Sample Aerobic Wastewater Report

Site Location

Date

Predominant Organisms Present

Organism	Abundance %	Quantity[1]	Interpretation[2]
Ammonia Oxidizing			
Nitrosococcus	0.01	150	Expected Range Not Available
Denitrification			
Thauera	15.89	238350	Above the Expected Range
Fermentation			
Propionivibrio	0.69	10349	Above the Expected Range
Filamentous			
Acinetobacter	0.01	150	Expected Range Not Available
Caldilinea	0.07	1050	Below the Expected Range
Isosphaera	0.10	1500	Expected Range Not Available
Leucothrix	0.01	150	Expected Range Not Available
Runella	3.58	53700	Expected Range Not Available
Thiothrix	0.01	150	Within the Expected Range
Foaming			
Mycobacterium	0.95	14250	Above the Expected Range
Nitrite Oxidation			
Nitrospira	2.06	30900	Expected Range Not Available
Phosphorus Accumulation			
Dechloromonas	0.34	5100	Within the Expected Range
Rhodocyclus	0.11	1650	Expected Range Not Available
Simultaneous Nitrification Denitrification			
Dechloromonas	0.34	5100	Within the Expected Range
Paracoccus	0.02	300	Expected Range Not Available
Pseudomonas	0.03	450	Below the Expected Range
Sulfur Oxidizing			
Sulfuritalea	0.59	8850	Expected Range Not Available

Organism	Abundance %	Quantity	Interpretation
Thiobacillus	6.52	97800	Expected Range Not Available
Thiorhodospira	1.58	23700	Expected Range Not Available
Sulfur Reducing			
Desulfomicrobium	0.01	150	Expected Range Not Available
Desulfovibrio	0.03	450	Expected Range Not Available
Viscous Bulking			
Thauera	15.89	238350	Above the Expected Range
Zoogloea	0.03	450	Within the Expected Range

Note: Only organisms with abundances greater than 0.01% that are associated with specific functions are presented in this table.

Cause of Filamentous and Viscous Bulking Organisms

Organism	Alternate.Name	Description
Acinetobacter	Type 1863	Associated with high concentrations of fats, oils and grease. Take steps to lower concentrations.
Caldilinea	Type 0803	Associated with a low food-to-microorganism ratio (F:M). Consider reducing the solids concentration in bioreactor.
Isosphaera	Nostocoida limicola III	Associated with high concentrations of organic acids formed by decomposition in anaerobic conditions. Ensure that dissolved oxygen concentrations are sufficient.
Runella		Associated with high concentrations of organic acids formed by decomposition in anaerobic conditions. Ensure that dissolved oxygen concentrations are sufficient.
Thauera		Primarily a denitrifying bacteria, however it has been show to generate slime causing viscous bulking.
Thiothrix	Type 021N	Associated with septicity and high concentrations of organic acids formed by decomposition in anaerobic conditions. Ensure that dissolved oxygen concentrations are sufficient in the bioreactor and upstream processes.
Zoogloea		Associated with slime, suggested to be caused by high food-to-microorganism (F:M), nutrient deficiencies or high sludge loading. Check the F:M ratio and nutrient concentrations for any limitations.

Description of Potential Functional Groups

Functional Groups	Description
Ammonia Oxidizing	This group of organisms is responsible for oxidizing ammonia to nitrite, which is the first step in nitrification. Organisms are aerobic and typically are much slower growing then heterotrophic organisms that consume biochemical oxygen demand. Therefore, ammonia oxidizing organisms typically need long hydraulic residence times and sludge ages.
Anammox	Anammox organisms are capable of converting ammonia and nitrite directly to nitrogen gas for total nitrogen removal. They have very slow growth rates and prefer anoxic environments.
Denitrification	Denitrifying organisms convert nitrate to nitrogen gas in anoxic environments. Denitrification is important for total nitrogen removal. However, because nitrogen gas is produced, it can result in rising sludge in secondary clarifiers thereby reducing clarification efficiency.
Fermentation	Fermentation occurs in in anaerobic environments. Organic matter is broken down to form organic acids such as acetate. Presence of fermenting organisms could mean that there are dead or very low dissolved oxygen zones in the bioreactors. However, it is also possible that they are being carried over from upstream anaerobic processes such as enhanced biological phosphorus removal anaerobic tanks. If there are no upstream anaerobic processes, profile the dissolved oxygen in the bioreactor to ensure sufficient aeration is being provided.

Functional Groups	Description
Filamentous	Filamentous organisms are a normal component of sludge. When under control in low concentrations, they can help with floc formation and settling. However, if concentrations are too high, filamentous sludge bulking can occur in clarifiers resulting in sludge carryover and poor dewatering characteristics. There are various causes of filamentous organisms, refer to the table 'Cause of Filamentous and Viscous Bulking Organisms' to diagnose the operational causes of the organisms relevant to your system.
Foaming	Foam is a common problem for biological wastewater treatment facilities. Foam is associated with many operational problems include instrumentation fouling and reduced treatment capacity due to sequestering of active biomass within the foam layer. Foam forming organisms have hydrophobic surfaces which make them easier floatable. One control strategy is to reduce fat, oil and grease (FOG) concentrations in the plant, as they are the preferred substrate for foam forming organisms.
Glycogen Accumulation	Glycogen accumulating organisms have been found to reduce the performance of enhanced biological phosphorus removal systems. They compete with phosphorus accumulating organisms for volatile fatty acids in the anaerobic zone. Volatile fatty acids are typically the limiting substrate in enhanced biological phosphorus removal system. The operation controls that lead to the proliferation of glycogen accumulating organisms over phosphorus accumulating organisms is not well understood.
Nitrite Oxidation	This group of organisms is responsible for oxidizing nitrite to nitrate, which is the second step in nitrification. Nitrification is typically limited by ammonia oxidation not nitrite oxidation. If you are trying to achieve anammox, nitrite oxidation needs to be limited however process controls to limit growth are not well understood.
Phosphorus Accumulation	Phosphorus accumulating organisms are capable of accumulating and storing phosphorus as polyphosphate. Phosphorus accumulating organisms have an affinity for utilizing volatile fatty acids for growth under anaerobic conditions. Therefore, their abundance can be increased by having an anaerobic zone or tank before the aerated bioreactor.
Simultaneous Nitrification Denitrification	Simultaneous nitrification denitrification organisms are capable performing aerobic heterotrophic nitrification utilizing organic carbon. They can also perform denitrification under anoxic and potential aerobic environments.
Sulfur Reducing	Sulfur-reducing organism, also known as sulphate-reducing bacteria or SRB, are problematic for wastewater treatment plants due to their role in hydrogen sulfide and odour formation and microbial induced corrosion. They prefer anaerobic environments therefore if there is a high abundance or if odour issues are noticed ensure that dissolved oxygen concentrations are sufficient.
Sulfur Oxidizing	Sulfur oxidizing organisms oxidize reduced sulfur compounds, such as sulfide, thiosulfate or elemental sulfur, and produce sulfate. These organisms have both beneficial and inhibitory outcomes. They can reduce hydrogen sulfide production by decreasing precursor compounds (ie. reduced sulfur compounds). However, they form sulfate which is acidic and can contribute to microbial induced corrosion.
Viscous Bulking	Viscous bulking occurs when organism produce excessive quantities of extracellular polymeric substance (EPS) which acts like a sponge and retains water. The result is a gelatinous sludge that has poor settling and dewatering characteristics. There are various causes of viscous bulking organisms, refer to the table 'Cause of Filamentous and Viscous Bulking Organisms' to diagnose the operational causes of the organisms relevant to your system.

[1] Quantity is calculated as the relative abundance multiplied by a total prokaryote qPCR assay.

[2] Interpretations are based on the MiDAS Field Guide. MiDAS is a central resource for information about the microbes in the engineered ecosystem of activated sludge and similar wastewater treatment systems, such as biofilms, granules and membrane-bioreactors. The resource is managed by Center for Microbial Communities, Aalborg University.Interpretation guidelines. The expected range falls between the 10^{th} and 90^{th} percentile.

NOTE: These interpretation guidelines provided in this report are designed for generic risk management guidance only. LuminUltra and its affiliates do not accept any liability for any decision or assessment taken or made as a consequence of using this report.