

May 2020

# The Wastewater Insight

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Just when it seems that we've started to get a leg up on this Covid pandemic, other issues are arising in the upcoming aftermaths. Municipal Wastewater Treatment plants are used to flows with typical wastes from households and neighboring "essential" businesses. But with so many extra cleaning and sanitation practices heightened over the past few months, we have seen a change in the flows as well as loading chemical composition.

## Why is my plant having issues with nitrification right now and never did before?

There are tons of households, industrial facilities, hospitals, nursing homes that are using heavier than normal cleaning and sanitation products, which can be loaded with Amines. These will all wind up down the collection systems and into your plant. We have seen some plants that test TKN and their levels have jumped from a normal loading of 20 or 30 up to 60-80. That can seriously impact your nitrification system if you do not have enough time to break down the organic nitrogen first.



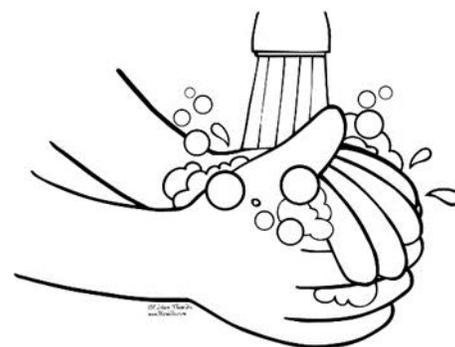
**Amines are a carbon compound with a nitrogen component and are present in many cleaning and sanitation products. Here are some examples of their SDS sheets:**

### Disinfecting wipes

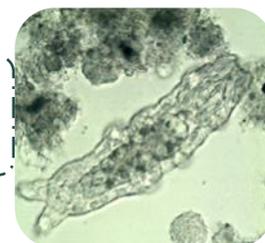
3. Composition/information on ingredients		
Substance/mixture : Mixture		
Ingredient name	%	CAS number
ethanol	1 - 5	64-17-5
D-Glucopyranose, oligomeric, C9-11-alkyl glycosides	0.5 - 1.5	132778-08-6
Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl, chlorides	0.1 - 1	68424-85-1

### Antibacterial hand soap

3. COMPOSITION/INFORMATION ON INGREDIENTS				
Substance				
Not applicable.				
Mixture				
Chemical name	CAS No.	Weight-%	Hazardous Material Information Review Act registry number (HMIRA registry #)	Date HMIRA filed and date exemption granted (if applicable)
Benzalkonium Chloride 0.13% w/w	68391-01-5	0.13	-	-
Water	7732-18-5	50 - 100	-	-
Lauramine Oxide	1643-20-5	0 - 10	-	-
Cocamidopropyl Betaine	61789-40-0	0 - 10	-	-
Lauramidopropylamine Oxide	61792-31-2	0 - 10	-	-
Sodium Chloride	7647-14-5	0 - 10	-	-
Myristamidopropylamine Oxide	67806-10-4	0 - 10	-	-
Glycerin	56-81-5	0 - 10	-	-
Fragrance	FRAGRANCE	0 - 10	-	-
Disteareth-75 IPDI	53533-75-8	0 - 10	-	-
PEG-150 Distearate	9005-08-7	0 - 10	-	-
Citric Acid	77-92-9	0 - 10	-	-
Tetrasodium EDTA	64-02-8	0 - 10	-	-
Benzophenone-4	4065-45-6	0 - 10	-	-
Sodium Benzoate	532-32-1	0 - 10	-	-
Red 33	3567-66-6	0 - 10	-	-
Red 40	25956-17-6	0 - 10	-	-
Yellow 5	1934-21-0	0 - 10	-	-



**Mystery Bug of the month!** Check out our website for more photos of our new mystery bug!!!! [EnvironmentalLeverage.com](http://EnvironmentalLeverage.com)



## Disinfectant spray

### 3. Composition / Information on Ingredients

Ingredient(s)	CAS #	Percent
Ethanol	64-17-5	40 - 60
Butane	106-97-8	2.5 - 10
Propane	74-98-6	1 - 2.5
Alkyl (40% C12, 50% C14, 10% C16) dimethyl benzyl ammonium saccharinate	Not Applicable	0 - 0.1

## Floor cleaner

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### Product AS SOLD

Pure substance/mixture : Mixture

Chemical name	CAS-No.	Concentration (%)
Dodecyldimethylamine oxide	1643-20-5	1 - 5
C10-16 Polyglycoside	110615-47-9	1 - 5
Monoethanolamine	141-43-5	1 - 5



## Bathroom cleaner

Ingredient	C.A.S. No.	% by Wt
1-OCTYL-2-PYRROLIDINONE	2687-94-7	10 - 30 Trade Secret *
WATER	7732-18-5	10 - 30 Trade Secret *
HYDROXYACETIC ACID	79-14-1	10 - 30 Trade Secret *
MALIC ACID	6915-15-7	10 - 30 Trade Secret *
AMINES, COCO ALKYL DIMETHYL, N-OXIDES	61788-90-7	1 - 5 Trade Secret *
ETHOXYLATED C9-11 ALCOHOLS	68439-46-3	1 - 5 Trade Secret *
Fragrance Added	Mixture	0.1 - 1.5 Trade Secret *

## Sanitizer

### SECTION II - COMPOSITION AND INGREDIENTS

Ingredients/Chemical Name: (Actives) Mixture of N-Alkyl (C<sub>12-18</sub>)-N,N-dimethyl -N-benzylammonium chloride and N-Alkyl (C<sub>12-14</sub>)-N,N-dimethyl-N-ethylbenzylammonium chloride

#### Hazardous Ingredients as defined by OSHA, 29 CFR 1910.1200.

Chemical Name	CAS No.	TWA/TLV	Composition Range (%)
N-Alkyl (C <sub>12-18</sub> )-N,N-dimethyl -N-benzylammonium chloride	68391-01-5	None established	7.0
N-Dodecyl-N,N-dimethyl-N-ethyl benzylammonium chloride	27479-28-3	None established	4.7
N-Tetradecyl-N,N-dimethyl-N-ethyl benzylammonium chloride	27479-29-4	None established	2.3
Ethanol	64-17-5	ACGIH TLV: 1000 mg/m <sup>3</sup>	1.0 - 4.0
Water	7732-18-5		Balance



### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### Product AS SOLD

Pure substance/mixture : Mixture

Chemical name	CAS-No.	Concentration (%)
n-alkyl (C14 50%; C12 40%; C16 10%) dimethyl benzyl ammonium chloride	68424-85-1	8.68
Octyl decyl dimethyl ammonium chloride	32426-11-2	6.51
Didecyl Dimethyl Ammonium Chloride	7173-51-5	3.906
Diocetyl dimethyl ammonium chloride	5538-94-3	2.604
ethanol	64-17-5	4.34
Alcohols, C9-11, ethoxylated	68439-46-3	5 - 10
ethylenediamine tetraacetate	64-02-8	1 - 5
disodium metasilicate	6834-92-0	1 - 5

### 3. Composition / Information on Ingredients

Ingredient(s)	CAS #	Percent
Ethanol	64-17-5	2.5 - 10
Alkyl (50%C14, 40%C12, 10%C16) dimethyl benzyl ammonium chlorides	Not Applicable	0.1 - 1

#### How do I test for Amines?

Amines can be an effective surfactant that can act as biocides due to their ability to kill microorganisms. They can enhance the biocidal effect of chlorinated phenolics when they are applied in water. High levels of Amines may be present in the collection systems and influent, especially right now. Industrial plants such as chemical or refineries usually make it a standard practice of measuring amines present in the influent. They take these into account when performing a total nitrogen balance across a system in order to completely assess the efficiency of their nitrification removal process. Municipalities are not used to measuring amines. It is often overlooked and can sometimes be a contributing factor to problems with nitrification and violations of final effluent permits.

The first thing you need to do is to check for the presence of Amines in your influent. The best way would be to check with a 24 hour composite sample. This would ensure finding any Amines that may be present. In some plants, there may be variations on when Amines might come through, not only daily, but weekly or monthly numbers may also change. Again, with the higher demand on cleaning and sanitation procedures right now, Amines can be affecting your plant tremendously. The old standard way of testing is a TKN procedure- total Kjeldahl nitrogen. Samples are digested in sulfuric acid in the presence of a mercuric oxide catalyst. The Kjeldahl nitrogen present is converted to ammonium cation. Potassium sulfate helps speed the conversion to ammonium. There are now easier methods to measure Total Nitrogen- NH<sub>3</sub>, NO<sub>2</sub> and NO<sub>3</sub>. A variety of test procedures and methods are now available for use by wastewater operators. They run the gamut from colorimetric, titrimetric, electrometric (meter & probe), turbimetric and nephelometric through demonstrative methods. Hach has Total Nitrogen Test N Tube reagents that probably can be used with your current COD testing system.



#### How do Amines impact nitrification and total math Nitrogen balance?

Since the nitrification process is very "mathematical" compared to the way that carbonaceous bacteria work, it is easier to do the math with nitrifiers and measure what is going on in the system this way. Here is an example from a customer site: The influent has ammonia levels of 25 ppm and BOD of 300. Theoretically, 15 parts of ammonia will be consumed by the carbonaceous bacteria and 10 ppm will be left for the nitrifiers. But then how is it possible that the ammonia levels in the effluent were coming out at 30 ppm? Are the nitrifiers dead? In this case, there was no measurement of amines in the influent and no measurement of nitrates in the final effluent. There were amines present in the influent after supplementary testing. After measuring TKN on the influent and nitrates and nitrites on the effluent, the missing N was accounted for. Amines can be permit violators to a plant if not properly broken down at the head of the plant.

Amines are generally most effective against bacteria in alkaline pH ranges. They are positively charged and will bond to the negatively charged sites on the bacterial cell wall. These electrostatic bonds will cause the bacteria to die due to stresses in the cell wall. They also cause the normal flow of life-sustaining compounds through the cell wall to stop, by declining its permeability. Ammonia can be removed through nitrification. Carbonaceous bacteria use carbon as a food source. Nitrosomonas and Nitrobacter use carbonate as their food source and the ammonia is just their energy transfer source. They do not "eat" the ammonia. Most of the NH<sub>3</sub>-N is used as an energy source. It is used in a non-assimilative way so only a small amount of biomass (sludge) is produced. Carbon dioxide (CO<sub>2</sub>) or carbonate is used as the carbon source in nitrification. That is why alkalinity is extremely critical in nitrification. 7.14 parts of alkalinity are required for each part of ammonia to be removed.

## How do I break down Amines?

One way to look at an Amine is to see that there is a Nitrogen atom attached. Amines are classified according to the number of carbon atoms bonded directly to the nitrogen atom. In order to have a complete awareness of what is coming into the plant it is important to break down the Amines at the head of the plant. This will help with overall plant efficiency.

Using bioaugmentation MicroBlocks upstream in the collection systems can help break down the amines. A MicroBlock™ is a solid, bacterial laden, slow release block for use in degrading organics. The safe, naturally occurring bacteria are present in high numbers to handle difficult organic problems. A MicroBlock™ is specifically formulated and packaged for use in lift stations, large restaurant grease traps, EQ tanks, portable outhouse, collection tanks & upstream areas from wastewater systems. You can select the environment, organisms and bacteria that are present. Biological products offer a more efficient alternative to chemicals, as they actually degrade the grease and organics at the source. Traditional methods of surfactants, enzymes or chemicals can cause upset conditions at the wastewater treatment plant.



The addition of Bioaugmentation throughout the plant may benefit the system as well. It's always a time and numbers game in wastewater. Time is limited by your equipment hydraulic loading; you can only change the numbers. Using Bioaugmentation can help when you are limited by equipment capabilities. This change in variation of loading and nutrient requirements often makes it difficult to run any wastewater plant. Any time a change is made at a plant of more than 10%, it is significant to the bacteria. Bioaugmentation can help to even out the influent flow and loading changes that may vary daily if not hourly. It might be necessary to overdose a bit closer upstream, or to pH adjust in order to help even out the significant BOD swings. The addition of Bioaugmentation along with some process control adjustments should help in aiding the system to shift to optimized conditions.



Moreover, the addition of Micronutrients MicroClear® M100 will help to supplement a system. Research has shown that inadequate micronutrients can lead to poor settling or high effluent suspended solids due to unhealthy floc. The addition of micronutrients can help in the development of good floc formation by increasing the size as well as the characteristics of the floc structure and can also increase the biological degradation rate in many situations which will allow the biomass to more rapidly respond to sudden increases in loading. Finally, laboratory studies indicate that application of micronutrients can lower final effluent BOD5 levels by maintaining a healthy population capable of more complete organic reduction in a shorter time. Regular application of MicroClear® M-100 can provide numerous benefits to all types of biological waste treatment processes. Daily or weekly application of micronutrients can help with settleability, filamentous control, dewatering ease, less polymer use and better solids control.



Don't forget that some of the chemicals used onsite at the treatment plant may also contain Amines. Not all Safety Data Sheets show the COD or BOD or nitrogen in the chemical formulation. Test all products in your own lab. Polymers, alum, ferric, salts and metals can also cause issues with toxicity, especially to nitrifiers. Test for TOC and TKN. The TOC test will give better results than the COD test. High nitrates interfere with COD testing. Notice the Acrylamide copolymer in the sample MSDS table below, a Nitrogen compound. Most cationic or anionic polymers are ADAM, MADAM or EPI/DMA which contain amine compounds.

**Polymers can not only have high organic loading, but may also have high levels of amines**

### Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Petroleum distillate hydrotreated light	64742-47-8	15 - 40
Adipic acid	124-04-9	1 - 5
POE 6 Tridecyl alcohol	78330-21-9	1 - 5
Acrylamide copolymer	Proprietary	< 50

It does not matter how you test for Amines, just be sure there are no impacts on the calculations and final test results. Make sure that if you are testing influent samples, that you are measuring total influent to the plant, including supernatant from sludge dewatering units or digesters. If they have a different feed point, test these streams separately if necessary, but be sure to include the final measurements in your calculations. These side streams are often overlooked and can also be a contributor to ammonia problems.

If you need help with troubleshooting or testing your samples, Biomass analyses, performing a Total Math balance call our office or check out the additional newsletters we have on each topic on our website or in our Training materials. Let us know if you need help with breaking down amines at your facility with Bioaugmentation products.



MicroClear MicroBlocks can be used upstream in Industrial facilities. This is a GRAS product. It can help break down Grease and Oils, high BOD, lower organic loading to the wastewater treatment plant and reduce odors and biofilm build up in the collections system.

### Hands on Wastewater Training Classes:

**All classes are canceled at this point. We will reschedule only when it is SAFE to do so. However, during this time ELearning can be done from the safety of your own computer! Elearning is a great way to take online courses at your own speed and still get the CEU's and training.**

Our Elearning Website [www.WastewaterElearning.com/elearning](http://www.WastewaterElearning.com/elearning) is loaded with courses have been pre-approved for Wastewater CEU's in Alaska, Arkansas, California, Connecticut, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Louisiana, Kentucky, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New York, North Carolina, Rhode Island, South Dakota, Tennessee, Vermont, Washington, Wisconsin and West Virginia. Some states do not require pre-approval. If you need these approved for your state, please contact our office.

Now approved in Canada for Nova Scotia and Saskatchewan.

These courses are eligible for CEU's, Contact Hours or PDH (Professional development hour) in Alabama, Arizona, Maryland, Virginia, South Carolina, Utah and more to come.



**\*\*Some states give different credits than others. Not all states give credits solely based upon contact hours. Please contact our office if you need to know the approval codes and credit hours for your specific state.**

**Please Be Safe and follow social distancing guidelines! We're in this Together!**



Did you guess what this was? It is a free swimming ciliate. If dominant, this can indicate a young to medium sludge or a recent high BOD loading.

March/April- Free swimming ciliate

Check out our website for more photos of our new mystery bug!!!! [EnvironmentalLeverage.com](http://EnvironmentalLeverage.com)

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