

For Earth Bio

Aussie case study in bio-augmentation

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This project centred on a series of trials (For Earth Bio) to enhance nitrification and denitrification at the Greenwith Waste Water Treatment Plant (WWTP) in Adelaide and seek approval from South Australia Water in relation to trade waste discharges.

Sponsored by the City of Tea Tree Gully (CTTG) in Adelaide, South Australia the project involved three trial sites: Amanda Dr Redwood Park; Riverside Dr Redwood Park; and Greenwith WWTP. It started in March this year and was performed over a three-month period.

The Greenwith WWTP was commissioned in 2011 and handed over to the local council to operate. The WWTP influent is sourced from two sewage pumps stations owned by South Australia Water. This is commonly referred as 'sewer mining' where the council is taking raw sewage from the sewer pump stations, treating to reuse level and irrigating on council sports fields and reserves instead of using potable water.

The WWTP uses a Sequence Batch Reactor (SBR) process with the following processes: raw influent screening, primary aeration, secondary aeration tank, holding tank, sand filtration, ultra-filtration membrane, UV disinfection and chlorine disinfection. Designed flow 1.2M/day.

Key issues

The WWTP was experiencing the following treatment issues: moderate risk of septicity issues at the pump stations potentially leading to corrosive material and odours; high risk of poor denitrification resulting in elevated levels of nitrogen in the Class feed water reducing the effectiveness and efficiency of chlorination; and moderate to high risk of high levels of organics in the effluent, leading to high colour and reducing the efficiency of UV disinfection.

Trial of additive

For Earth Bio is a liquid bacteria product that contains nitrifying and denitrifying bacteria. The product is being successfully used in the states of NSW and Victoria at treatment plants and pond systems to improve treatment results in the following parameters, BOD, ammonia and nitrates.

Jar testing

Prior to dosing the WWTP with For Earth Bio, four jar tests were performed. Four 600mL composites were created from sewer pump station on December 21 2016 and January 4 2017, and were characterised before and after 24 hours of the addition of 0.25ml For Earth Bio additive during which time the composites were aerated.

After 24 hours the composites showed an mean average reduction in NH₃ (Ammonia) by 98.5 percent, and total nitrogen by 53 percent.

Jar test results

Pre addition of For Earth Bio

	1	2	3	4	Mean Composite Value
NO ₃	33.3	34.1	43.6	32.8	35.95
NH ₃	1.99	2.13	0.95	1.92	1.7475
Total N	81	67.8	97.3	91.1	84.3
pH	6.36	6.36	6.38	6.33	6.3575

Post treatment 24 hours after addition of For Earth Bio

	1	2	3	4	Mean Composite Value
NO ₃	5.8	24.4	35.1	10.4	23.925
ΔNO ₃	7.5	9.7	8.5	22.4	12.025
%ΔNO ₃	22.5%	28.4%	19.5%	68.3%	Nitrate 34.7%
NH ₃	0.018	0.009	0.025	0.039	0.02275
ΔNH ₃	1.972	2.121	0.925	1.881	1.7247w5
%ΔNH ₃	99.1%	99.6%	97.4%	98.0%	Ammonia 98.5%
Total N	43	27	35	54	39.75
ΔTotal N	38	40.8	62.3	37.1	44.55
%ΔTotal N	46.9%	60.2%	64.0%	40.7%	Total N 53.0%
pH	7.23	7.47	7.52	7.51	7.4325
ΔpH	-0.87	-1.11	-1.14	-1.18	1.075
%ΔpH	-13.7%	-17.5%	-17.9%	-18.6%	pH -16.9%

Bio-augmentation trial of WWTP

After the review of the jar testing a three-month trial commenced at the WWTP.

For Earth Bio dosing at sewer pump stations

A five-litre initial dosage was added to the Primary Tank at the WWTP, also a dilution of 1:20 of For Earth Bio with tap water was slowly dripped into both Amanda and Riverside pump stations, every day from Monday to Friday for three months.

Monitoring results

Samples were taken at SP3 (inlet to the treatment plant), SP7 (Primary Tank to Secondary Tank) and SP11 (decant to Balance Tank) every day to monitor the quality of the effluent. The parameters being monitored: Ammonia, Total Nitrogen, Total Phosphorous, Nitrite, Nitrate, pH and EC etc.



Swan Analytical NZ arrives

Swan Analytical New Zealand has been recently set up to improve distribution and support its services from Switzerland for generation, municipal, wastewater, recycling, pharmaceutical, food and beverage and other markets

The New Zealand country manager, Muhammad (Mak) Kahn, pictured, will be making his debut at Water New Zealand's conference in Hamilton this month.

WWTP pre-treatment results at sample points prior to dosing trial

Sp3	NH ₃	Total N	TSS
Max	8.9	83.1	160.0
Min	0.02	22.7	40.0
Average	3.1	52.8	100.6

Sp7	NH ₃	Total N	NO ₃	NO ₂	MLSS
Max	13.2	124.0	234.6	19.0	3210.0
Min	0.8	42.4	3.8	0.2	2100.0
Average	3.2	65.3	74.5	3.3	2727.9

Sp11	NH ₃	Total N	NO ₃	NO ₂	TSS
Max	8.9	125.0	261.2	19.0	20.0
Min	0.02	37.0	0.18	0.2	3.1
Average	2.6	63.6	59.2	3.2	12.3

WWTP trial results

The bio-augmentation of the plant with For Earth Bio treatment results over the three-month period were very similar to our jar testing with a significant drop of ammonia at SP3, SP7 and SP11, which helped us reduce the usage of chlorine at the tertiary treatment. Both Total Nitrogen and Total Phosphorous have a noticeable decrease as well, pH is more neutral at SP3, and it is less acidic throughout the class B treatment.

SA Water's trade waste staff also performed four water quality testings at the discharge point from the plant back to their sewer network and the results have shown there to be no impact to their sewer network. An approval was then granted to City of Tea Tree Gully for the use of For Earth Bio at the WWTP.

Conclusion

The water quality results have shown that dosing For Earth Bio into our WWTP has an advantage in pre-treatment water quality, hence, reducing the use of chemicals for pH correction as well as disinfection.

A significant operational advantage of dosing For Earth Bio is that it enables BOD reduction without increasing aeration systems or process. Bio augmentation with For Earth Bio achieves BOD (NH₃) reductions without an increase in energy for aeration and no additional capital expenditure required. **WNZ**