

BiOWiSH® Aqua

Industrial Wastewater Treatment at Eastern Seaboard Industrial Estate, Thailand

Background

Eastern Seaboard Industrial Estate (ESIE) is located in Rayong province on the eastern seaboard of Thailand. ESIE is a mixed heavy duty industrial park. Industries represented include automotive, fabrication, plastics & polymers, electronics, packaging & consumer, building materials and logistics. The site covers 3,451 ac. and there are currently over 214 companies and 25,000 employees who live and work on the estate.

Waste water on the ESIE is treated in a series of purpose built oxidation ponds which discharge into a constructed wetland area. The plant has been in operation for 7 years and had an original design capacity of 2.1 million gallons (8,000 kl) per day. Future growth of the estate requires the plant to reach a capacity of 2.6 million gallons (10,000 kl) per day. Estimated capital expenditure for plant expansion is 30,000,000 Thai Baht (approx USD 882,000). Current daily influent to the plant is approximately 1.1 million gallons (4,500 kl.)

Challenges

It is estimated that 1.7 million gallons (6,760 kl) of sludge has accumulated in the first oxidation pond which has reduced the effective capacity of the plant to approximately 792,000 gals (3,000 kl) per day. The cost of removing and disposing of the accumulated sludge was estimated at 3,920,800 Thai Baht (approx USD 114,966).

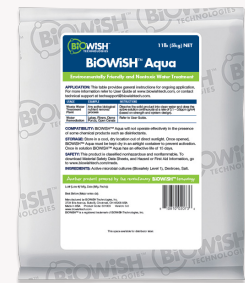


BiOWiSH® Aqua Application

Prior to the application of BiOWiSH® Aqua, the owners of the plant conducted a small scale trial to demonstrate the capability of BiOWiSH® Aqua in digesting sludge without creating excessive odor.

In this small scale trial, BiOWiSH® Aqua reduced ammonia and sulfide levels by more than 50%. The sludge digestion rate was up to 20% when compared to the thickness of the sludge prior to treatment.

BiOWiSH® Aqua



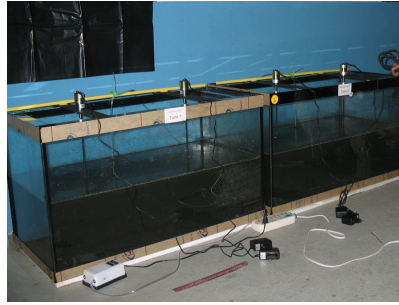
- Rapid nitrification and denitrification in aerobic and anaerobic conditions
- Reduces sludge production
- Increases plant treatment capacity
- Reduces odors
- Reduces aeration requirements
- Reduces need for chemical additives
- Improves plant stability
- Pre-treats influent in collection systems
- Natural and non-toxic

Available Sizes

- 100g/3.5oz
- 1kg/2.2lbs
- 5kg/11lbs
- 10kg/22lbs



BiOWiSH® Aqua Solution



Prior to Application



After Treatment

Dosing

Before dosing of BiOWiSH® Aqua into the plant, there was no aerating machine operating in aeration pond #1. Aeration pond #1 was used as the equalization pond. Organic, TSS and residue were treated by plants growing in the purpose built pond, and polish pond.

Surface aerators were installed in aeration pond #1 to assist with the digestion of the accumulated sludge, and to provide enhanced biological treatment conditions. During the initial run period, BiOWiSH® Aqua was sprayed from a water cart vehicle to suppress odors that were being emitted. Following 48 hours of dosing, the level of perceptible odor was negligible.

BiOWiSH® Aqua was dosed into the plant during the 90 day period. The dosages were based on a daily flow of 924,602 gals (3,500 kl):

Day 1:	4 mg/L	14 kg	30 lb
Day 2:	2 mg/L	7 kg	15 lb
Day 3 - 90:	1 mg/L	3.5 kg	7.7 lb

Dosing Equipment

- 2 x 660 gal (2,500 L) tanks
- Submersible pumps discharging above water line for circulation and aeration
- Gravity feed dosing as shown below



Dosing Tanks



Float Valve Inside Dosing Tanks



BiOWiSH® Application



Actual Dosing

Water Clarity

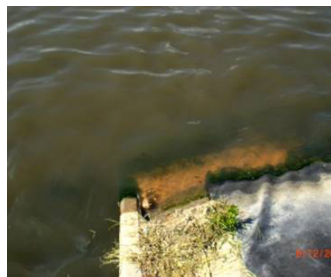
Water samples were taken throughout the 90 day dosing period and were sent to a laboratory for analysis. The below photos clearly show the significant improvement in water clarity.



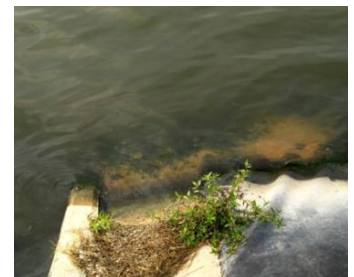
AL1 Effluent Day 1



AL1 Effluent Day 7



AL1 Effluent Day 30

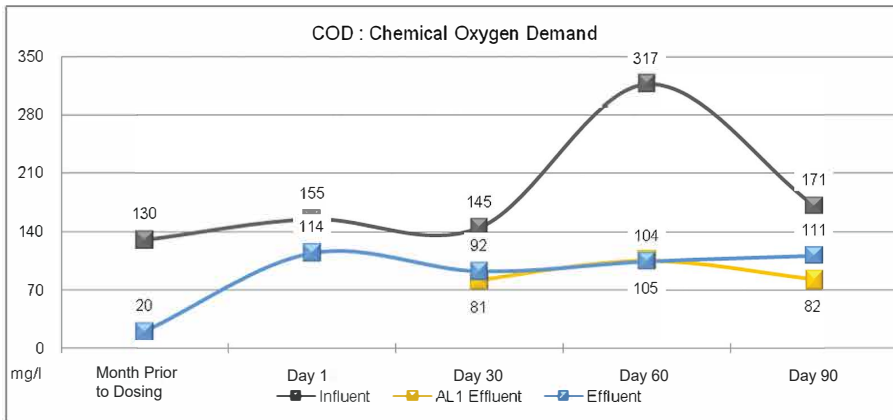


AL1 Effluent Day 90

In digesting the sludge biologically, the operators of the plant were concerned that excessive nutrient was not simply being transferred into latter lagoons. The following graphs show the relative efficiency of removal of the plant following the commencement of dosing.

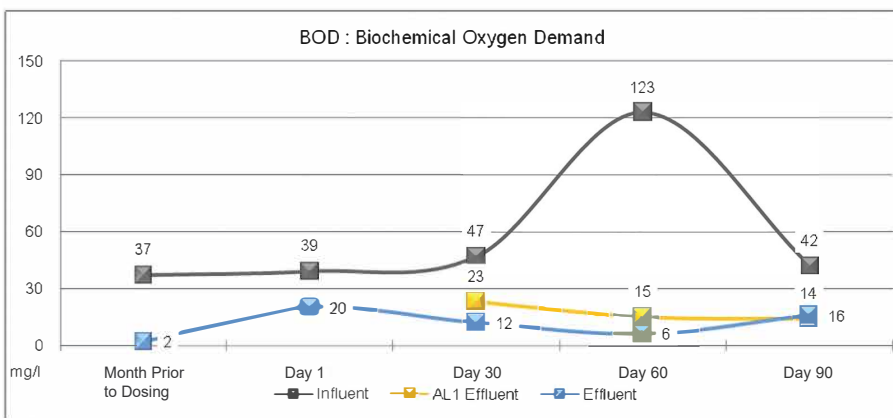
Chemical Oxygen Demand (COD)

COD removal efficiency was 44.14% on day 30, 66.88% on day 60, and 52.05% on day 90.



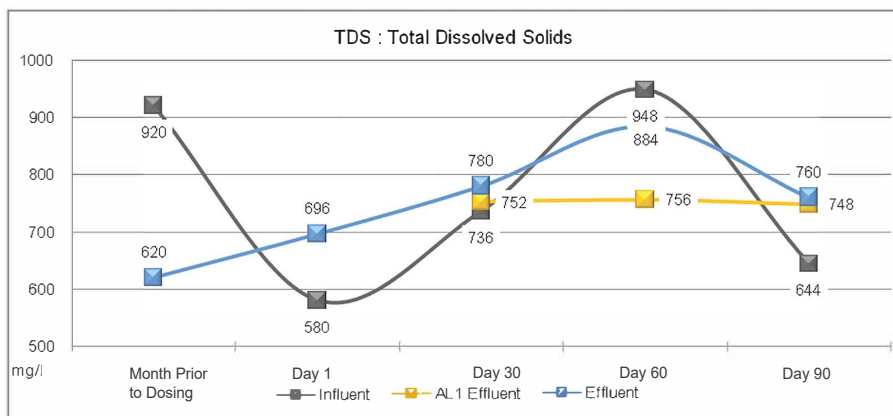
Biological Oxygen Demand (BOD)

BOD removal efficiency was 51.06% on day 30, 87.50% on day 60 and 66.67% on day 90.



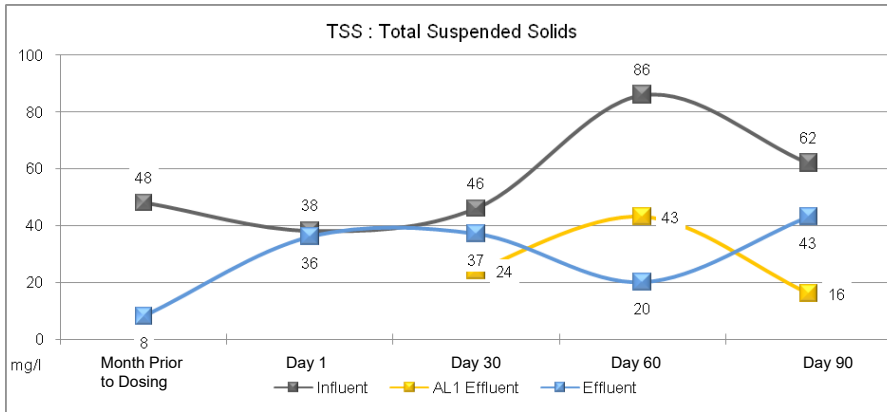
Total Dissolved Solids (TDS)

TDS influent into the plant is highly variable. Effluent figures reflect this and also demonstrate the impact of rapid sludge digestion activity.



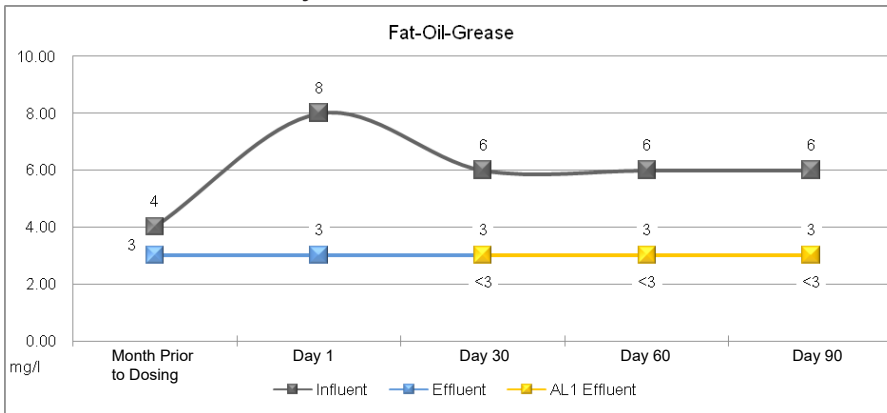
Total Suspended Solids (TSS)

TSS decreased by 47.83% on day 30, 8.50% on day 60, and 74.19% on day 90.



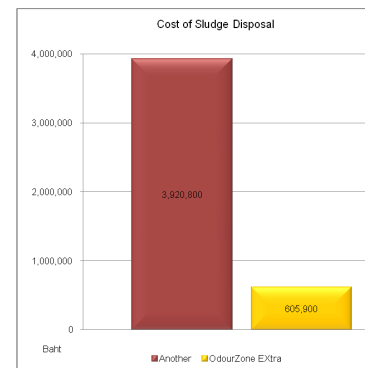
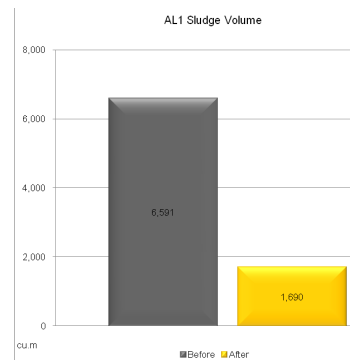
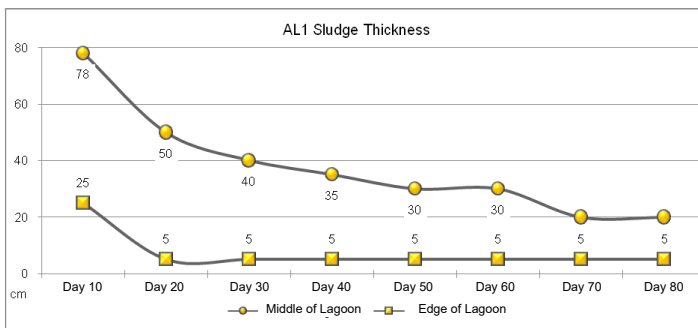
Fats, Oils & Greases (FOGS)

FOGs were eliminated by 50%.



Sludge Thickness

Sludge thickness in the middle of the pond measured 78 cm (6,591 kl) on day 10. On day 80 it measured 20 cm (1,690 kl). In total, BiOWiSH® Aqua decreased sludge by 58 cm (4,901 kl) or by 74.36%.



For a full history of the results, please refer to the table on last page of this report.

Summary

The use of BiOWiSH® Aqua at ESIE has led to a significant reduction in sludge by up to 75%. This remarkable result can be attributed to the high speed action of BiOWiSH® in the digestion of organic waste matter into its final inert compounds. BiOWiSH® is truly ground breaking as it completely eliminates the dependency of waste water treatment plants on a large volume of biomass in the removal of nutrients, solids, and contaminants from the waste water.

Furthermore, there is also the benefit of increased plant capacity for ESIE due to the substantial elimination of accumulated sludge. This result has cost benefit implications for the entire wastewater treatment industry. In the case of ESIE alone, additional capital expenditure amounting to 30 million Baht (USD 882,000) has been avoided.

The use of BiOWiSH® Aqua has reduced the cost of sludge removal by 3,314,900 Thai Baht (84.5%). Biological digestion of the sludge also ensured that ESIE avoided the environmental issues typically associated with mechanical excavation.

About BiOWiSH® Aqua

The result of over 18 years of research and development, BiOWiSH® is a powerful blend of biocatalysts that breaks down complex organic molecules to help eliminate waste, reduce odors, improve soil fertility, and enhance water quality, among other uses. 100% natural, and non-toxic, BiOWiSH® is safe for everyday use in a wide range of consumer, and industrial products. It has been proven to solve problems in environmental management (including wastewater, solid waste, soil, and water remediation and industrial emissions), as well as agriculture. BiOWiSH® products are used extensively and available in Asia, Australia, Europe, North America and Latin America.

Developed specially for the Wastewater Treatment industry, BiOWiSH® Aqua accelerates the biological removal of nutrients, pathogens, suspended solids, and other contaminants from wastewater.

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BiOWiSH® is a registered trademark of BiOWiSH Technologies International, Inc.

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Data Table

Date	Parameter	Hydrogen Sulfide	Ammonia Nitrogen	BOD ₅	COD	FOG	pH	Total Dissolved Solids	Total Suspended Solids	Total Nitrogen	TKN	Nitrate	Total Phosphorus
02/10/08	WWTP Influent		17.1	37	130	4	7.5	920	48	20.8	15.6	4.3	3.9
14/10/08	WWTP Effluent *			2	20	3	7.6	620	8				
03/11/08	WWTP Influent			39	155	8	7.6	580	38				
03/11/08	WWTP Effluent *			20	114	3	7.5	696	36				
01/12/08	WWTP Influent			47	145	6	7.6	736	46				
09/12/08	AL1 Effluent	<0.5	20.5	23	81	<3	8	752	24	28.6			2.3
01/12/08	WWTP Effluent **			12	92	3	7.6	780	37				
06/01/09	WWTP Influent			123	317	6	7.4	948	86				
13/01/09	AL1 Effluent	<0.5	17.5	15	105	<3	7.8	756	43	31.7	28.1		3.5
06/01/09	WWTP Effluent **			6	104	3	7.9	884	20				
03/02/09	WWTP Influent			42	171	6	7.8	644	62				
03/02/09	AL1 Effluent	<0.5	19.3	14	82	<3	7.8	748	16	29.5	28	0.9	2.6
13/02/09	WWTP Effluent **			16	11	3	8.3	760	43				
Dec 2008	AL1 Efficiency			51.06	44.14	50.00							47.83
Jan 2009	AL1 Efficiency			87.80	66.88	50.00							50.00
Feb 2009	AL1 Efficiency			66.67	52.05	50.00							74.19

* via constructed wetland

** bypass to polishing pond