: a) control and eliminate excessive foam/foaming events in both aerobic and anaerobic biological treatment systems; b) enhance biological degradation of organic compounds; c) expedite recovery of biological systems following an upset and/or loss of treatment organisms; d) sustain aerobic and anaerobic biological treatment processes that are nutrient deficient and/or otherwise deficient.
7	Odor neutralization and sulfide reduction	Odor neutralization and non-hazardous sulfide treatment reduction) products
8	Active nitrifying and heterotrophic "seed" bacteria	Active nitrifying (*Nitrosomonas, Nitrospira and Nitrobacter*) and heterotrophic "seed" bacteria to facilitate recovery from an upset or wash-out event
9	Active methanogens bacteria	Active methanogens bacteria to facilitate and/or support anaerobic digestion processes
10	Biological supplements	Biological supplements demonstrated to reduce and control extracellular polymeric substances and zoogloea organisms
11	EPA registered biolarvacide and bioaugmentation products	EPA registered biolarvacide and bioaugmentation products for the treatment (eradication) red worms and midge flies organisms.

SCOPE OF WORK/SERVICES

A. The Successful Offeror shall provide all supplies, labor, equipment, materials and technical supervision required to provide microscopic analysis of biological samples and make recommendations for biological supplements.

B. The Successful Offeror shall work with a designated WRF employee to coordinate all requests and completions of each sample. All requests shall be identified with a number traceable to an invoice number and the awarded contract number.

C. The Successful Offeror must be available for consultation Monday through Friday between the hours of 8:00 am and 4:30 pm eastern standard time.

D. Successful Offeror will be responsible for obtaining all permits required to perform the requirements of this proposal. The cost of the permit will be the Successful Offeror's responsibility. All analysis shall be in accordance with the latest applicable industry codes, standards, and specifications.

E. The Successful Offer shall perform microscopic analysis of biological samples to identify and quantify the following:

1. Major and minor filaments and subspecies (Gram and Neisser staining);
2. Extracellular polymeric substances and zoogloea colonies;
3. Metazoan and protozoa organisms; and
4. Assess and characterize floc structure, sludge age and oxygen penetration.

F. The Successful Offer shall provide digital summary report of microscopic analysis results, treatment recommendations, and suggested dosing rates and schedule of appropriate bioaugmentation products within 4-days of receiving a sample from the County. Offers shall provide a sample of their reports with proposal.

G. The Successful Offer shall provide the following products and the required quantities within six (6) business days of receiving a Purchase Order from the County, shall :

1. Bioaugmentation products demonstrated to facilitate (through biological conversion);
2. A 75% reduction in volume of fats, oil, grease and volatile fatty acids;
3. A 300 ppm reduction in carbon (Chemical as measured by the COD parameter);
4. The eliminating excessive "foaming" conditions in both aerobic and anaerobic treatment systems; and
5. Anaerobic digestion of organic compounds and reduce "soft sediment" depth / depth of accumulated solids;
6. Micro and macro-nutrients, biostimulants and biocatalysts products demonstrated to:
   a) control and eliminate excessive foam/foaming events in both aerobic and anaerobic biological treatment systems;
   b) enhance biological degradation of organic compounds;
   c) expedite recovery of biological systems following an upset and/or loss of treatment organisms; and

d) sustain aerobic and anaerobic biological treatment processes that are nutrient deficient and/or otherwise deficient.

7. Odor neutralization and non-hazardous sulfide treatment (reduction) products;
8. Active nitrifying (*Nitrosomonas, Nitrospira and Nitrobacter*) and heterotrophic "seed" bacteria to facilitate recovery from an upset or wash-out event;
9. Active methanogens bacteria to facilitate and/or support anaerobic digestion processes;
10. Biological supplements demonstrated to reduce and control extracellular polymeric substances and zoogloea organisms; and
11. EPA registered biolarvacide and bioaugmentation products for the treatment (eradication) red worms and midge flies organisms.

H. The County and WRF reserve the right to review report data, request additional and repeat analysis as necessary to ensure the result provided conform with the requirements specified.

I. There is no additional cost for retest of samples.

J. Aquafix will provide all necessary sample kits for the County of Henrico at no cost. The process is described in the Service Approach.

K. The Successful Offer shall submit itemized invoices for requested services and products under this contract. Invoices shall include but not limited to purchase order number provided by the County, contract number, description of requested services and products with traceable number, unit price, and any other pertinent information necessary to verify the invoice total.

SERVICE APPROACH

At Aquafix, we are passionate about wastewater and the science behind it. Our laboratory offers a Microanalysis and Filament Origins to help our customers identify issues and ensure their success.

Microanalysis & Filament Origins Testing

We will supply a test kit including sterile sample bottles, bags/liners, and a cooler for the return shipping. This wastewater lab testing consists of:

- A review of major and minor filaments plus subspecies with Gram and Neisser staining
- Testing of EPS (extracellular polymeric substances) sliming and zoogloeal colonies
- Precise explanation of filament presence and origin
- Analysis of protozoa and metazoa in the system
- Analysis of floc structure, sludge age, and oxygen penetration
- Treatment and process recommendations
- Results returned by e-mail and hard copy
- 3-day to 4-day turnaround

The assigned Service Representative from Aquafix will ensure that each lab kit is labeled, packaged, and sent to the appropriate lab location.

Proactive Microanalysis Program

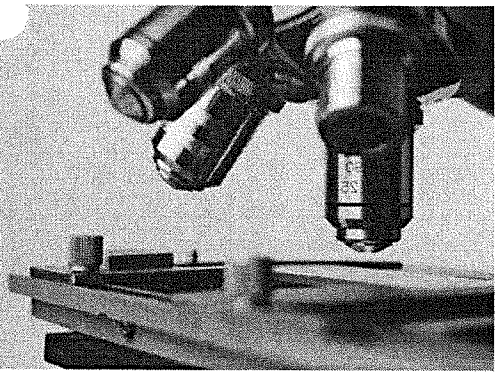
This bundling program of testing allows operators to get ahead of conditions before they become a problem. Compare results during normal operation to upset conditions to gain even deeper insights into your plant. Package consists of:

- 4 Microanalysis and Filament Origin tests, use at your own pace
- Spot potential problems before they become a major issue
- Filament ID, EPS Sliming, Floc Structure and Oxygen Penetration, and More
- Helpful recommendations to improve biology function and optimize treatment plant
- Get a clearer picture of how your plant conditions evolve over time

Aquafix lab location

505 S Rosa RD
Room 25
Madison, WI 53719
Hours: M-F 7:30 am – 4:00pm CST**

**Service Representative may be contacted outside of these hours for immediate assistance as needed.



Date:	11/7/2019
To:	City of [redacted] NY WWTP
Sample(s):	AT2-2, AT4-2
Date Received:	11/7/2019
Date(s) Analyzed:	11/7/2019, 11/8/2019
Sample Analyzed By:	Dan McKeaton, Chemist; Aquafix
Objective:	Perform microscopic observations of the [redacted] sample and make recommendations where needed.

Microscopic Observations:

AT2-2

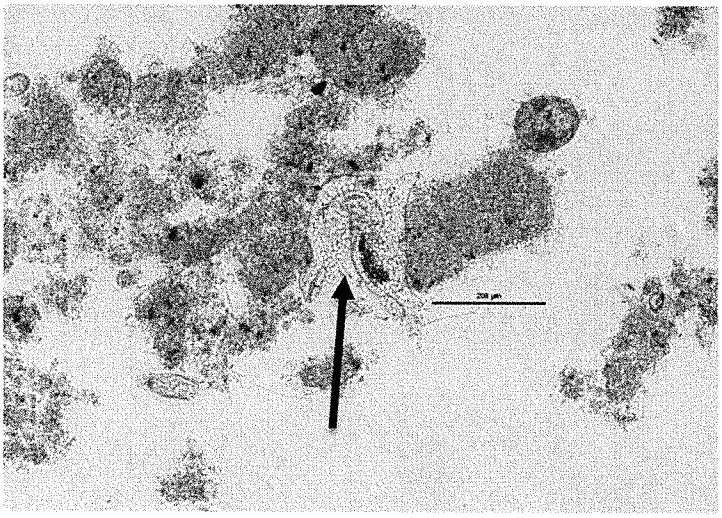


Figure 1, 100x magnification (m): Most floc in the [redacted] AT2-2 sample appeared to be medium in size. A significant number of smaller flocs which may have difficulty settling were also observed. Rotifers were abundant, and several tardigrades (arrow) were observed indicating a high sludge age.

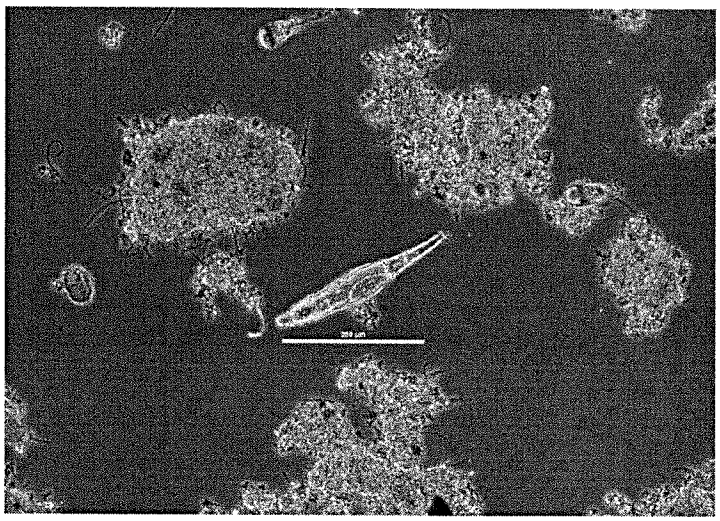


Figure 2, 100x (m), Phase contrast: Occasional filaments were observed extending from floc. Some free bacteria were observed in the bulk liquid. Occasional black spots were observed in floc indicating the presence of septic compounds.

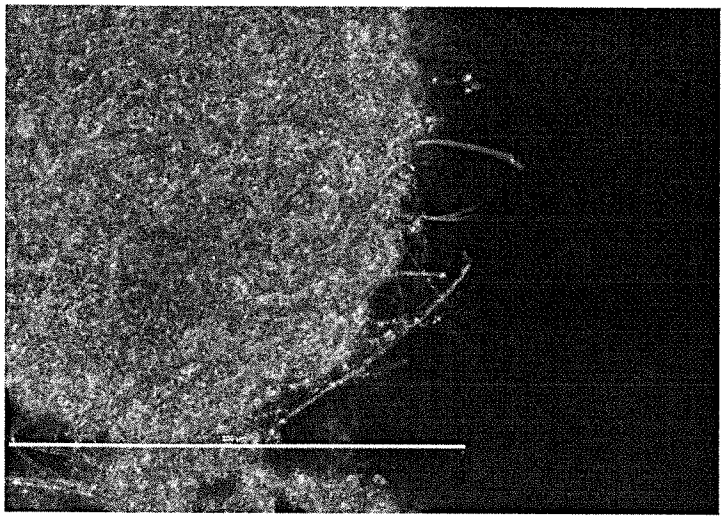


Figure 3, 400x (m), Phase contrast: Floc appeared to be tan to light brown in color under phase contrast, indicating floc high enough for good floc formation, and adequate for effective floc formation.

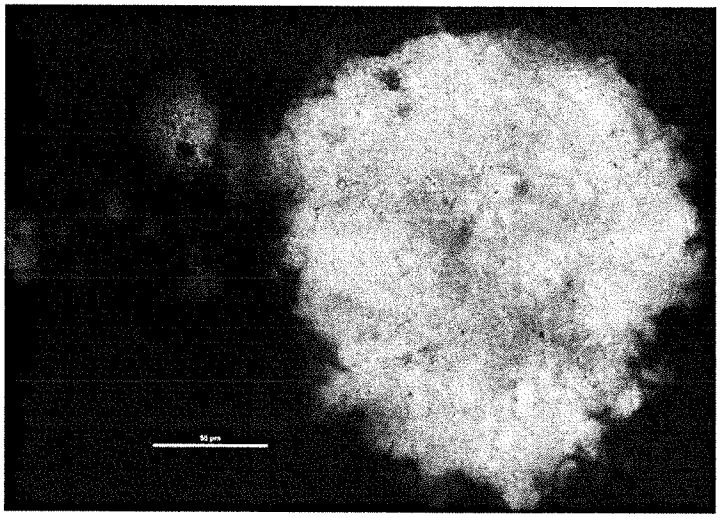


Figure 4, 400x (m), India ink stain: Floc present appeared to contain medium levels of extracellular polymer substances (EPS) in the AT2-2 sample. EPS levels appeared adequate oxygen penetration throughout floc.

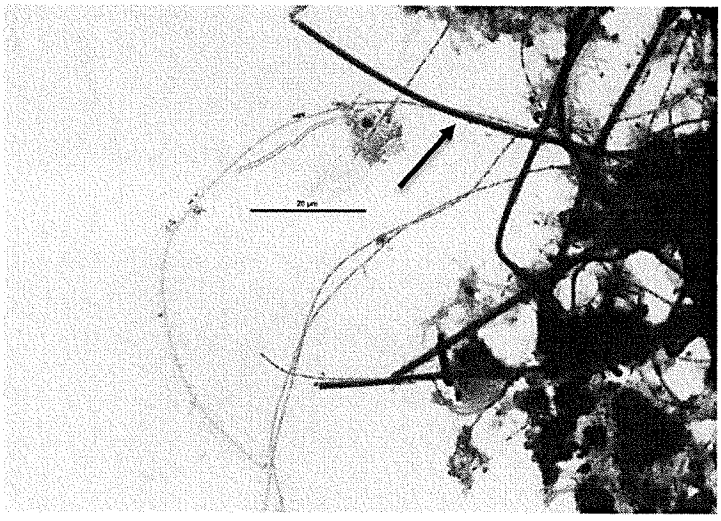


Figure 5, 1000x (m), Gram stain: Low Levels of Type 0041/0675 were observed after Gram staining (arrow).

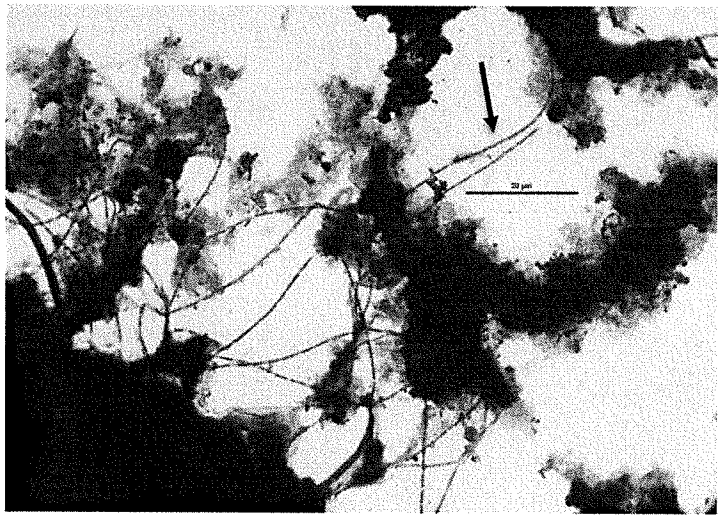


Figure 6, 1000x (m), Gram stain: Low to moderate levels of Type 1851 (arrow) was observed in the AT2-2 sample.

AT4-2

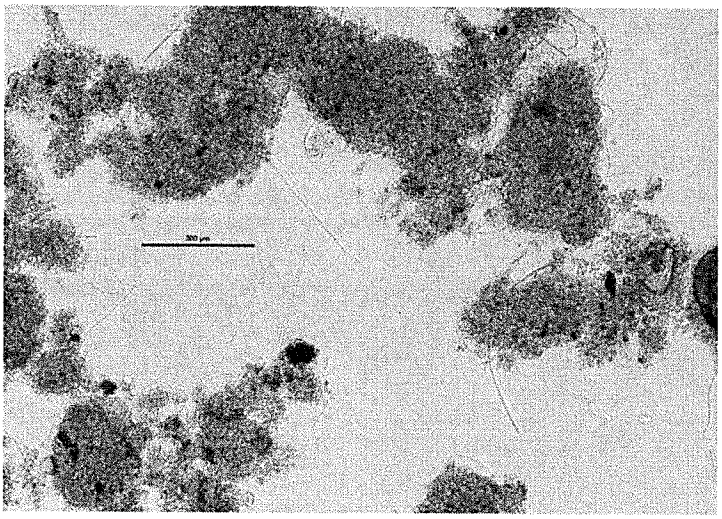


Figure 7, 100x (m): Floc in the AT4-2 sample appeared to be condensed and irregular in shape and mostly large in size. Filamentous bacteria were observed extending from floc into the bulk liquid. Filament abundance appeared somewhat higher than the AT2-2 sample.

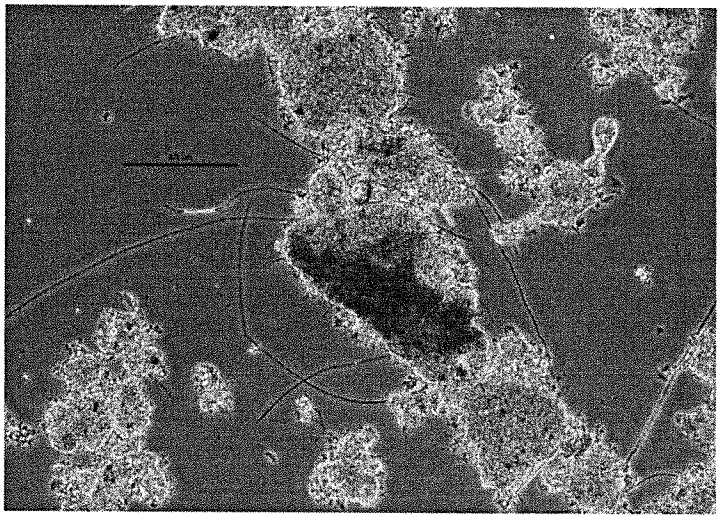


Figure 8, 100x (m), phase contrast: Floc in the AT4-2 sample appeared to be relatively dense based on brown color under phase contrast. This typically indicates good floc forming qualities. Some darker areas in floc indicated the presence of septic compounds.

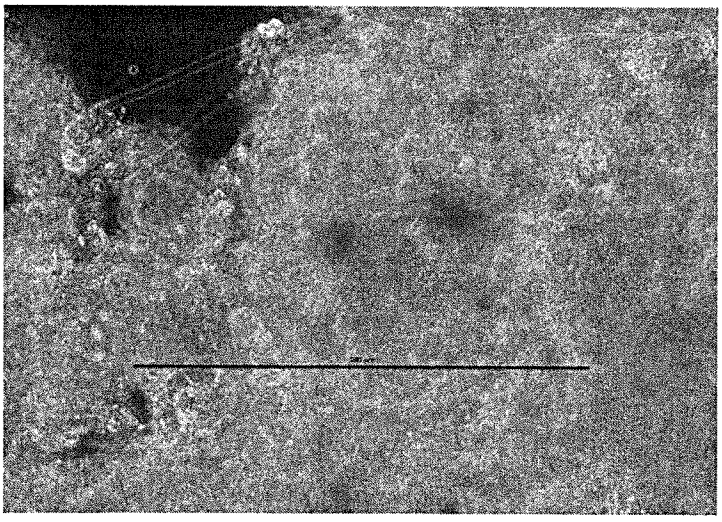


Figure 9, 400x (m), phase contrast: Floc appeared to be mostly tan to light brown in color under phase contrast. Occasional darker areas were present within floc. Overall, oxygen penetration into floc appeared adequate at this time.

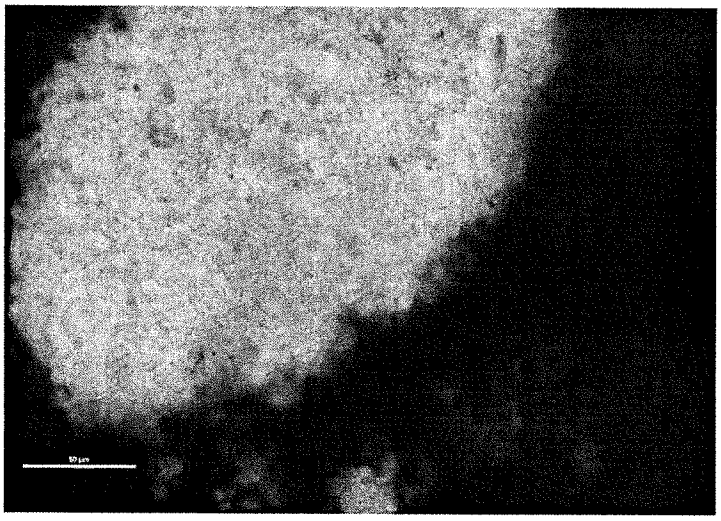


Figure 10, 400x (m), India ink stain: Floc in the AT4-2 sample appeared to contain moderate levels of EPS. EPS was not observed diffusing from floc in significant levels in the AT4-2 sample.

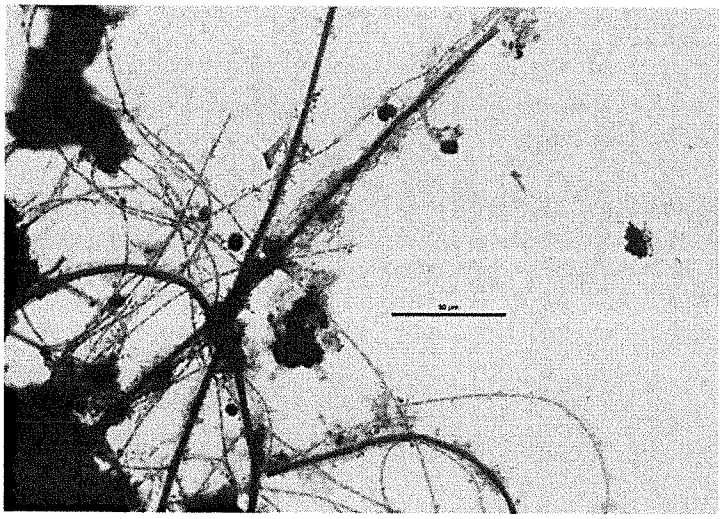


Figure 11, 1000x (m), Gram stain: Moderate levels of Type 0041/0675 were observed after Gram staining as well as levels of Type 1851. Both filaments tend to thrive in

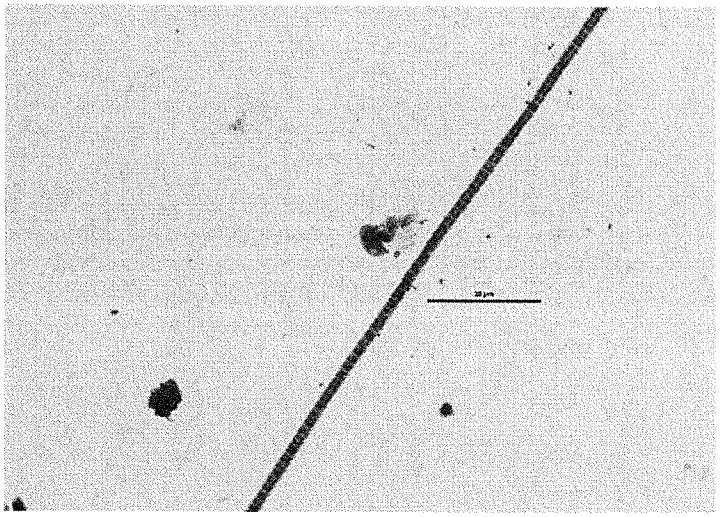


Figure 12, 1000x (m), Gram stain: *Thiothrix*/Type 021N were observed after Gram stain. Filaments appeared to contain medium many Gram-positive granules. low F:M conditions.

Summary:

Overall, the [redacted] aeration samples appeared to be relatively healthy at this time. Sludge age appeared to be somewhat higher than ideal, but not high enough to cause issues with the settling properties of the [redacted] mixed liquor.

Floc in both [redacted] samples appeared to be medium to large in size. Floc appeared to range from spherical to irregular in shape with high floc density. Generally high density, medium flocs are unlikely to have any issues settling and maintaining low effluent TSS levels.

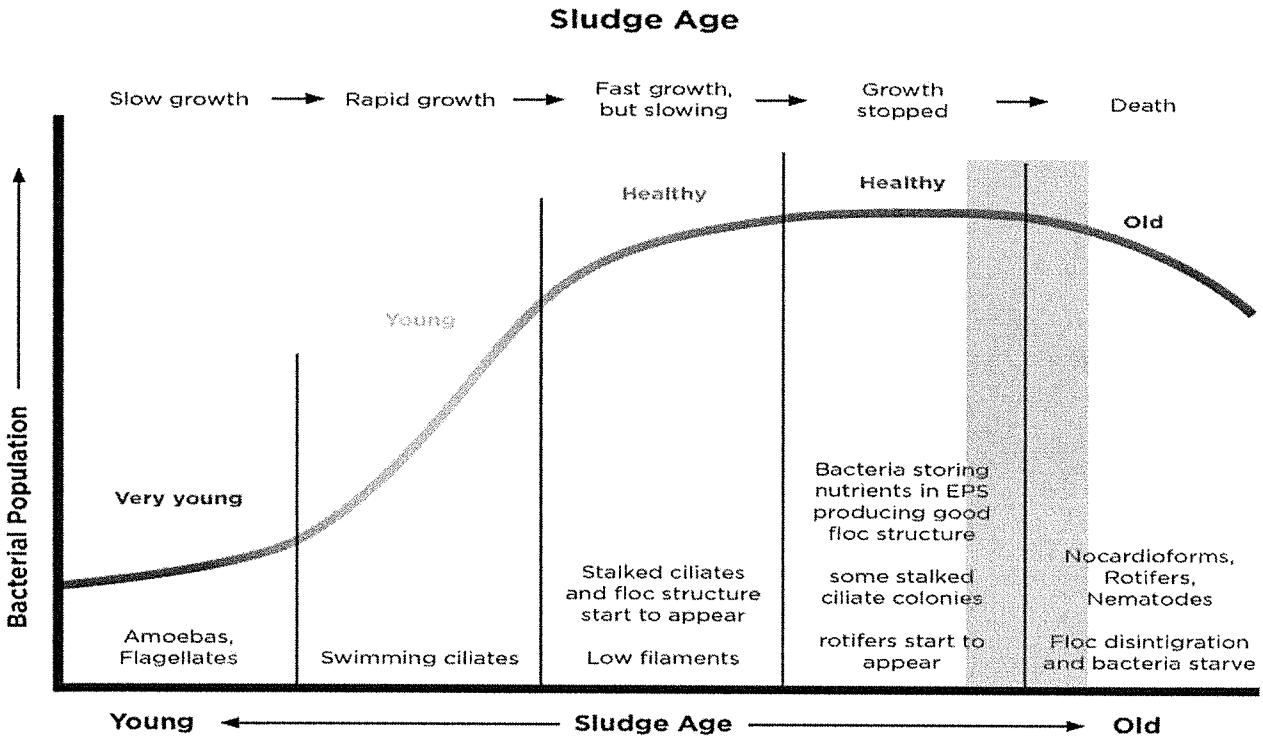
Some smaller spherical floc as well as free bacteria were observed in both AT2-2 and AT4-2 samples. These floc and free bacteria are unlikely to settle well in the [redacted] final clarifier and may contribute to effluent turbidity and high TSS. Levels of small floc and free bacteria appeared to be unlikely to cause any effluent issues. It is likely levels of small floc and free bacteria will increase, if sludge age in the City of [redacted] sample increases further.

Floc appeared to be mostly tan in color under phase contrast (400x). This indicates that while floc density appears to be relatively high, oxygen is still effectively penetrating into floc. Occasional areas of darker color under phase contrast were observed which may be receiving more limited levels of oxygen.

India ink staining results showed that extracellular polymeric substance (EPS) levels appeared adequate in both AT2-2 and AT4-2 samples to produce good floc forming qualities. EPS is a glue-like substance which causes bacteria to adhere together and form floc. Medium levels of EPS contained within floc usually indicates good floc forming properties. Diffused EPS was not observed in significant levels in either sample, indicating settling problems and foaming issues due to excessive EPS are unlikely to be experienced at this time, unless a

change in influent properties occurs. This indicates that nutrient levels in the City of [redacted]mples appeared relatively well balanced at this time.

Levels of metazoa and protozoa indicated a high sludge age in the [redacted]es. Several tardigrades were observed, as well as large stalked ciliate colonies and rotifers. Crawling ciliates appeared to be abundant as well, but levels of swimming ciliates appeared to be quite low in both samples. High sludge age can become a problem when bacteria no longer receive adequate food to reproduce. Starved bacteria begin to degrade EPS within floc which compromises floc structures and leads to floc disintegration which can lead to high TSS in effluent. No evidence of this occurring was observed at this time, but this will become more likely if sludge age increases further in the system



The blue rectangle on the diagram above indicates the current microbial sludge age of the [redacted] samples.

Levels of filamentous bacteria in the [redacted] sample appeared to be low to moderate. Low F:M filaments such as Type 0041/0675 and Type 1851 were observed frequently extending from floc. Levels of these filaments did not appear to be high enough to indicate any immediate issues. Levels of attached growth on these Low F:M

filaments appeared to be relatively low, especially on the ends of the filaments. This can indicate the population of Low F:M filaments may be increasing at this time. *Thiothrix*/Type 021N was observed primarily in the AT42 sample. This filament can grow in response to low DO, or in low nitrogen conditions. Levels did not appear to be high enough to indicate an issue at this time. In this case, *Thiothrix* appeared to be extending mostly from larger floc in the [redacted] samples, indicating it may be growing due to low oxygen penetration into occasional larger floc. This indicates the prevalence of *Thiothrix* is unlikely to increase unless oxygen levels in the [redacted] basins decrease.

Rank	Filament	Abundance	Cause
1	Type 1851	Low to Medium	Low F:M
2	*Type 0041/0675*	Low	Low F:M
3	*Thiothrix*/Type 021N	Low	Low DO, Low N, septic waste

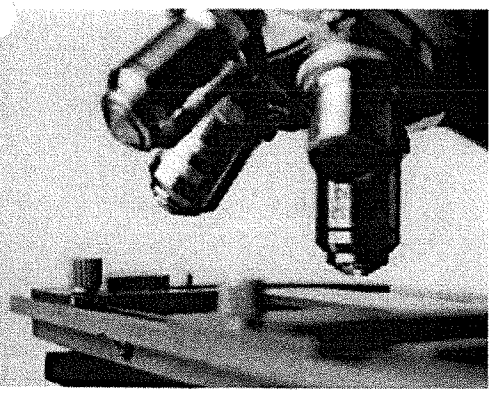
https://teamaquafix.com/common-wastewater-filaments/#1851

https://teamaquafix.com/common-wastewater-filaments/#021N

https://teamaquafix.com/common-wastewater-filaments/#0041

Recommendations:

- No major changes are necessary at this time as samples indicate the [redacted] system is performing well.
- We recommend continued addition of Accelerator VII and other nutritional supplements being used at this time, as nutrient levels did not appear to be causing any issues at this point.
- We recommend increasing wasting somewhat to decrease sludge age. This should help to prevent the growth of new Low F:M filaments and prevent high sludge age issues from occurring.



Date:	11/24/2021
To:	[redacted]
Sample(s):	MLSS
Date Received:	11/19/2021
Date(s) Analyzed:	11/19/2021
Sample Analyzed By:	Michael Lanphier (Research Scientist); Aquafix Inc.
Objective:	Determine the cause of bulking, poor ammonia removal, poor phosphorous removal, and sliming in the [redacted] and recommend treatment.

Microscopic Observations: MLSS

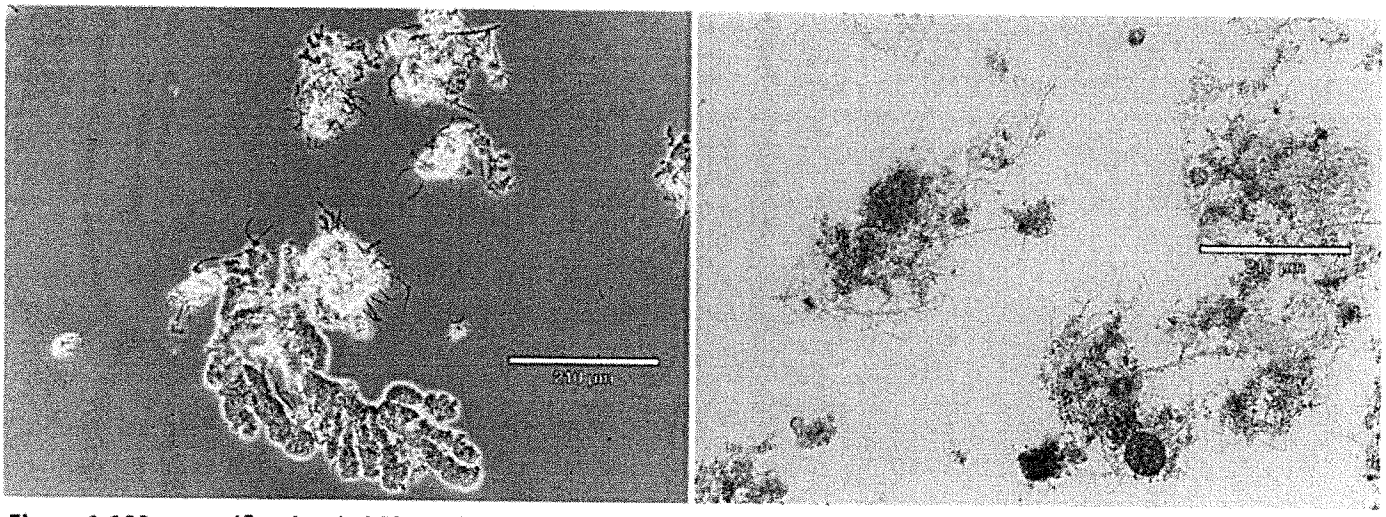


Figure 1-100x magnification (m) Phase Contrast & Figure 2-100x (m): Floc in the MLSS sample appeared to be predominantly medium in size with an average floc size of 186.95 µm. Approximately 30% of the floc were small in size (<150µm), and 70% were medium in size (>150µm, <500µm). Floc appeared irregular in shape and mostly open in structure. High levels of filamentous bacteria were observed within and extending from floc. High amounts of bridging was occurring between floc. Low to moderate levels of free bacteria were observed.

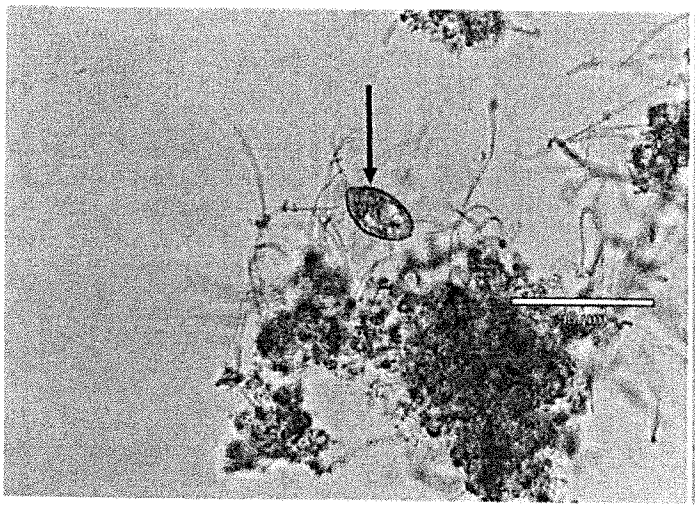


Figure 3-400x (m): Moderate levels of crawling ciliates (arrow) were observed. Crawling ciliates help to condense the floc by eating loosely attached bacteria around the floc edges. They are indicators of a healthy sludge age.

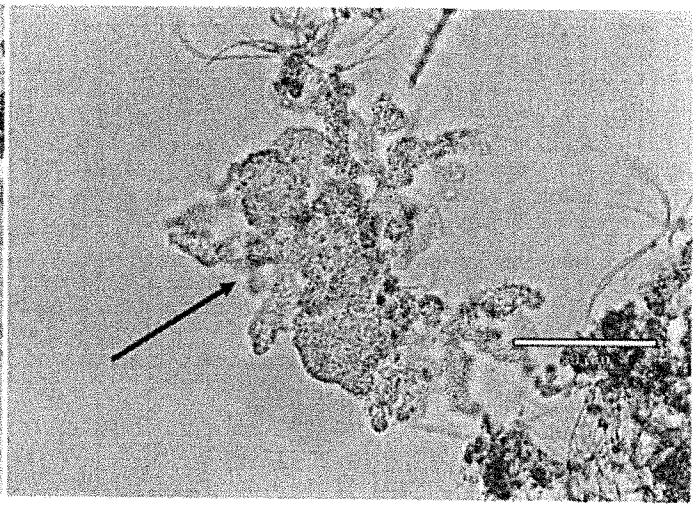


Figure 4-400x (m): High amounts of zoogloeal growths (arrow) were observed in the MLSS sample. Zoogloeal growths indicate high levels of incoming soluble carbon, and are likely contributing to slime formation.

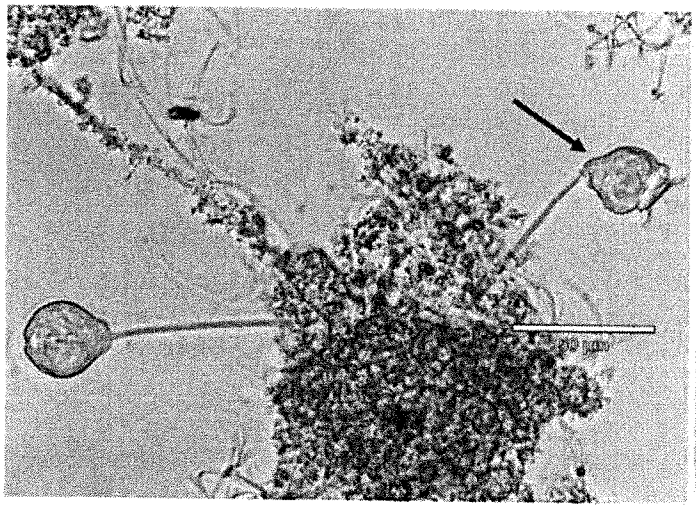


Figure 5-400x (m): Moderate amounts of stalked ciliates (arrow) were observed in the sample. Stalked ciliates are typically observed in healthy sludge age.

Figure 6-1000x (m) Neisser Stain: Low to moderate amounts of tetrads (red arrow) were observed. Tetrads are a cluster of four cells that are caused by an abundance of soluble carbon. It is common to see low levels of tetrads within a plant. Tetrads can be indications of nitrogen-deficient conditions.

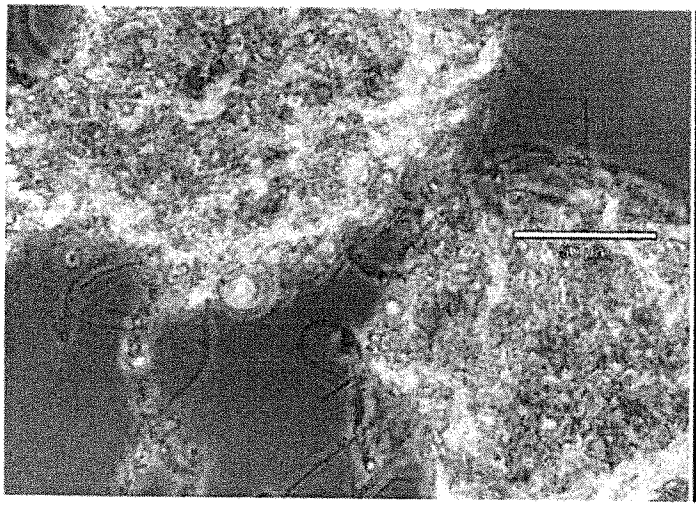


Figure 7-400x (m) Phase Contrast 2: When viewed under phase contrast the floc were primarily tan in color. This is indicative of adequate oxygen penetration into floc.

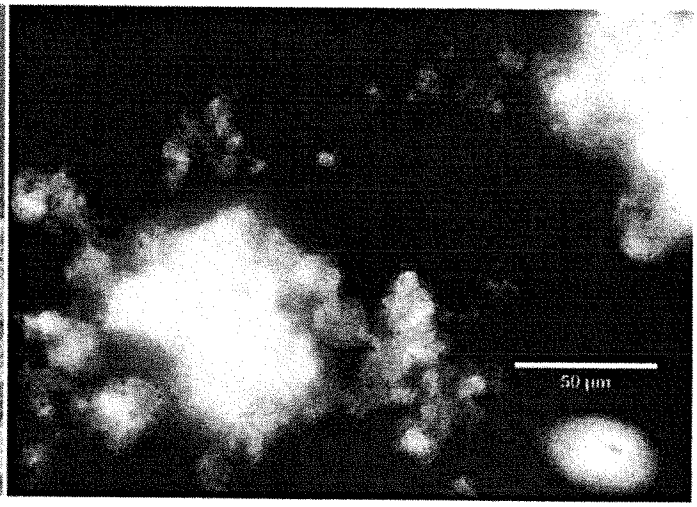


Figure 8-400x (m) India Ink Stain: Moderate levels of extracellular polymeric substances (EPS) seemed to be mostly concentrated in zoogloeal colonies. Many regions in the floc have low levels of EPS. EPS is a glue like substance that helps floc forming bacteria stick together and form strong floc.

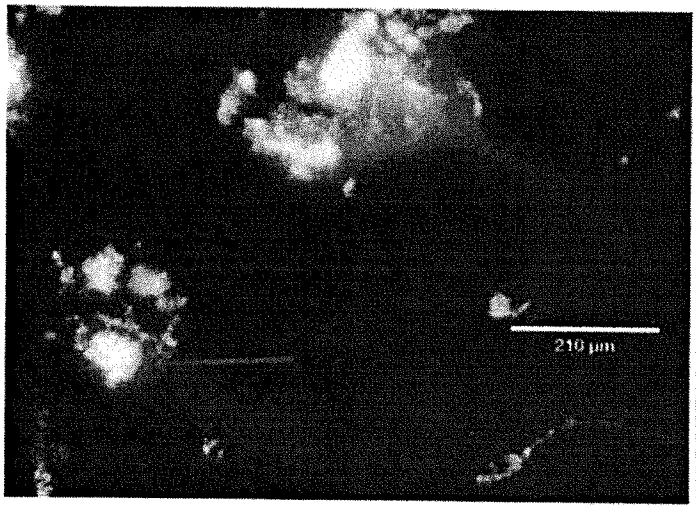


Figure 9-100x (m) India Ink Stain: Moderate levels of extracellular polymeric substances (EPS) were observed diffusing from floc and zoogloeal growths (red arrow). Diffused EPS tends to be a sign of stress in a wastewater system.

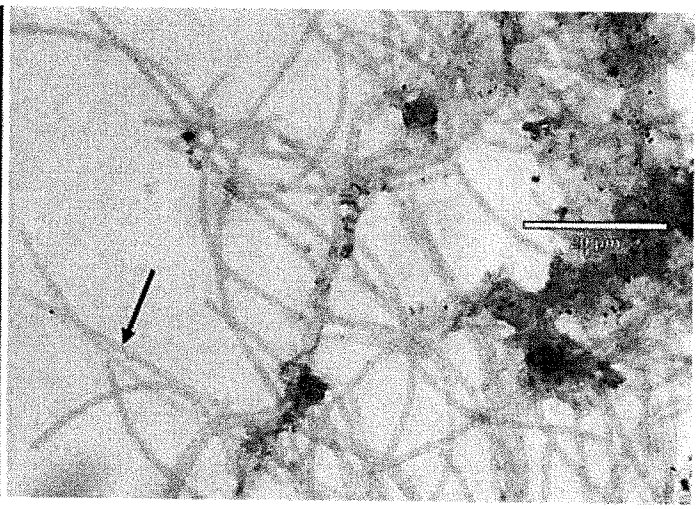


Figure 10-1000x (m) Neisser Stain: High levels of *Nostocoida limicola* were observed. *N. limicola* is usually associated with high levels of volatile acids in a wastewater system. *N. limicola* may also be associated with nutrient deficiency. When abundant enough, these filaments have been known to cause bulking and create a thin scum layer.

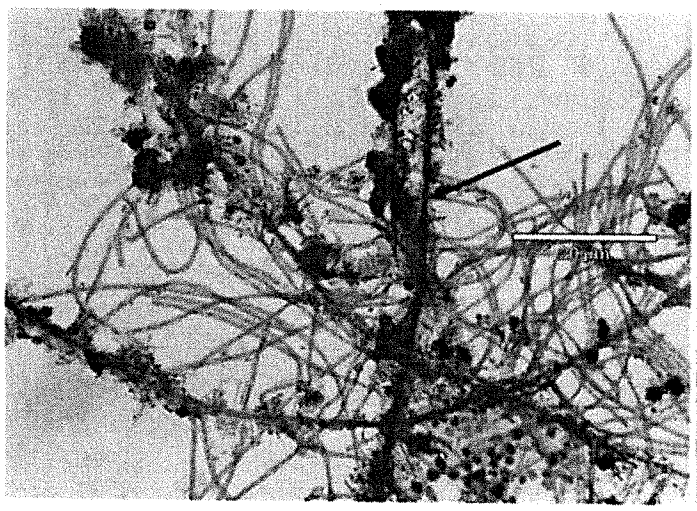


Figure 11-1000x (m) Gram Stain: Moderate levels of Type 0041/0675 were observed in the MLSS sample. Type 0041/0675 thrives in low F:M conditions.

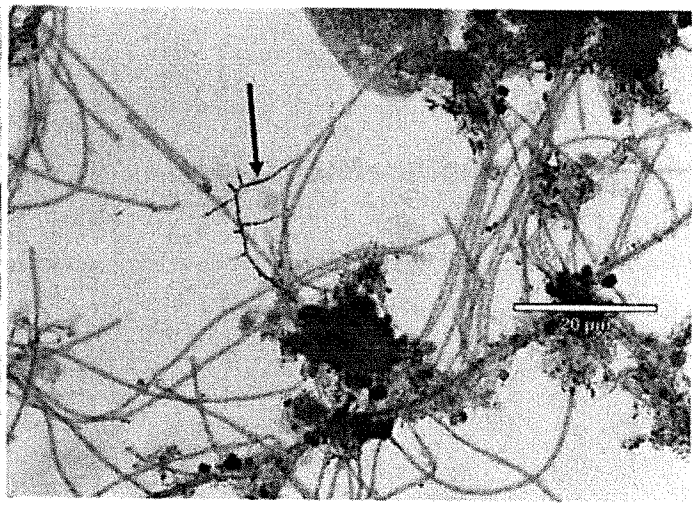


Figure 12-1000x (m) Gram Stain: Low levels of Nocardia-like organisms (NALO) were observed in the sample. NALO thrive in environments with high levels of incoming fats, oils, and greases (FOG) as well as in old sludge.

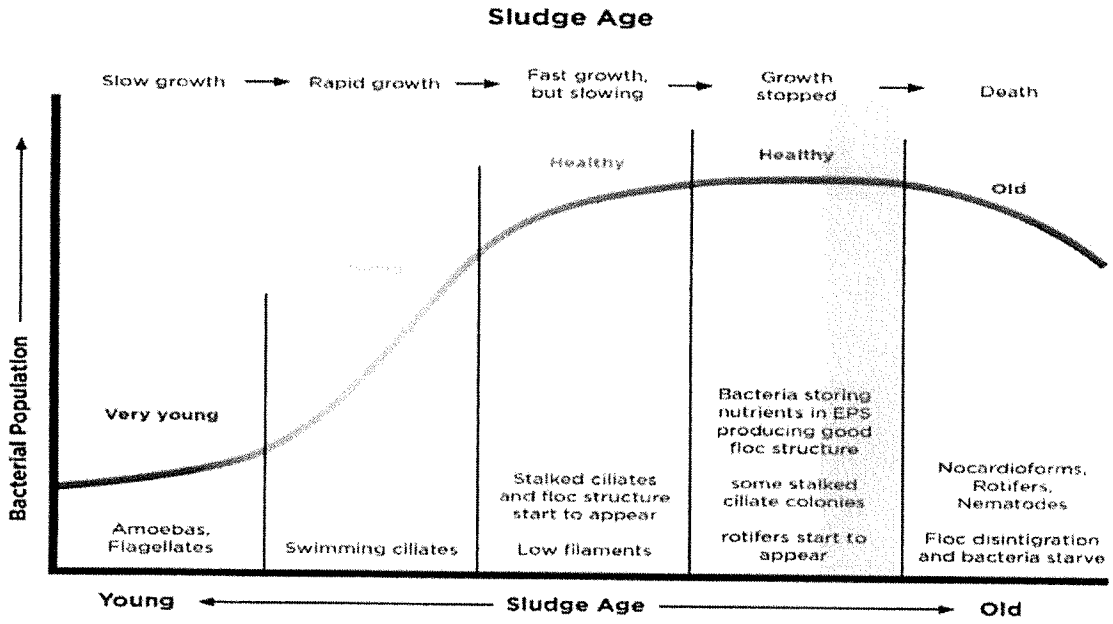
Summary:

Based on the abundance of *Nostocoida limicola*, diffused EPS, and zoogloeal growths, it is likely that the cause of poor ammonia and phosphorus removal in the [redacted] is high levels of incoming volatile acids. Volatile acids can be inhibitory to nitrifying bacteria. In addition, Volatile acids act as a soluble carbon substrate which encourages the growth of zoogloeal colonies, causing them to compete with healthy floc forming bacteria. Zoogloea can rapidly convert soluble carbon into capsular EPS causing other organisms to be carbon deficient. This leads to inefficient uptake of nitrogen and phosphorus. Zoogloeal colonies, and nutrient deficiency frequently lead to slime formation in wastewater systems. Slime diffusion can in some cases also lead to elevated effluent nitrogen and phosphorus if slime exits the system through the plant effluent.

The floc in the MLSS sample were irregular in shape, open in structure, and predominantly medium in size. When viewed under phase contrast the floc were primarily tan in color. This is indicative of adequate oxygen penetration into floc. High levels of filaments were influencing floc structure with high occurrences of bridging between floc.

Moderate levels of extracellular polymeric substances (EPS) were observed in floc. EPS was diffusing from both floc and zoogloeal growths. This is typically a sign of stress occurring in a wastewater system. EPS is a glue-like substance that helps floc forming bacteria stick together and form strong floc. Moderate amounts of zoogloeal growth showing EPS diffusion indicate that most likely, the WWTP had a high amount of incoming soluble carbon entering the system. This growth would cause EPS diffusion in regular floc forming bacteria as well as in zoogloeal growths. Diffused EPS can contribute to elevated nutrients in plant effluent if the diffused EPS exits the wastewater system.

Moderate levels of crawling ciliates were observed in the sample. Occasional stalked ciliates were also present. This generally indicates a healthy sludge age, but low levels of metazoa may be the result of high levels of incoming volatile acids, rather than sludge age. Elevated levels of filaments tend to be associated with higher sludge ages.



(The blue shaded area on the diagram above represents the approximate sludge age in the [redacted]

Microscopic Observations: MLSS

Rank	Filament	Abundance	Cause
1	*N. limicola*	High	High volatile acids
2	Type 0041/0675	Moderate	Low F:M
3	Nocardia-like organisms	Low	Older Sludge Age, High FOG

High levels of *Nostocoida limicola* were observed in the MLSS sample. *N. limicola* is typically found in conditions with high concentrations of volatile acids. If abundant enough, these filaments have been known to cause bulking and create a thin scum layer.

Low F:M filaments were also observed in the [redacted]em at moderate levels. As zoogloeal growths, and N. limicola tend to be associated with high F:M conditions, the growth of these low F:M filaments is unusual. This indicates that zoogloeal like organisms, and *N. limicola* are consuming enough soluble carbon substrates to cause low F:M conditions in other organisms.

Nocardia-like organisms (NALO) were present in low abundance in the MLSS sample. NALO frequently lead to foaming in wastewater systems. NALO grow due to high levels of incoming fats, oils and greases and old sludge.

Recommendation(s):

- We recommend the addition of Accelerator VII to help floc formers more efficiently degrade volatile acids to better outcompete organisms like zoogloea-like bacteria, and *N. limicola*. Accelerator VII is a blend of amino acids and micronutrients, designed to improve floc forming bacteria's ability to uptake soluble carbon substrates.

- We also recommend increasing wasting. Increasing wasting helps to reduce the prevalence of filamentous bacteria and allow for more rapid growth of healthy floc forming bacteria.

Aquafix Laboratories

Solutions-Based Microscopic Testing

Watch our how to submit a sample video online at www.teamaquafix.com/submit-a-sample

MICROANALYSIS & FILAMENT ORIGINS **$425.00**	• Identification of major and minor filaments and subspecies with Gram and Neisser staining • Precise explanation of their presence and origin • Testing of EPS sliming • An analysis of metazoa and protozoa in the system • An analysis of floc structure, sludge age, and oxygen penetration • Treatment and process recommendations • 3-4 day turnaround
PROACTIVE MICROANALYSIS PROGRAM **$1,200.00**	• 4 Microanalysis and Filament Origins tests; use at your own pace • Spot potential problems before they become a major issue • Filament ID, EPS sliming, floc structure and oxygen penetration, and more • Helpful recommendations to improve biology function and optimize your treatment plant • Get a clearer picture of how your plant conditions evolve over time

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Aquafix Laboratories

Microanalysis & Filament Origins Testing

Let Aquafix's skilled Microbiologists help you troubleshoot upsets, or spot potential upsets before they happen. Top of the line equipment and staining techniques allow you to see your wastewater biology more closely than ever before.

Reports include images, an explanation of what is there, what it means, and a recommendations section for overcoming challenges. The report is always followed by a phone call with a Technical Rep to discuss the results and answer questions.

Call to Request Your Lab Kit
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Fill Sample Bottles,
Mail Sample

Full report delivered in
5 Business Days

BugJuice

Biocatalyst Reduces Sludge and Undigested BOD

The catalysts in BugJuice reduce sludge hauling and digest the toughest forms of undigested BOD. Things like lint, paper fibers, plant tissue, and oils typically settle out in a wastewater plant, then end up in the digester. Using BugJuice prevents undigested BOD from bulking the sludge and impeding settling.

See Figures 1-3 below for a case study performed at a Chicagoland wastewater plant.

- **Improves settling**
- **Improves dewatering**
- **Reduces sludge volume**
- **Lowers polymer use**
- **Lowers sludge hauling**

Figure 1:

Polymer Cost/Ton

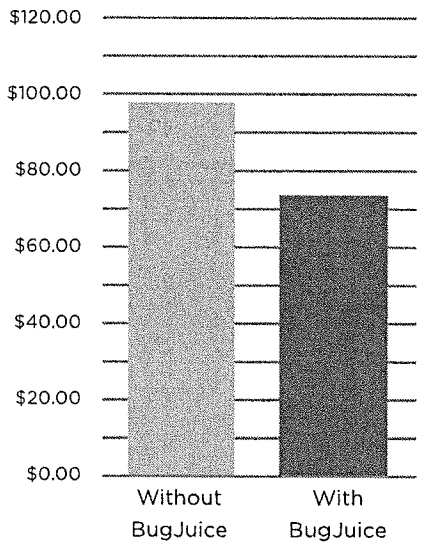


Figure 2:

Sludge Hauling (cubic yards)

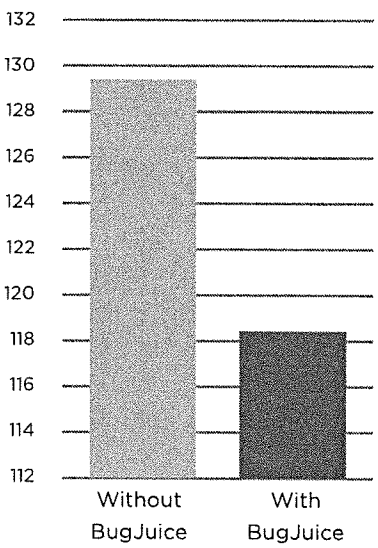
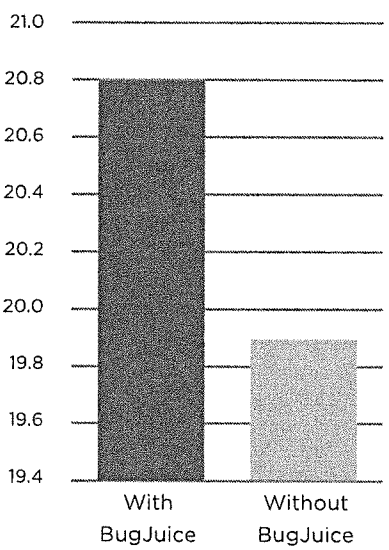


Figure 3:

Percent Cake Solids



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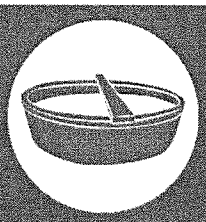
Dose Rates

BugJuice



BugJuice for Aerobic Digester		
Digester Volume Gallons	Initial Dose Once per week for 4 weeks	Maintenance Dose Once per week
100,000 gal	8 oz	3-4 oz
300,000 gal	0.5 gal	1 qt
500,000 gal	2.5 gal	1.25 gal

Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

BugJuice Dosing:

- Add to digester once per week

Notes:

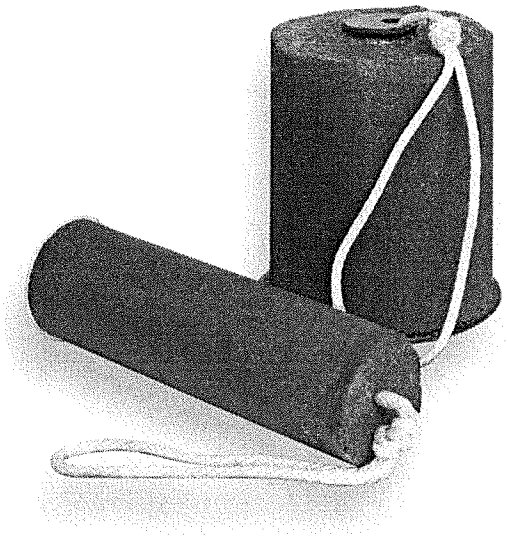
Bug On A Rope

Automated Delivery of Grease Eating Bacteria

Bug On A Rope is a unique bacterial block for lift station grease control.

The center of the Bug On A Rope is filled with instant impact *pseudomonas* bacteria that have a big impact in the first weeks. The biostimulants on the outside are rich in oxygen and key nutrients that ensure the grease-eating *bacillus* are released with maximum activity.

Hang Bug On A Rope under the incoming flow and it will slowly degrade, releasing the two powerful systems of bacteria into the lift station. These bacteria not only help consume grease, but also digest BOD and lower H_2S in the collection system.



No Netting And
Easy To Use

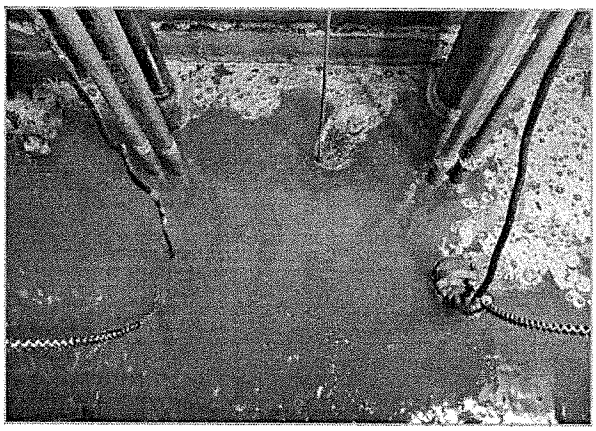
Pseudomonas Center For
Instant Impact

Bacillus Shell For
Continuous Release

- **Lift stations over 50,000 GPD: use 9 lb Bug On A Rope**
- **Lift stations under 50,000 GPD: use 3 lb Bug On A Rope Junior**

Figure 1:

Chronic grease build-up in a lift station before and after Bug On A Rope



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Dose Rates

Bug On A Rope

Bug On A Rope Average Dissolving Rates

For Bug On A Rope Jr dissolving rates, contact your technical rep

Flow Rate Gallons per day	Life Span Knock off remains into lift station; replace as necessary.
50,000 GPD	10 weeks
100,000 GPD	4 weeks
300,000 GPD	2 weeks

Bug On A Rope Dosing:

- Bring extra nylon rope with you, to deploy block to custom depth
- Hang block under incoming flow
- Hang at a depth that will have it fully submerged at the high water level
- For lift stations under 50,000 GPD use Bug On A Rope Jr

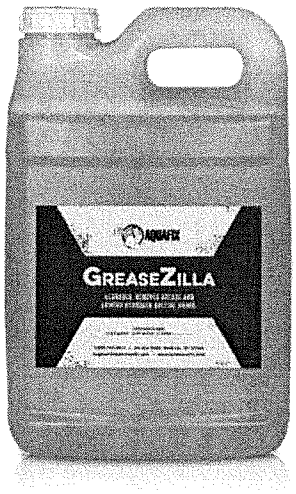
Bug On A Rope Available Sizes:

- Single 9 lb Bug On A Rope
- 4 pack of 9 lb Bug On A Rope

Bug On A Rope Jr Available Sizes:

- 4 pack of 3 lb Bug On A Rope Jr

Notes:



Pair With:

GreaseZilla to accelerate results especially if old, hardened grease is present.

Qwik-Zyme L

Biocatalysts Speeding Degradation of Grease

Qwik-Zyme L incorporates three types of fat-degrading biocatalysts to provide dramatic hydrolysis of fat, oil, and grease (FOG). These catalysts speed the breakdown of complex fat molecules into simple short chain fatty acids, which can help lower phosphorus.

Fats are often a key contributor to the presence of foaming filaments like *Microthrix parvicella* and *Nocardia* in wastewater plants. Pair with Foam Buster to alter the bacterial population to select against foaming filaments. When possible, increase wasting to lower sludge age during filament control treatment.

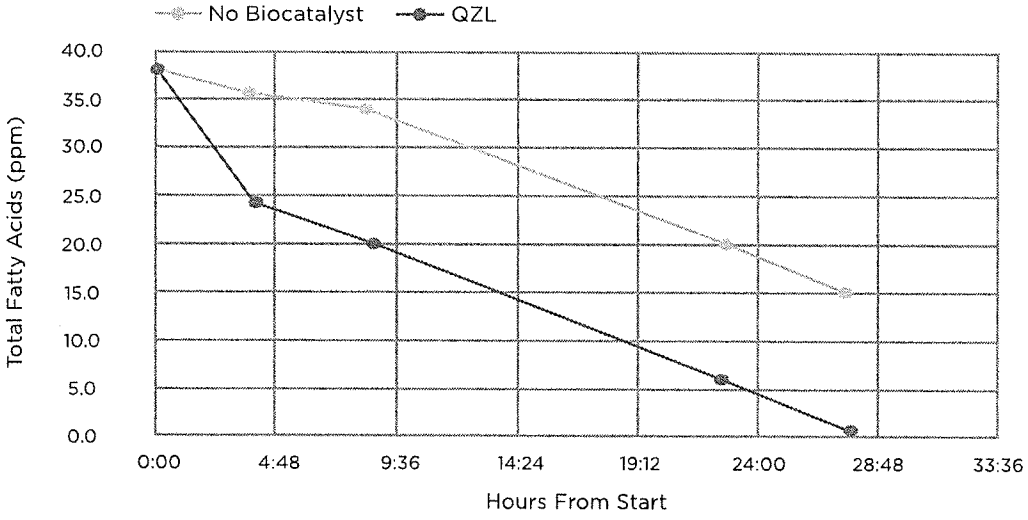
Helps Lower
Phosphorus

Ideal pH:
6-9

Helps to Get Rid of Filaments Like
Microthrix & Nocardia

Figure 1:

Total fatty acid concentration in restaurant grease



*Ask your Technical Rep for a copy of the full independent study conducted by researchers at University of Wisconsin Stevens Point.

Effects of Qwik-Zyme L catalysts on food waste (FOG) shown to the left.

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Dose Rates

Qwik-Zyme L

Microthrix parvicella Foam & WWTP Grease

(For *Nocardia* Foam, dose 2-4 times more, paired with Foam Buster)

Flow Rate Gallons per day	Initial Dose Daily for one month	Maintenance Dose Daily
10,000 GPD	4 oz	2 oz
100,000 GPD	1 qt	1 pt
500,000 GPD	5 qt	2.5 qt
1 MGD	2.5 gal	5 qt

Lift Stations & Sewer Lines

Flow Rate Gallons per day	Initial Dose Three times per week	Maintenance Dose Weekly
0 - 250,000 GPD	1 qt	1 qt
250,000 - 500,000 GPD	2 qt	2 qt
500,000 - 750,000 GPD	3 qt	3 qt
750,000 GPD - 1 MGD	4 qt	4 qt
1 MGD +	5 qt	5 qt

Sand Filter Backwash Application

Backwash Rate	Dose
5,000 gal	0.5 qt
10,000 gal	1 qt
20,000 gal	2 qt
30,000 gal	3 qt
40,000 gal	4 qt
50,000 gal	5 qt

Qwik-Zyme L Dosing:

- Add daily to WWTP headworks, or directly to aeration basin
- Can be metered in

Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

Notes:

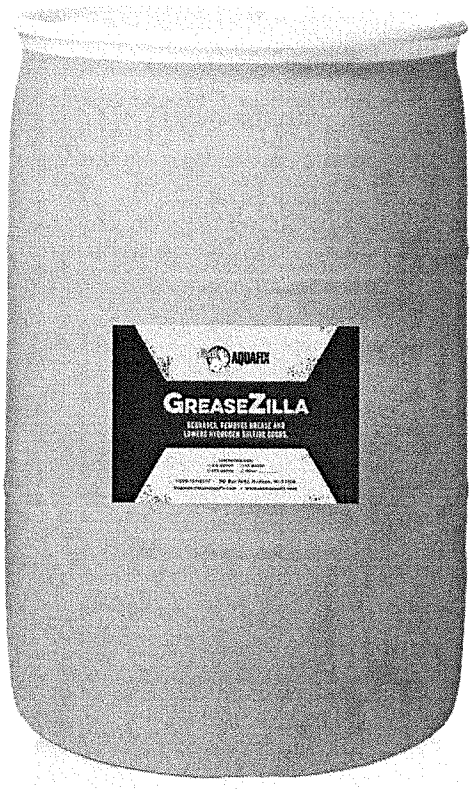
GreaseZilla

Biological Grease Control For Collection Systems

GreaseZilla is the fastest-acting grease control product for heavy grease and old hardened accumulations. It combines hydrophilic bacterial cultures with a fast-acting biocatalyst that quickly breaks up and digests grease in lift stations. It can also be used in kitchen drain lines and grease traps.

Unlike caustic or solvent based grease treatments, GreaseZilla will not result in a slug of grease being pushed down stream. The entirely biological action allows the grease to be irreversibly digested. And it is safe for the applicator as well as equipment.

*Ask your Technical Rep how GreaseZilla can lower BOD.

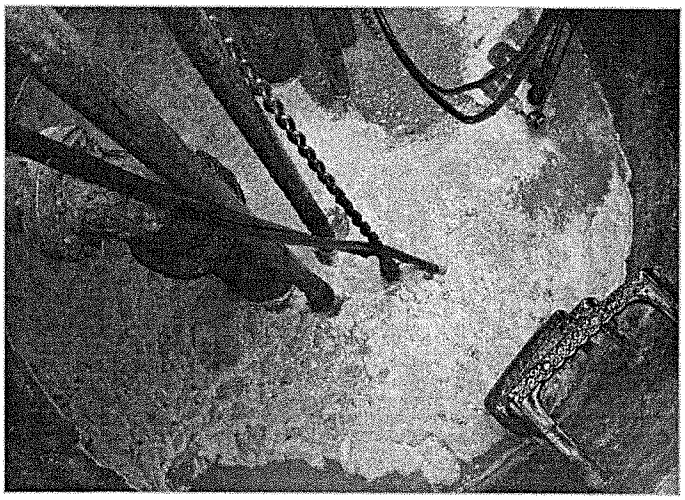


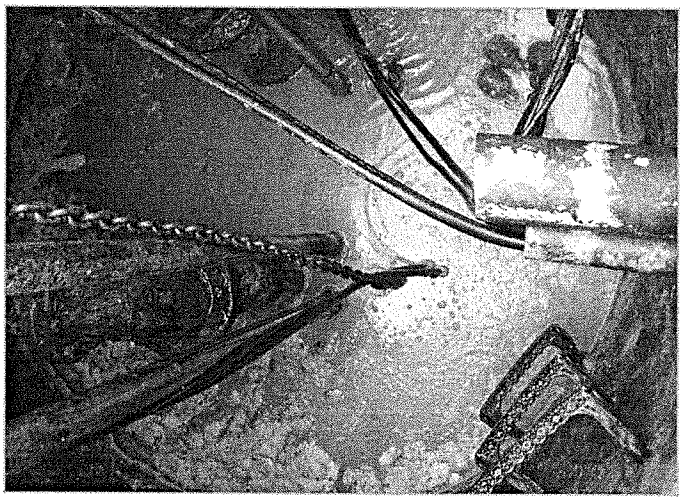
Tips:

- **For old hardened grease, spray directly on the accumulations to ensure maximum contact time**
- **Use with Bug On A Rope**

Figure 1:

Lift station before and 10 days after Aquafix grease treatment





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Dose Rates

GreaseZilla

GreaseZilla Dosing:

- For high grease loading or large grease accumulations, add daily
- For maintenance, add as little as twice per week, or can be metered in
- GreaseZilla sticks to grease and won't wash out

Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

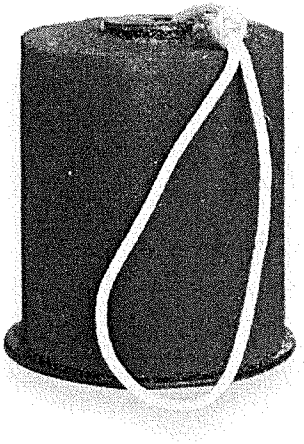
Lift Stations, Collection Lines, and Sewer Lines

Flow Rate Gallons per day	Initial Dose Daily for 1-2 weeks	Maintenance Dose Twice per week
10,000 GPD	6.5 oz	6.5 oz
100,000 GPD	0.5 gal	0.5 gal
500,000 GPD	2.5 gal	2.5 gal
1 MGD	5 gal	5 gal

Grease Traps

Grease Trap Size	Heavy Dose Twice per week	Maintenance Dose Once per week
1,000 gal	0.5 gal	8 oz
10,000 gal	5 gal	0.5 gal
20,000 gal	10 gal	1 gal

Notes:

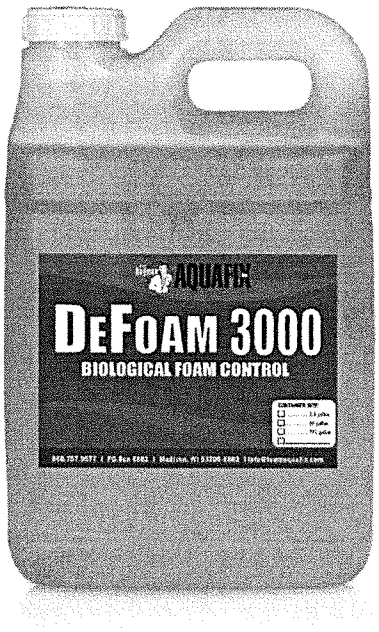


For ongoing maintenance after lift station is cleaned up, try our "set it and forget it" Bug On A Rope

DeFoam 3000

Wastewater Defoamer Designed for Biological Systems

DeFoam 3000 is a 100% concentrated defoamer, formulated to rapidly deflate foam by creating a monomolecular film. This film spreads across the water surface, quickly collapsing foam. DeFoam 3000 does not contain any emulsifiers, making it safe and effective in biological wastewater processes. It can be used in aerobic or anaerobic processes, wherever foaming is a concern.



DeFoam 3000 is composed of a concentrated blend of essential oils that works to quickly flatten the foam. Its concentration means even a small dose of DeFoam will take care of large amounts of foaming. For best results, apply directly to the surface of the foam. To get rid of foaming filaments like *Microthrix* and *Nocardia*, our Foam Buster and Qwik-Zyme L address the root cause of foaming and eliminate problematic filaments.

Say No to Silicone Defoamers

Industrial defoaming agents are often silicone-based, and we strongly recommend against them in biological systems. The silicone formulas are harmful to bacterial life, and interfere with settling. DeFoam 3000 does not contain silicone, and works with your wastewater plant's biology.

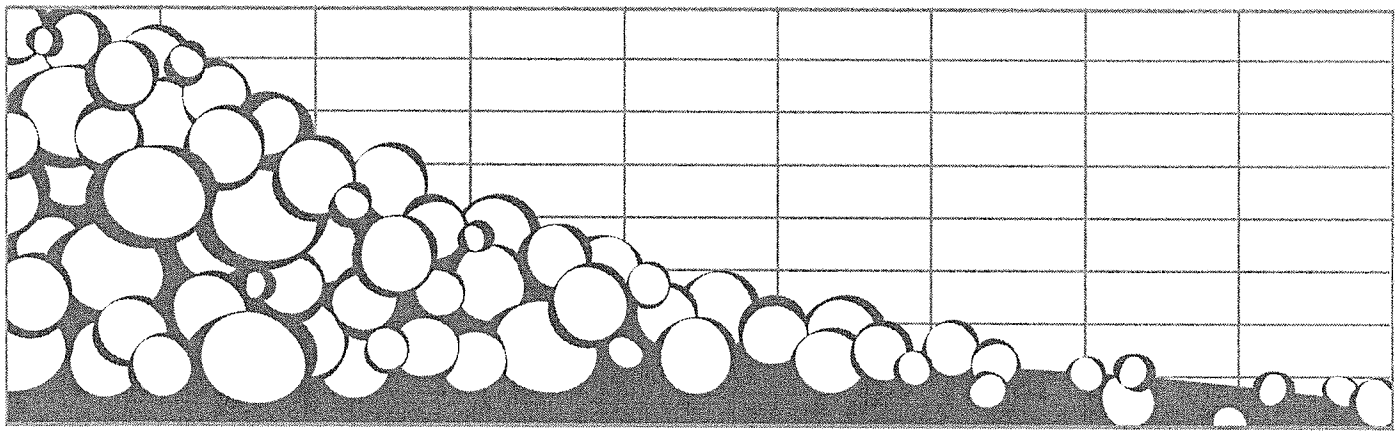
DeFoam 3000 breaks the surface tension of foam bubbles to release trapped gases and eliminate foam.

Use DeFoam 3000 in:

Anaerobic Digesters | **Aeration Basins** | **Anywhere with Foam**

Figure 1:

DeFoam 3000, added at hour 1, works quickly to eliminate foam



Hour 1 Hour 2

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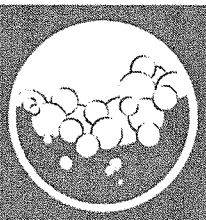
Dose Rates

DeFoam 3000



DeFoam 3000 Dosing:

- Starts working immediately; brings foam under control within 1-2 hours
- Pour the product directly on top of foam, or as close as possible
- Typical applications will require reapplying every 8-24 hours
- Dose charts are a typical starting point; adjust as needed to meet desired results

Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

Wastewater Treatment Plant	
Daily Average Flow	Daily Dose
100,000 GPD	1 pt - 1 qt
500,000 GPD	1 qt - 1 gal
1 MGD	2 qt - 2 gal

Anaerobic Digester	
Digester Capacity	Initial Dose*
500,000 gal	1-5 gal
1,000,000 gal	5-10 gal

*Contact your Technical Rep for assistance with maintenance dosing in anaerobic digesters.

Notes:

ANAEROBIC FOOD SUPPLEMENT

Anaerobic Food Supplement provides the building blocks to anaerobic life. This product provides methane-forming bacteria with a COD and micronutrient source specific for their growth and stabilization. This product is used in the following situations:

#1. When methane formers cannot keep up with variable high loadings or persistent low loadings.

#2. When operators are having trouble building methanogen populations.

#3. During new digester start up.

#4. To improve methane production.

#5. To stabilize digester pH by improving digester microbiota.

This product shines in plants with variable loading, or consistently low loading.

When methanogens become stressed they lose the ability to produce methane, which leads to a buildup of volatiles acids. That build up reduces the pH which causes the digester to be acidic (sour) and leads to poor digester performance. Generally, a digester is considered sour if the pH in the digester is too low to allow for the production of significant amounts of methane. Generally this occurs below pH 6. If a digester is already sour, the pH should be adjusted before any other treatment is attempted. Sour digesters have a buildup of methanogen substrate which means the food supplement may actually make the problem worse. After a neutral pH has been reestablished, the food supplement can be used to improve pH stability.

Anaerobic digesters contain a variety of facultative bacteria, strict anaerobic bacteria, and archaea (such as methanogens) which allow a digester to break down volatile solids. Volatile solids are converted to soluble compounds by hydrolysis and then to short chain fatty acids by the acid generating bacteria. Once short chain volatile acids are present in an anaerobic system, the methane generators use the acids to produce biogas (primarily methane and carbon dioxide). Methane generating archaea are much more susceptible to adverse conditions than acid generating bacteria (acetogens) and this is why anaerobic food supplement is so helpful. Anaerobic food supplement supplies methanogens with the COD and micronutrients they need so their populations can build during periods of low nutrient loading.

P.O. Box 8682 Madison, WI 53708-8682 p 888.757.9577 f 866.636.1864 bugman@teamaquafix.com

DOSE RATES

With this product, start dose low and build up the dose over time. Dose rate is dependent on the conditions in each digester. Overtime an operator will learn what dose best suits their conditions and this will be a helpful tool in improving performance. Monitor conditions closely during build up phase, and adjust doses to suit your system.

Week 1	1-2 lbs per day per 100,000 gallon per day incoming flow
Week 2	3-4 lbs per day per 100,000 gallon per day incoming flow
Week 3	5-10 lbs per day per 100,000 gallon per day incoming flow
Maintenance Dose	Dependent on Desired Methane Generation

*Dose rates can continue to be scaled up after Week 3 if needed for a larger boost in methane production.

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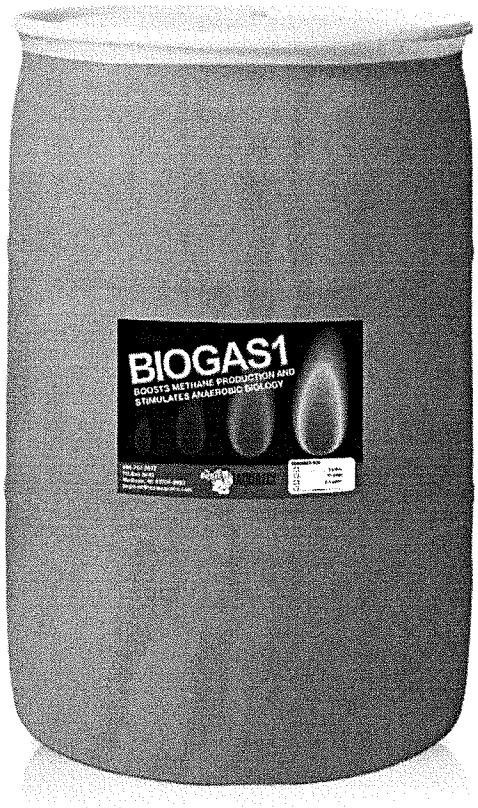
BioGas1

Trace Metal Micronutrient Blend for Better Biogas Production

BioGas1 increases methanogenesis in anaerobic digesters by enhancing the biochemistry that creates biogas. BioGas1 introduces the right micronutrients to stimulate methane production.

There is a lot of misinformation about which micronutrients are important in anaerobic digestion. BioGas1 contains ideal proportions of cobalt, nickel, and iron. This formulation is not only safe for your digester but is also the safest way to add micronutrients for the operator.

Other micronutrient products often precipitate out of solution very quickly in the digester, yielding them useless. Our formula is designed to maintain maximum solubility and bioavailability. The result is improved volatile solids conversion, a healthier population of methanogenic archaea, and better quality of biogas production.



Trace Elements Provided in BioGas1

Iron	Improves biogas production, redox activator, electron acceptor
Cobalt	Activates enzyme pathways, essential for B Vitamin synthesis
Nickel	Production of coenzymes
Manganese	Activates enzymes, stabilizes methane formers
Potassium	Stimulates cell growth
Calcium	Aids in membrane permeability
Copper	Activates enzymes
Chromium	Assists in the metabolism of glucose
Magnesium	Enzyme activator
Molybdenum	A cofactor in enzyme production, helps to inhibit sulfate reducing bacteria

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Dose Rates

BioGas1

Initial Loading Dose	
Tank Volume	Dose Rate One time
10,000 gal	0.5 gal
50,000 gal	2.5 gal
100,000 gal	5 gal

Maintenance Dose	
Flow Rate Gallons per day	Dose Rate Once per week
10,000 GPD	0.5 gal
50,000 GPD	2.5 gal
100,000 GPD	5 gal

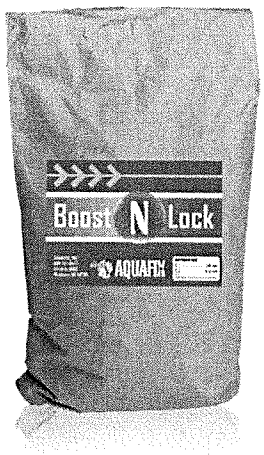
BioGas1 Dosing:

- Add to digesters with a pH already between 6-8
- Slug dose once per week, no need to feed gradually
- For anaerobic lagoons ask technical rep for custom dosing recommendation

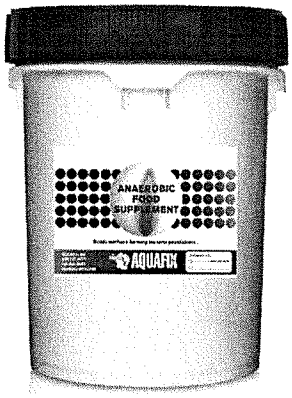
Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

Notes:



For digesters with low starting pH use Boost N Lock first to raise pH above 6.



For digesters with inconsistent or inadequate loading, pair BioGas1 with Anaerobic Food Supplement.

Boost N Lock

Alkalinity Sources Blended for pH Control

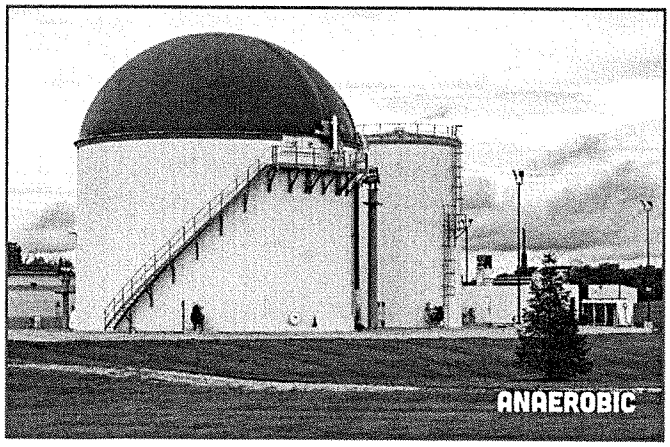
Boost N Lock raises the pH to neutral, and just as importantly holds it there. Boost N Lock is a blend of the best alkalinity sources available. It contains magnesium hydroxide, hydrated lime, sodium bicarbonate, and sodium carbonate in specific proportions. The combination of these ingredients provides superior pH stabilization when compared to lime, soda ash, or sodium hydroxide.

Magnesium hydroxide is a great additive if the starting pH is less than 6. If this is your starting point, ask your technical rep about pricing and dosing for our pure magnesium hydroxide to get the pH adjustment process started. Boost N Lock provides buffering capacity and works to stabilize pH. Boost N Lock can also be used to make minor increases in pH. Our technical team can advise on pH adjustments.

- **Works in anaerobic digesters, and aerobic wastewater plants**
- **Alkalinity sources prevent pH drops and neutralize acidity**
- **More soluble than lime**
- **Longer lasting results than caustic soda (sodium hydroxide)**

Compared to the Competition:

Lime is insoluble and leads to inorganic sludge accumulation. Sodium hydroxide is hazardous to use, and is very easy to overdose. Using Boost N Lock instead takes both of these concerns out of the equation.



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Dose Rates

Boost N Lock

Anaerobic Digester Dosing: Starting pH Greater Than 6		
Digester Capacity Gallons	Initial Dose Per day, until pH is neutral	Maintenance Dose Once per day, or as needed
100,000 GPD	60 lb	5 lb
500,000 GPD	300 lb	25 lb
1 MGD	600 lb	50 lb

WWTP Dosing: Starting pH Greater Than 6		
Flow Rate Gallons per day	Initial Dose Per day, until pH is neutral	Maintenance Dose Once per day, or as needed
100,000 GPD	40 lb	3 lb
500,000 GPD	200 lb	15 lb
1 MGD	400 lb	30 lb

Boost N Lock Available Sizes:

- 50 lb bag, bulk
- 40 bag pallet, discounted rates

Boost N Lock Dosing:

- Add to basin or digester once per day
- If existing pH is less than 6, start with our magnesium hydroxide
- The dosing table above is a starting point. Begin here, and after 12 and 24 hours measure the pH. Adjust dose based on the trend observed
- Titration to measure buffering capacity is the best way to know exact requirements, but is often unnecessary, ask rep for procedure details if desired

Notes:

CounterQuat™

Overcome Toxicity and Shield Bacteria From Quat

CounterQuat™ is a next generation technology developed to protect wastewater bacteria from toxicity, especially the effects of quaternary amines. CounterQuat was created to aid wastewater operators who have no control over toxic compounds that may come down the drain, but want to protect their wastewater biology and avoid noncompliance.

CounterQuat works by further developing the polyprotein matrix that bacteria naturally use to shield themselves from environmental toxins. CounterQuat develops and strengthens this defensive barrier. The result is greater bacteria resilience, flocculation, and nutrient removal in the presence of toxicity. CounterQuat can be fed upstream of the plant or directly in the plant and is excellent for wastewater plants concerned with incoming toxicity killing their organisms and causing a cloudy effluent and loss of nitrification.

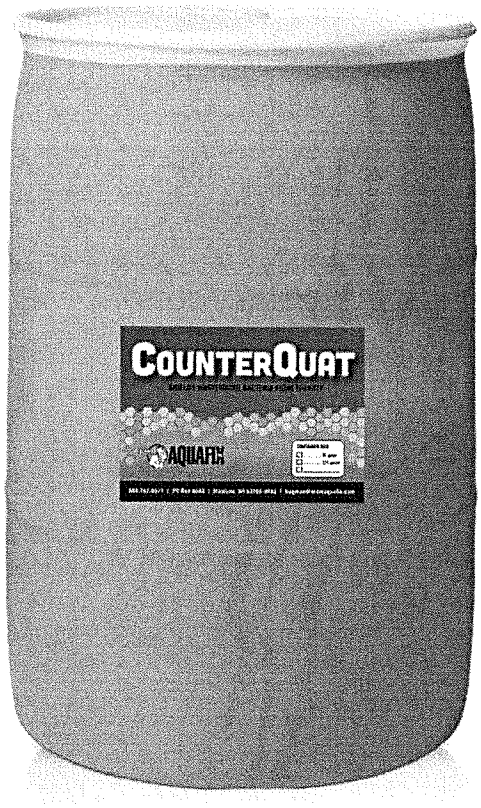
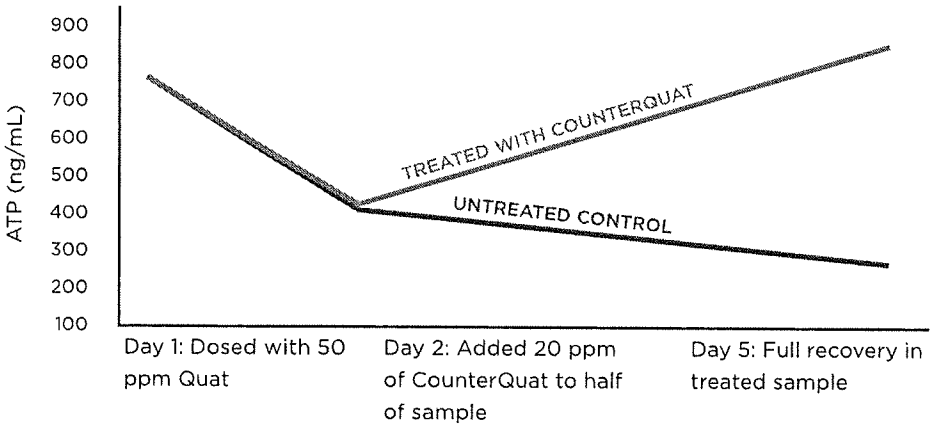


Figure 1:

Biological activity over time, measured as ATP



The Aquafix Laboratories ran tests to determine the success of CounterQuat in increasing biological activity after upset from quat toxicity. Samples dropped 387 ATP after being dosed with quat, but a dose of CounterQuat the next day raised ATP back up another 455 ng/mL, higher than the initial sample even.

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Dose Rates

CounterQuat

Recovery From Severe Toxicity	
Initial Dose	10 gal per 1 MGD per day
Maintenance Dose	6 gal per 1 MGD per day

Preventative Dose	
Initial Dose	4 gal per 1 MGD per day
Maintenance Dose	1 gal per 1 MGD per day

CounterQuat Dosing:

- Add daily to aeration basin, or headworks of plant
- Can be metered in
- Best used as a preventative treatment
- May need to increase dose rates in cold weather

Available Size:

- 55 gal drum
- 275 gal tote

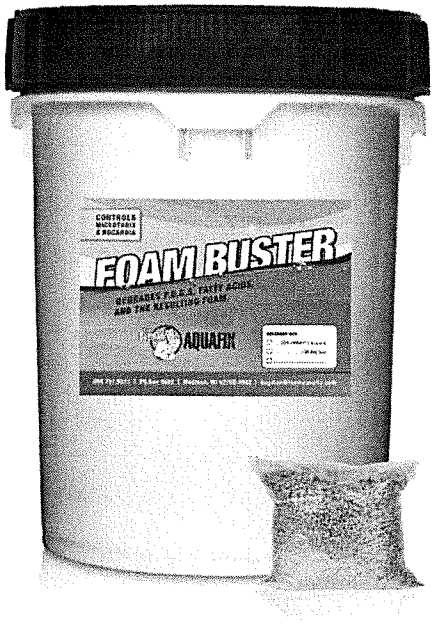
Notes:

Foam Buster

Helps Bacteria Populations Outcompete Foaming Filaments

Foam Buster is a blend of specialized proteins, free amino acids, and micronutrients which stimulate the floc-forming bacteria to degrade grease, emulsions, and helps them to outcompete the filaments which cause foaming. Chlorinating can only provide short term relief, and often only fragments the filaments, leading to worse foaming issues down the road. Foam Buster addresses the underlying cause of foaming.

Foaming filaments like *Nocardia*, *Gordonia amare*, and *Microthrix parvicella* use fatty acids to produce a buoyant cell wall. Foam Buster programs your wastewaters plant's naturally occurring bacteria to consume these fatty acids. Foam Buster's vitamins enable certain cellular functions to accomplish this task. Once the degradation of FOG and fatty acids improves, these troublesome filaments cannot survive on the dwindling food supply. Pair with Qwik-Zyme L for maximum effect.



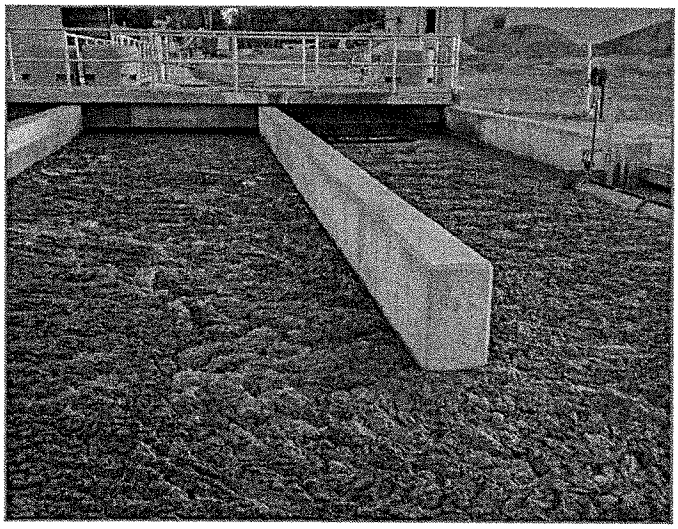
Waste Heavily During Treatment to
Lower Sludge Age

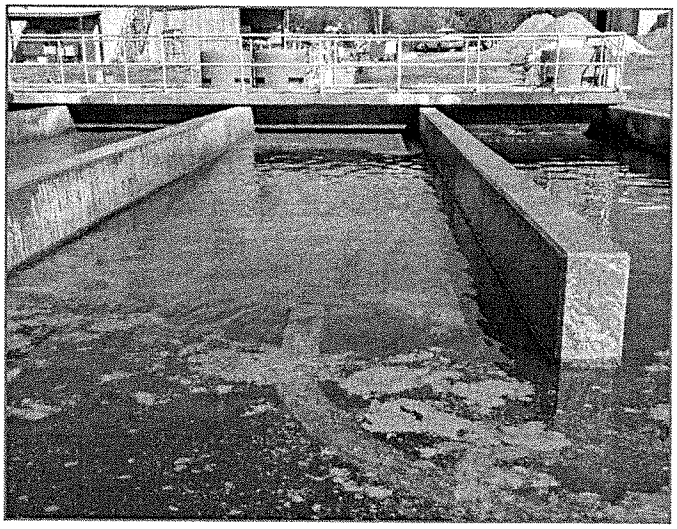
Fixes the Root Cause of
Foaming

Pair with Qwik-Zyme L for
Maximum Effect

Figure 1:

Before and after Foam Buster treatment





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Dose Rates

Foam Buster

Foam Buster Dosing:

- Add directly to aeration basin, once per day
- Pair with Qwik-Zyme L for best results
- Substantial improvement within 30 days

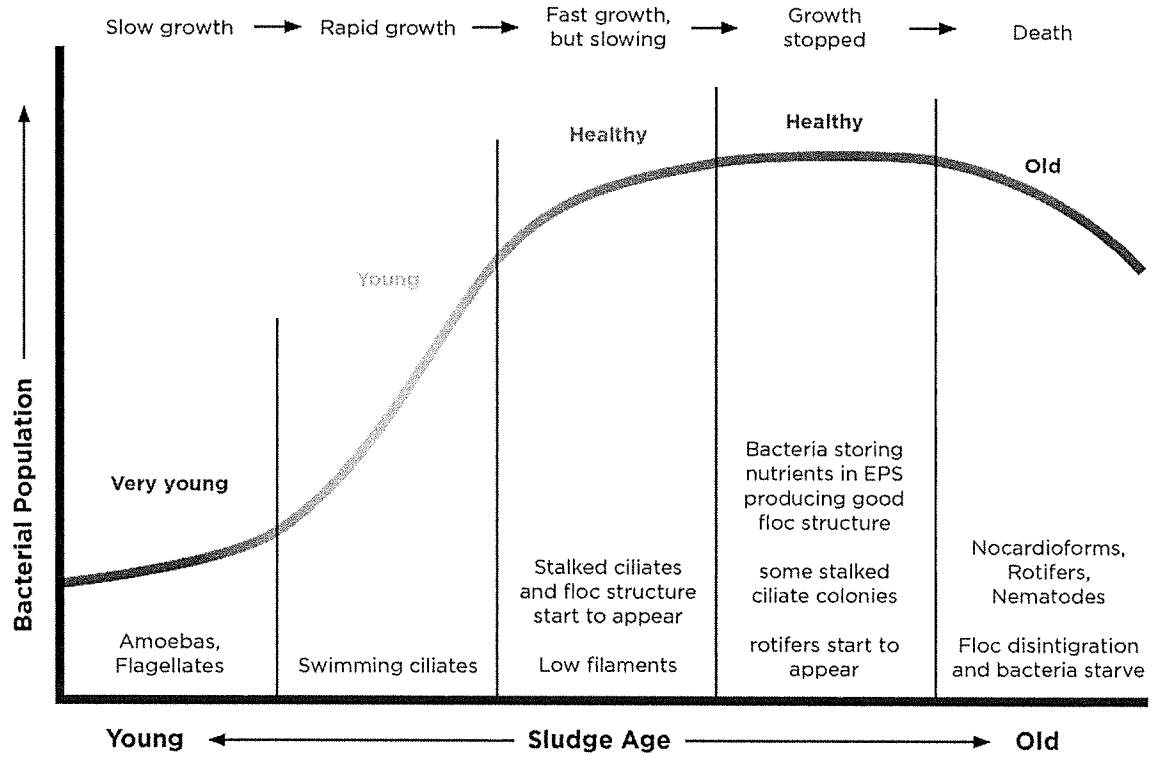
Available Sizes:

- 50 lb bag
- 30 lb pail with 1 lb water soluble packs

Nocardia or *Microthrix* Treatment		
Flow Rate Gallons per day	Initial Dose (First 30 days) Once per day	Maintenance Dose Once per day
100,000 GPD	2 lb	1 lb
500,000 GPD	4 lb	2 lb
1 MGD	8 lb	4 lb

The Importance of Sludge Age:

Foaming filaments take hold when incoming FOG is high, and sludge ages are old. Foam Buster and Qwik-Zyme L work to starve the filament and boost the ability of floc formers to compete. You can help the floc formers compete further by lowering sludge age and wasting heavily during treatment. See the sludge age graph below for a description of how sludge age relates to filament presence.



DAZZeL Sewer Sweetener

Wastewater Odor Neutralizer

DAZZeL Sewer Sweetener reacts with common wastewater odors and breaks them down in a fundamental way. This product is a blend of essential oils (plant extracts) that binds with volatile malodorous compounds and breaks them down, in an irreversible reaction.

Works on sulfides, mercaptans, ammonia, septic, and volatile fatty acid odors. This product is not a perfume or masking agent; instead it neutralizes the molecules responsible for the odor. This product is non-toxic and formulated specifically for use in biological wastewater systems.

Breaks down the odorous molecules

- **Not a masking agent**

Works great in:

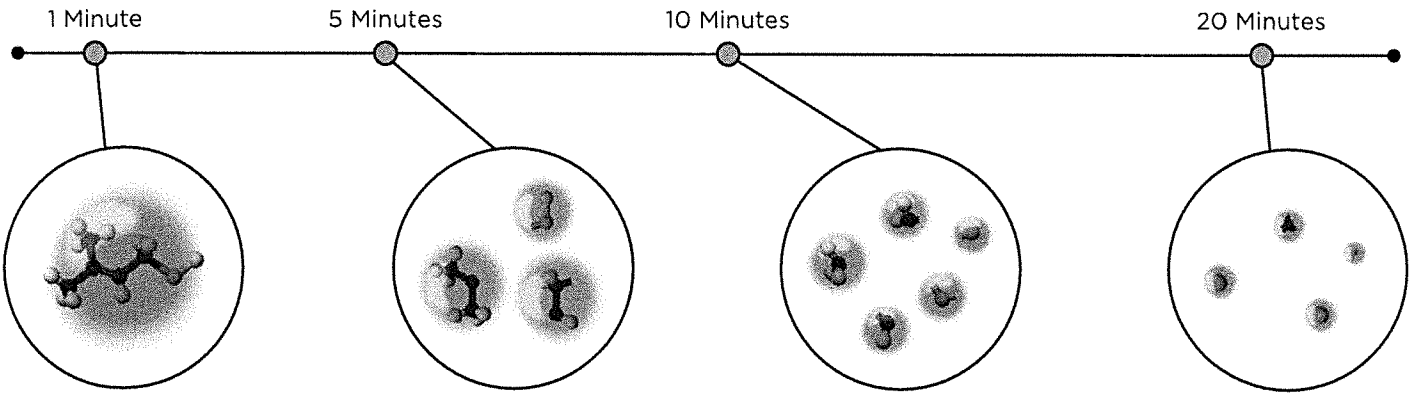
- **Collection systems, influent wells, sludge holding tanks, small lagoons**

Figure 1:

DAZZeL Sewer Sweetener eliminates odor by breaking down molecules

Odor Molecule

DAZZeL Sewer Sweetener



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Dose Rates

DAZZeL Sewer Sweetener

DAZZeL Sewer Sweetener in Collection Systems

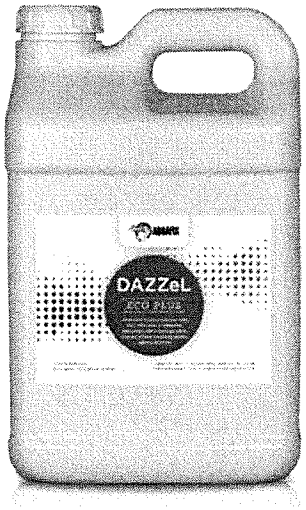
Flow Rate Gallons per day	Initial Dose Once per day for 10 days	Maintenance Dose Once per day
100,000 GPD	0.5 gal	1 qt
500,000 GPD	2 gal	1 gal
1 MGD	4 gal	2 gal

DAZZeL Sewer Sweetener Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote

For Wastewater Lagoons Over 1 Acre:

DAZZeL Eco Plus is specifically formulated for wastewater lagoons.



Notes:

De-Sulph-A-Nator

Hydrogen Sulfide Preventative

When added to a wastewater process De-Sulph-A-Nator is a sulfide scavenger, seeking to bind sulfur and sulfide chemistry. De-Sulph-A-Nator is unique in that it chelates the anionic sulfur and sulfide molecules; this prevents odor formation and makes the sulfur unable to form dangerous hydrogen sulfide.

Compared to ferric acid and caustic soda, De-Sulph-A-Nator is a much safer and easier product to work with. De-Sulph-A-Nator is used in wastewater plants, lagoons and anaerobic digesters and sludge storage tanks where sulfide odors are a concern.

Binds With Sulfate to

Prevent H_2S Formation

Safe to Use

Stops Corrosion

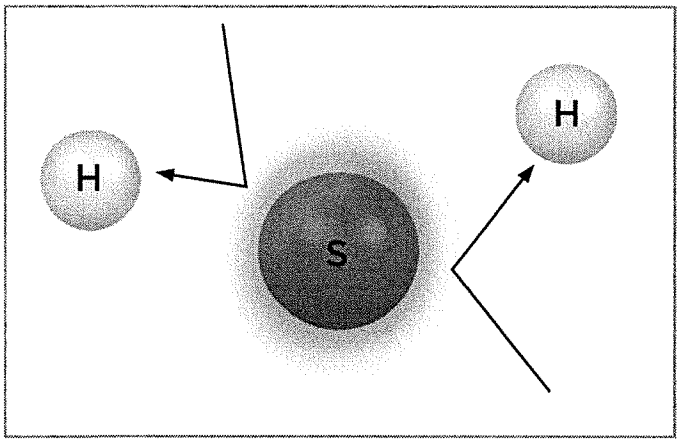
Apply Upstream of Problem Area to

Eliminate Odors

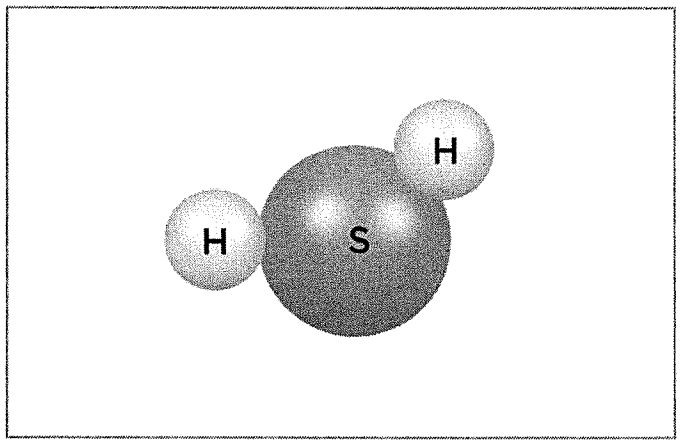
Figure 1:

Sulfur molecule chelated with De-Sulph-A-Nator doesn't bind with hydrogen, doesn't become hydrogen sulfide

Treated



Untreated



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Dose Rates

De-Sulph-A-Nator

De-Sulph-A-Nator in Lift Stations/Collection Systems/Sewer Lines	
Flow Rate Gallons per day	Dose Once per day
10,000 GPD	15 - 60 oz
100,000 GPD	1 - 4.5 gal
1 MGD	12 - 45 gal

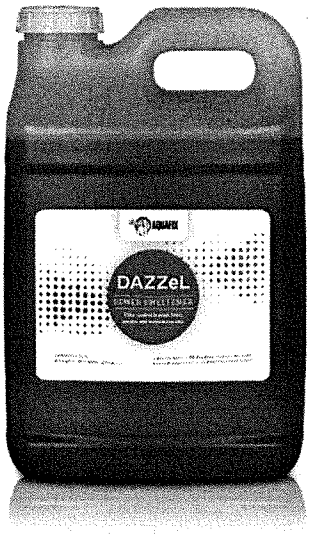
Sludge Storage Tank	
Tank Size	Dose Once per week
100,000 gal	5 gal
500,000 gal	25 gal
1,000,000 gal	50 gal

De-Sulph-A-Nator Dosing:

- Meter in upstream of problem area
- 8 hours or less detention time is ideal

Available Sizes:

- 5 gal case
- 55 gal drum
- 275 gal tote



If the odor problems are not sulfide related, use our DAZZeL Sewer Sweetener.

Notes:

VitaStim Dynamic Duo

Quickly Restores Nitrification and Lowers Ammonia

NH_3

VitaStim Ammonia Assimilators

VitaStim Ammonia Assimilators contains heterotrophic nitrifying bacteria that utilize both carbon and a high fraction of nitrogen. In systems with high organic loading or low dissolved oxygen the Ammonia Assimilators are the first step in ammonia removal.

VitaStim Nitrifiers

VitaStim Nitrifiers contains high concentrations of autotrophic ammonia- and nitrite-oxidizing bacteria, such as *Nitrospora*, *Nitrosomonas*, *Nitrospira*, and *Nitrobacter* as well as a micronutrient helpful to the growth and reproduction of nitrifying bacteria.

VitaStim Dynamic Duo provides two pathways for ammonia removal, making it the fastest way to restore nitrification.

After a typical 10 day treatment, the nitrifying bacteria continue to multiply, meaning there's no continued need to add the product. For systems with chronically high ammonia, consult an Aquafix Technical Rep to address the root causes.

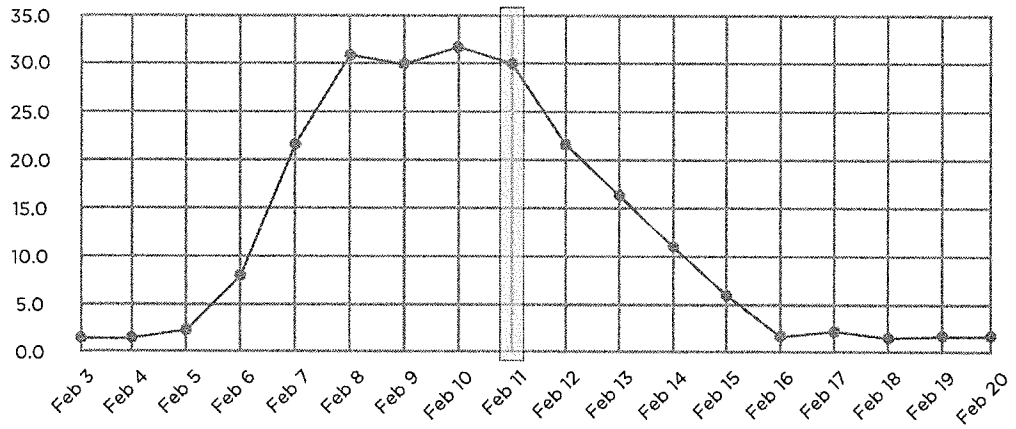
100% Success Rate
Guarantee

After Treatment Nitrifiers Continue to
Multiply on Their Own

Best Nitrifier for
Cold Water

Figure 1:

Example of nitrification recovery



Left: Dynamic Duo added February 11th.

Quickly restores nitrification to former levels.

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Dose Rates

Dynamic Duo

Dynamic Duo Dosing:

- Add both parts daily to aeration basin
- Typical treatment lasts 10 days
- **Refrigerate** product when not in use

For Best Results:

- pH 7-8
- DO 2-3 mg/L
- Good BOD removal
- Adequate alkalinity

Available Sizes:

- 2 Quart Box (1 of each)
- 2 Gallon Case (1 of each)

Water Temperature Below 60°F (15.6°C)

Flow Rate Gallons per day	Days 1-10 Once per day
10,000 GPD	15 oz
100,000 GPD	30 oz
300,000 GPD	96 oz
500,000 GPD	1.25 gal
1 MGD	2.5 gal

Water Temperature Between 60-72°F (15.6-22.2°C)

Flow Rate Gallons per day	Days 1-4 Once per day	Days 5-10 Once per day
10,000 GPD	40 mL	5 mL
100,000 GPD	12 oz	1.5 oz
300,000 GPD	36 oz	3.5 oz
500,000 GPD	60 oz	6 oz
1 MGD	1 gal	12 oz

Water Temperature Above 72°F (22.2°C)

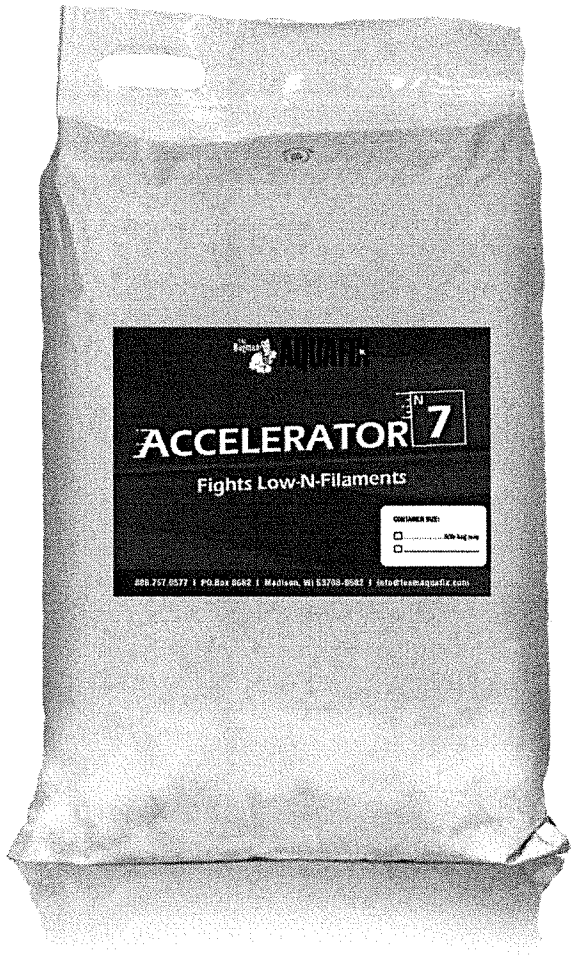
Flow Rate Gallons per day	Days 1-2 Once per day	Days 3-10 Once per day
10,000 GPD	40 mL	5 oz
100,000 GPD	12 oz	1.5 oz
300,000 GPD	36 oz	3.5 oz
500,000 GPD	60 oz	6 oz
1 MGD	1 gal	12 oz

Accelerator 7

Improves Settling In Low Nitrogen Wastewater Plants

Accelerator 7 is an organic nitrogen source specifically formulated for rapid uptake by floc forming bacteria in wastewater systems with nitrogen deficiency. It also contains trace minerals and vitamins to promote floc formation.

Accelerator 7 is an excellent substitute for wastewater plants that use inorganic nitrogen sources like urea. Urea requires high dose rates and creates dissolved oxygen demand.

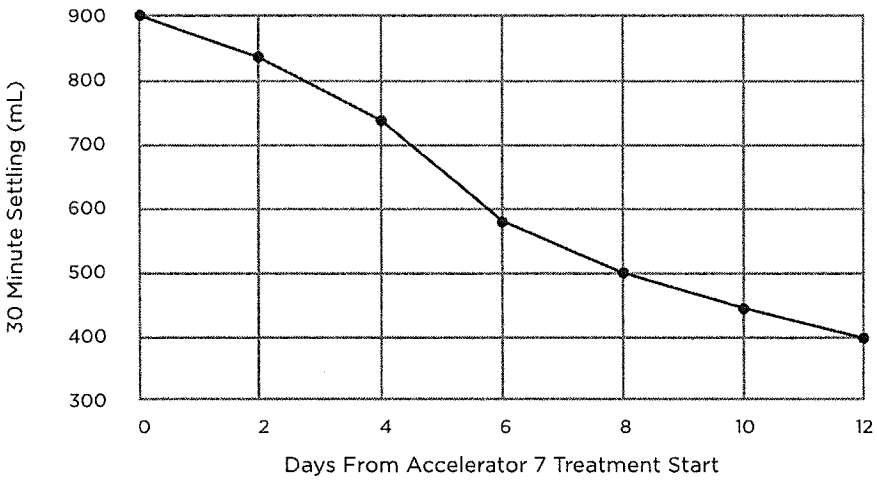


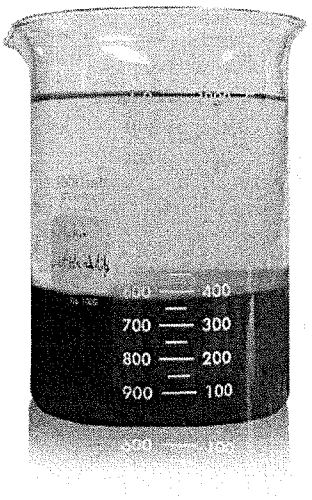
Benefits:

- Controls nitrogen deficient filaments like Type 021N
- Decreases the production of diffused EPS
- Improves settling
- Improves sludge dewatering
- Safe and easy to use

Figure 1:

Accelerator 7 quickly improves settling





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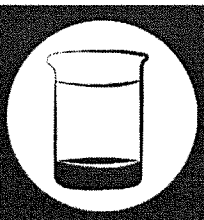
Dose Rates

Accelerator 7



Standard Dosing		
Flow Rate Gallons per day	Initial Dose Once per day for 30 days	Maintenance Dose Once per day
100,000 GPD	1 lb	0.5 lb
500,000 GPD	5 lb	2.5 lb
1 MGD	10 lb	5 lb

Severely Low Nitrogen Dosing	
Flow Rate Gallons per day	Initial Dose Once per day for 30 days
100,000 GPD	1.5 lb
500,000 GPD	8 lb
1 MGD	16 lb

Available Size:

- 50 lb bag

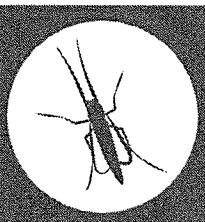
Accelerator 7 Dosing:

- Add directly to aeration basin, once per day
- Pair with OxyFresh for low DO

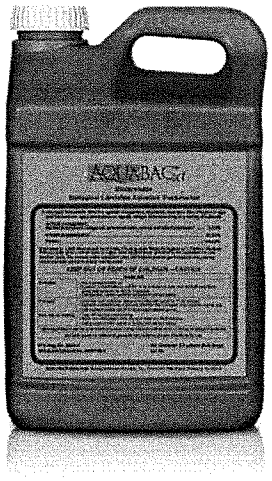
Notes:

AQUABACxt & BugJuice

Eliminates Red Worms and Midge Flies In Wastewater



AQUABACxt



AQUABACxt is a highly effective, US EPA-registered biological larvicide. It contains a species of bacteria called *bacillus thuringiensis* (BT), an approved larvicide for controlling red worms and midge flies in wastewater treatment plants.

Red worms find wastewater plants to be a perfect home. They survive by eating your MLSS, then hatch into midge flies, and the cycle repeats. The active ingredient in AQUABACxt kills the red worms and breaks the cycle.

Common symptoms of red worm infestations include: disappearing MLSS (the red worms are eating it), stringy or clumpy return activated sludge, and nuisance flies that attract pests. AQUABACxt is safe to use and will only kill a very narrow set of target species; larvae of the mosquito, midge flies, and black flies. It will not cause effluent toxicity issues.

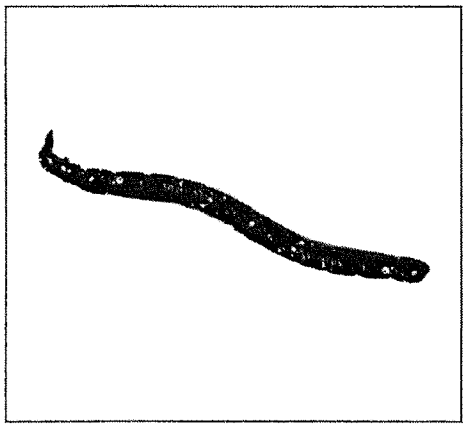
BugJuice

BugJuice degrades the cocoons red worms build around themselves, exposing more red worms to the AQUABACxt treatment. You can often find these cocoons on the walls of clarifier rings, or the sides of basins. This technique increases the effectiveness of AQUABACxt dramatically.

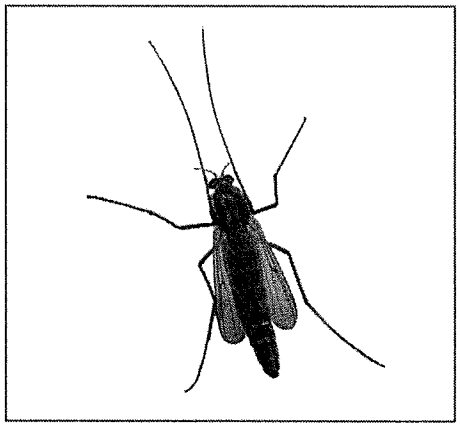
We recommend using BugJuice for the first 20 to 40 days of any treatment. After the initial treatment, an annual or biannual 20 day treatment is helpful for restoring the benefits.

Figure 1:

Isolated midge fly and an isolated red worm



Red Worm



Midge Fly

The Bugman AQUAFIX Inc.

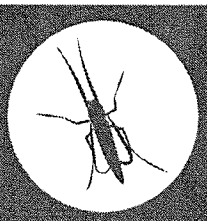
PO Box 8682
Madison, WI
53708-8682

P: 888.757.9577
F: 866.636.1864

info@teamaquafix.com
www.teamaquafix.com

Dose Rates

AQUABACxt & BugJuice



AQUABACxt: Wastewater Plant Dosing

Flow Rate Gallons per day	Super Dose Twice per week for 1-2 weeks	Initial Dose Twice per week for 2 weeks	Maintenance Dose Once per week
10,000 GPD	0.5 pt or 8 oz	4 oz	2 oz
50,000 GPD	1 qt or 2 pt	1 pt	8 oz
100,000 GPD	0.5 gal	1 qt	1 pt
200,000 GPD	1 gal	2 qt	2 pt
300,000 GPD	1.5 gal	3 qt	3 pt
400,000 GPD	2 gal	4 qt	4 pt
500,000 GPD	2.5 gal	5 qt	5 pt
600,000 GPD	3 gal	6 qt	6 pt
700,000 GPD	3.5 gal	7 qt	7 pt
800,000 GPD	4 gal	8 qt	8 pt
900,000 GPD	4.5 gal	9 qt	9 pt
1,000,000 GPD	5 gal	10 qt	10 pt

AQUABACxt: Wastewater Lagoon Dosing

Lagoon Size	Initial Dose Once per week for 4 weeks	Maintenance Dose Once per week
1 Acres	2.5 gal	1 gal
4 Acres	10 gal	4 gal
8 Acres	20 gal	8 gal

BugJuice Dose Rate

Flow Rate Gallons per day	Dose: Add Daily at the head of treatment plant
100,000 GPD	1 pt
200,000 GPD	2 pt
300,000 GPD	3 pt
400,000 GPD	4 pt
500,000 GPD	5 pt
600,000 GPD	6 pt
700,000 GPD	7 pt
800,000 GPD	8 pt
900,000 GPD	9 pt
1,000,000 GPD	10 pt

AQUABACxt:

- Add directly to areas with red worms, often secondary clarifiers and tertiary processes
- Can be metered instead of weekly slug dose, if desired
- Continue to use throughout your climate's active midge fly season

BugJuice:

- Add daily at headworks of plant
- Use for at least the first 20-40 days of any AQUABACxt treatment

Available Sizes:

- 5 gal case
- 135 gal pallet
- 250 gal tote (AQUABACxt)
- 275 gal tote (BugJuice)

Safety Data Sheet

Oxyfresh

Revision Date 9/10/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifiers

Product Name	:	Oxyfresh
Synonyms	:	O2 and odor control
Product Form	:	Liquid

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Odor control in wastewater process

1.3 Details of the supplier of the safety data sheet

Company	:	Aquafix Inc. 2310 Daniels St. Madison WI 53718 USA
Telephone:	:	+1 888-757-9577 Monday-Friday 7:30am-4:00pm CST

1.4 Emergency telephone number

Emergency Phone#	:	Chemtrec +1 800-424-9300

2. HAZARD IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Eye damage/irritation (Category 2A)

Skin corrosion/irritation (Category 3)

2.2 GHS Label elements, including precautionary statements

Pictogram:

Signal Word	:	Warning
Hazard Statement(s)	:	May cause serious eye irritation and skin irritation.

Precautionary Statement(s) : Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Do not eat, drink, or smoke while handling.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

None

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Hazardous Components

Component	Cas-No.	Concentration %	OSHA PEL	ACGIH TLV
Sodium Nitrate	7631-99-4	18-22%	N/A	N/A

Ingredients not precisely identified are proprietary or non-hazardous. Product formulation consists of listed materials, non-hazardous ingredients, and naturally occurring microorganisms.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

This product is considered non-toxic, if concerned consult a physician. Provide general supportive measures and treat symptomatically.

In case of skin contact

Wash exposed area with soap and water. Get medical attention if irritation develops and persists.

In case of eye contact

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists seek medical attention.

If Inhaled

Remove to fresh air.

If Ingested

May cause nausea or diarrhea, drink plenty of water.

4.2 Most important symptoms and effects both acute and delayed

Serious eye irritation.

4.3 Indication of any immediate medical attention and special treatment needed

Seek medical attention if irritation persists.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water, water spray, foam, carbon dioxide (CO2), or dry powder.

Unsuitable extinguishing media

None

5.2 Special hazards arising from the substance or mixture

None

5.3 Special protective equipment for firefighters

No special protective equipment required.

5.4 Further Information

Flash Point (°C) : No data available

Autoignition temperature (°C) : No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions

No special precautions required. Wear adequate personal protective equipment.

6.3 Method and materials for clean up

Maintain good housekeeping practices. Can be washed away with water. No special disposal method required, except that it be in accordance with current local, state/provincial and federal regulations.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Wear personal protection equipment.

7.2 Conditions for safe storage

Risks

Not at risk for corrosion, fire, explosion, or chemical reaction.

Place of storage

Store in a cool, dry space between 50-80°F.

Fire/explosion protection

None needed

7.3 Specific end use

None

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Components with work place parameters

None

8.2 Exposure controls

Engineering controls

Handle in accordance with good industrial hygiene and safety practice.

Personal Protective Equipment

Eye/face protection	:	Protective glasses are recommended
Skin	:	**Hand:** Gloves are recommended
		Other: Wear appropriate clothing for work
Respiratory protection	:	Respirator is recommend if prolonged exposure expected
Thermal protection	:	None
Environmental exposure	:	None

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	:	Light green liquid
Odor	:	Slight eucalyptus odor
Solubility	:	Highly soluble
Boiling point	:	110°C
pH	:	4.0-6.0
Vapor density	:	No data available
Melting point	:	No data available
Vapor pressure	:	No data available
Specific Gravity	:	1.0 @ 25°C

9.2 Other information : None

10. STABILITY AND REACTIVITY

10.1	**Reactivity**	:	None
10.2	**Chemical Stability**	:	Stable
10.3	**Possibility of hazardous reactions**	:	None
10.4	**Conditions to avoid**	:	Strong acids or bases
10.5	**Incompatible materials**	:	Strong acids or bases
10.6	**Hazardous decomposition products**	:	None

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity	:	No known effects
Skin corrosion/irritation	:	Can cause mild skin irritation
Eye damage/irritation	:	Can cause serious eye irritation
Respiratory/skin sensitization	:	No known effects
CMR(Carcinogenity, Mutagenicity, Reproductive toxicity)		No known effects

12.ECOLOGICAL INFORMATION

12.1	**Toxicity**	:	No known information available
12.2	**Persistence and degradability**	:	No known information available
12.3	**Biaacumulative potential**	:	No known information available
12.4	**Mobility in soil**	:	No known information available
12.5	**Results of PBT and vPvB assessment:**		No known ecological information available

13.DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product and packaging can be disposed of in regular trash. No special disposal method required. Follow all applicable local laws for recycling, bagging, and disposal of trash.

14. TRANSPORTATION INFORMATION

14.1	**UN NUMBER**	:	UN1498
14.2	**UN proper shipping name**	:	Sodium Nitrate
14.3	**Transportation hazard class**	:	5.1
14.4	**Packing group**	:	III
14.5	**Environmental hazards**	:	None
14.6	**Special precautions**	:	None
14.7	**Further Information**	:	None

15.REGULATORY INFORMATION

Sara/Title III – CERCLA LIST of Hazardous Substances and Reportable Quantities (40CFR304.4): This product **does not** contain an ingredient(s) listed as a hazardous ingredient for Emergency Release Notification under section 304.

Sara/Title III – List of Extremely Hazardous Substances for Emergency Planning and Notification (40 CFR 300 & 305): This product **does not** contain an ingredient(s) listed as an extremely hazardous substances (EHS) for Emergency Planning under sections 301-303 and for Emergency Release Notification under section 304.

Sara/Title III – List of Toxic Chemicals subject to Release Reporting (Community Right to Know) (40 CFR 372): This product **does not** contain an ingredient(s) listed as a toxic chemical for Annual Release Reporting Requirements under section 313.

16.OTHER INFORMATION

The information in this SDS was obtained from sources which we believe to be reliable. However, the information is provided without any warranty expressed or implied regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself.

This SDS was prepared and is to be used only for this product. No representation, warranty, or guarantee of any kind, express or implied, is made as to its accuracy, reliability or completeness. We assume no responsibility for any loss, damage or expense direct or consequential arising out of use. It is the user's responsibility to satisfy himself as to the suitableness and completeness of such information for his own particular use.

COMMONWEALTH OF VIRGINIA

County of Henrico

Non-Professional Services Contract
Contract No. 2247A

This Non-Professional Contract (this "Contract") entered into this 28th day of December 2021, by Aquafix, Inc. (the "Contractor") and the County of Henrico, Virginia (the "County").

WHEREAS the County has awarded the Contractor this Contract pursuant to Request for Proposals No. 21-2247-11LOC (the "Request for Proposals"), for Annual Contract for Biological Supplements for Wastewater Treatment.

WITNESSETH that the Contractor and the County, in consideration of the mutual covenants, promises and agreements herein contained, agree as follows:

SCOPE OF CONTRACT: The Contractor shall provide the services to the County as set forth in the Contract Documents.

COMPENSATION: The compensation the County will pay to the Contractor under this Contract shall be in accordance with the Price Schedule included as Appendix A.

CONTRACT TERM: The Contract term shall be for a period of one year beginning January 1, 2022 and ending December 31, 2022. The County may renew the Contract for up to 4 one-year terms giving 30 days' written notice before the end of the term unless Contractor has given the County written notice that it does not wish to renew at least 90 days before the end of the term.

CONTRACT DOCUMENTS: This Contract hereby incorporates by reference the documents listed below (the "Contract Documents") which shall control in the following descending order:

1. This Non-Professional Services Contract between the County and Contractor.
2. The General Contract Terms and Conditions included in the Request for Proposals;
3. The Negotiated Modifications (Exhibit A);
4. Contractor's Best and Final Offer dated December 15, 2021 (Exhibit B);
5. Contractor's Original Proposal dated November 24, 2021 (Exhibit C); and
6. The Scope of Services included in the Request for Proposals.

IN WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound hereby.

Aquafix, Inc.
P.O. Box 8682
Madison, WI 53708-8682

Signature

Kevin Ripp
Owner and Director of Science and Innovation

1-18-22
Date

County of Henrico, Virginia
P.O. Box 90775
Henrico, VA 23273-0775

Signature

Oscar Knott, CPP, CPPO, VCO
Purchasing Director

1/19/22
Date

APPROVED AS TO FORM

1/14/22
ASSISTANT COUNTY ATTORNEY