



Interim Report

AquaBioSolution® Treatment for IWK STP

Duration: 1st June 2022 until 31st August 2022
Alternative solution to reduce electricity, cost of maintenance and operation of sewage treatment plant through reduction in aeration pump usage.

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INTRODUCTION

1.0 Introduction

- The implementation of this project is to reduce electricity consumption and cost of Sewage Treatment Plant (STP) in all Indah Water Konsortium STP station across Malaysia and achieve the permitted water quality level set by the Department of Environment (DOE).

2.0 Objective

- To reduce operational time of aeration system by 80% per month and comply with DOE standards.
- To maintain compliance of Final Effluents after 80% reduction of operational aeration system.
- To reduce both electricity and maintenance operation cost (i.e desludging, replacement of spare parts) of Indah Water Konsortium Sdn. Bhd.

Notes:

1. Lab observation by NUAIM CORP (M) SDN BHD will only be done on pre-treatment and after treatment during 3 months of Proof of Concept (POC) period. After 3 months, all lab testing shall be conducted by IWK as per normal practices.
2. Observation and progress report will be submitted to IWK once a month.

METHODOLOGY

3.0 Methodology

3.1 Sampling Point

- Sampling were taken on the 1st of June 2022 before dosing took place between 9:00am – 1:00pm.
- Final Discharge (FD) were the chosen location of sampling for each STPs.
- All samples were sent to a certified lab (Malayan Testing Laboratory Sdn. Bhd.).

3.2 Dosing of Sewage Treatment Plant

- Dosing will be conducted by applying AQUABIOSOLUTION® into aeration tank (mainly near sewerage inlet point).
- Scheduled period of dosing every 2-3 days from 8:00am to 12:30pm in all 19 STPs.

Percentage Reduction of Aeration Pump Schedule

No	Date	Pump Reduction (%)	Pump Capacity (%)
1	09/7/2022	20	80
2	16/7/2022	40	60
3	23/7/2022	60	40
4	30/7/2022	80	20

Notes:

1. Aeration pump of all 19 STPs ran at 20% capacity throughout the month of August.

List of 19 Pulau Pinang STPs Treated By Nuaim Corp Via Enhanced Phycoremediation & Bioremediation

No	Asset Code	Location
1	PEG 008	Taman Idaman
2	PEG 015	Taman Greenfield
3	PEG 024	Taman Ferry Height
4	PEG 052	Uda Flats
5	PEG 060	Persiaran Nipah
6	PEG 064	Lrg Zoo 7
7	PEG 067	Tkt Titi Teras
8	PEG 117	Jln Hill Railway
9	PEG 132	Marina Tower
10	PEG 136	Taman Sri Indah
11	PEG 137	Villa Ria
12	PEG 145	Taman Desa May
13	PEG 151	Taman Desa Mesra
14	PEG 163	Taman Relau Intan
15	SPI 281	Taman Remia
16	SPI 404	Taman Iks Bukit Tengah
17	SPI 262	Taman Bukit Minyak
18	SPI 239	Kws Industri Ringan Juru
19	SPI 162	Taman Harapan

Dosing Schedule for 19 STPs Pulau Pinang

June	July	August
1/6/22	3/7/22	3/8/22
4/6/22	6/7/22	6/8/22
6/6/22	9/7/22	9/8/22
9/6/22	13/7/22	11/8/22
12/6/22	16/7/22	13/8/22
15/6/22	19/7/22	15/8/22
18/6/22	22/7/22	17/8/22
21/6/22	25/7/22	19/8/22
24/6/22	28/7/22	21/8/22
27/6/22	31/7/22	23/8/22
30/6/22		25/8/22
		27/8/22
		29/8/22
		31/8/22

Aeration & Clarifier Tank (PEG 008 – TAMAN IDAMAN)

Before



After



Before



After



Conclusion (PEG 008 – TAMAN IDAMAN)

Before Treatment:

- Floating solids can be seen on surfaces of Aeration Tank.
- Foul odour.
- Activated sludge remained still on floor of Clarifier Tank.
- Aeration pump ran a total of 15 hours daily.

After 3 Months of Treatment:

- Significant reduction in floating solids on Aeration Tank.
- No foul odour.
- Surfaces of Aeration Tank highly reflective.
- Activated sludge was successfully disintegrated via microbial activities, releasing trapped nutrient.
- Aeration pump was reduced to 3 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful.

Aeration & Clarifier Tank (PEG 015 – TAMAN GREENFIELD)

Before



After



Before



After



Conclusion (PEG 015 – TAMAN GREENFIELD)

Before Treatment:

- Condition of Aeration Tank clear of floating solids.
- Clarifier Tank contains small amount of floating solids with dark water surface colour.
- Activated sludge remained still on floor of Clarifier Tank.
- Aeration pump ran a total of 20 hours daily.

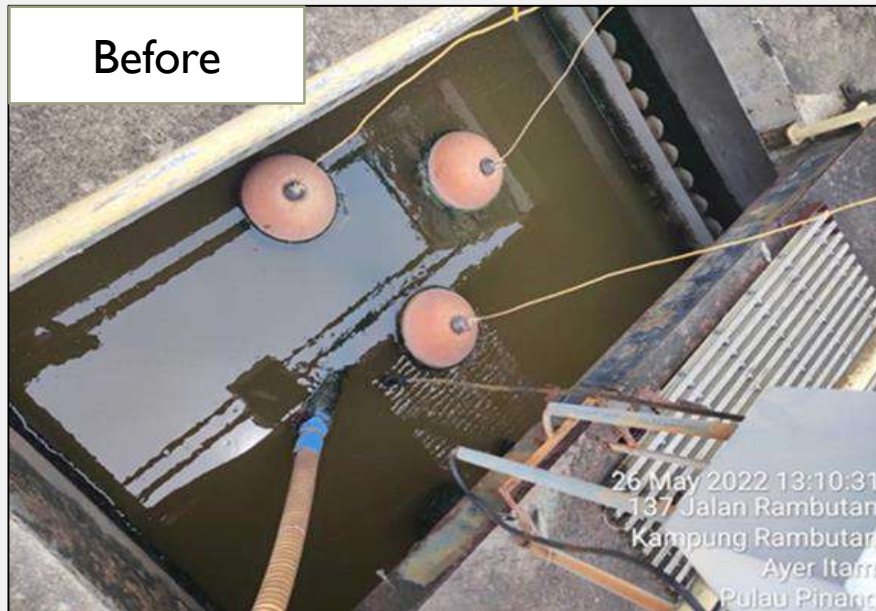
After 3 Months of Treatment:

- Surface colour of Aeration Tank becomes brighter as compared to 3 months prior.
- Absence of foul odour was maintained.
- Surfaces of both Aeration & Clarifier Tank becomes highly reflective.
- Aeration pump was reduced to 4 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 024 – TAMAN FAIRY HEIGHT)



Conclusion (PEG 024 – TAMAN FAIRY HEIGHT)

Before Treatment:

- Surface of Aeration Tank was covered with green algae film.
- Pungent odour at Aeration Tank.
- Aeration pump ran a total of 15 hours daily.

After 3 Months of Treatment:

- Green algae film on Aeration Tank was successfully eliminated, providing a clear surface appearance.
- Pungent odour was eliminated.
- Aeration pump was reduced to 3 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 052 – UDA FLATS)

Before



After



Before



After



Conclusion (PEG 052 – UDA FLATS)

Before Treatment:

- No foul odour at Aeration Tank
- Aeration & Clarifier Tank water colour slightly dark.
- Aeration pump ran a total of 16 hours daily.

After 3 Months of Treatment:

- Surface colour of Aeration & Clarifier Tank becomes brighter as compared to 3 months prior.
- Absence of foul odour was maintained.
- Aeration pump was reduced to 3.2 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful.

Aeration & Clarifier Tank (PEG 060 – PERSIARAN NIPAH)

Day 6



After



Before



After



Conclusion (PEG 060 – PERSIARAN NIPAH)

Before Treatment:

- Colour of Aeration Tank is dark brown.
- No foul odour was detected.
- Aeration pump ran a total of 16 hours daily.

After 3 Months of Treatment:

- Aeration Tank water surface condition becomes brighter after 3 months of enhance phycoremediation & bioremediation treatment.
- Absence of foul odour was maintained.
- Surfaces of both Aeration becomes highly reflective.
- Aeration pump was reduced to 3.2 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 064 – LORONG ZOO 7)

Before



After



Before



After



Conclusion (PEG 064 – LORONG ZOO 7)

Before Treatment:

- Colour of Aeration Tank is dark brown.
- No foul odour was recorded.
- Aeration pump ran a total of 15 hours daily.

After 3 Months of Treatment:

- Aeration Tank water colour becomes brighter after 3 months of treatment.
- Absence of foul odour was maintained.
- Activated sludge was successfully disintegrated via microbial activities, releasing trapped nutrient & sludges, causing sludges to rise on surface of tank.
- Aeration pump was reduced to 3 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 067 – TKT. TITI TERAS, BALIK PULAU)

Before



After



Before



After



Conclusion (PEG 067 – TKT. TITI TERAS, BALIK PULAU)

Before Treatment:

- Colour of Aeration Tank is dark brown.
- Slightly pungent odour was detected near Aeration Tank.
- Clarity of Aeration Tank is low.
- Aeration pump ran a total of 12 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank becomes brighter with a significant increase in reflectivity of water surface, indicating increase in population of Diatom contained in Aeration Tank.
- Activated sludge in Clarifier Tank was successfully disintegrated via microbial activities, releasing trapped nutrient & sludges, causing sludges to float on surface of tank.
- Aeration pump was reduced to 2.4 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 117 – TAMAN LINTANG / PENHILL)

Before



After



Before



After



Conclusion (PEG 117 – TAMAN LINTANG / PENHILL)

Before Treatment:

- Colour of Aeration Tank was dark brownish-yellow with small amount of floating solids on surface of water.
- Colour of Clarifier Tank was dark brown with some floating sludges on surface of tank.
- No foul odour was detected at Aeration Tank.
- Aeration pump ran a total of 20 hours daily.

After 3 Months of Treatment:

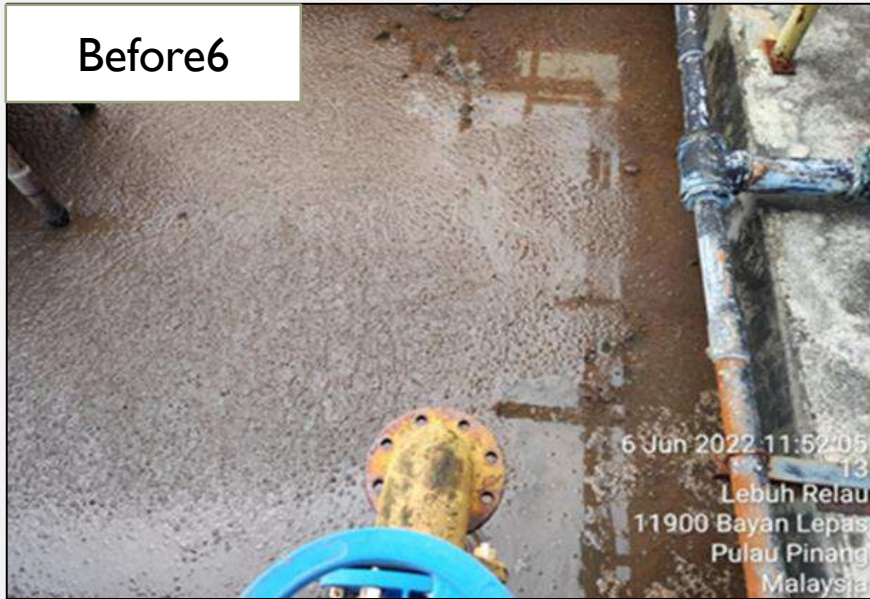
- Colour of both Aeration & Clarifier Tank becomes brighter brown as compared to pre-treatment condition.
- Absence of foul odour was maintained.
- Activated sludge in Clarifier Tank was successfully disintegrated via microbial activities, releasing trapped nutrient & sludges, causing a slight increase of sludges to float on surface of tank.
- Aeration pump was reduced to 4 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 132 – MARINA TOWER)

Before6



After



Before



After



Conclusion (PEG 132 – MARINA TOWER)

Before Treatment:

- Colour of Aeration Tank was bright brown with thick semi-hard layer of floating sludge covering surface of Aeration Tank.
- Slight foul odour was recorded at Aeration Tank.
- Thin fatty-brown film was observed on the surface of Clarifier Tank.
- Aeration pump ran a total of 14 hours daily.

After 3 Months of Treatment:

- Thick semi-hard layer of floating sludge was able to be broken down into a more liquid form after 3 months of treatment.
- Foul odour was able to be eliminated and maintained.
- Layers of floating sludge can be observed at Clarifier Tank due to activated sludge being disintegrated and released to surface of tank.
- Aeration pump was reduced to 2.8 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 137 – VILLA RIA)

Before



After



Before



After



Conclusion (PEG 137 – VILLA RIA)

Before Treatment:

- Colour of Aeration Tank was light brown-yellowish colour with no visible floating solids.
- Minimal pungent odour near Aeration Tank.
- Aeration pump ran a total of 15 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to a light brown-greyish colour.
- Absence of foul odour was maintained.
- Surface of Aeration Tank has become more reflective than pre-treatment conditions.
- Blooming of Duck Weed in Clarifier Tank was due to the release of trapped nutrients as a result of disintegration of activated sludge at the bottom of tank.
- Aeration pump was reduced to 3 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 145 – TAMAN DESA MAY)

Before



After



Before



After



Conclusion (PEG 145 – TAMAN DESA MAY)

Before Treatment:

- Colour of Aeration Tank was dark brown with floating solids seen on the surface.
- No foul odour was reported at Aeration Tank.
- Thick hard layer of sludges can be seen on the surface of Clarifier Tank.
- Aeration pump ran a total of 20 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to light brownish colour with a reflective surface.
- No foul odour was reported after 3 months of treatment.
- Thick hard layer of sludges from pre-treatment condition was able to be disintegrated and reduced to a clump-size floating sludges and increase in water visibility.
- Aeration pump was reduced to 4 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 151 – TAMAN DESA MESRA)



Conclusion (PEG 151 – TAMAN DESA MESRA)

Before Treatment:

- Colour of Aeration Tank was brownish colour.
- Minimal foul odour was reported at Aeration Tank.
- Significant amount of green algae film can be seen at Clarifier Tank.
- Aeration pump ran a total of 15 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank becomes brown, slightly greenish colour.
- Foul odour was successfully eliminated after 3 months of treatment.
- Green algae film bloomed on Day 60 due to the released of trapped nutrients from floor of tank, however on After, film of Green algae reduces slightly after excess nutrients has been consumed.
- Aeration pump was reduced to 3 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 163 – TAMAN RELAU INTAN)

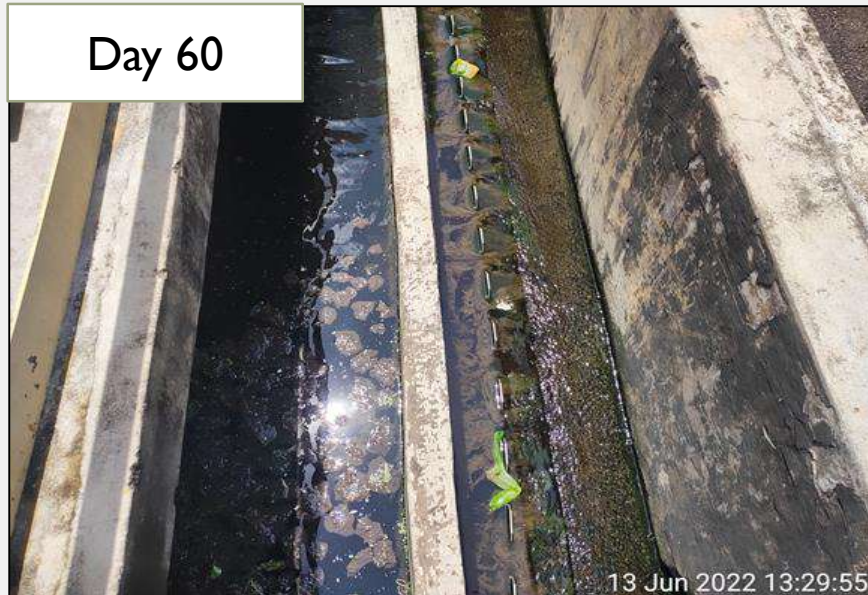
Before



After



Day 60



After



Conclusion (PEG 163 – TAMAN RELAU INTAN)

Before Treatment:

- Colour of Aeration Tank was brown, slightly reddish colour with low water clarity.
- Foul odour was minimal.
- Clumps of sludges can be seen at Clarifier Tank with a reflective water surface.
- Aeration pump ran a total of 16 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to a bright light green colour with a reflective water surface.
- Foul odour was able to be eliminated after 3 months of treatment.
- Clumps of sludges was able to be eliminated, but with an increase in green algae population due to the release of trapped nutrients.
- Aeration pump was reduced to 3.2 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (SPI 281 – TAMAN REMIA)

Before



After



Before



After



Conclusion (SPI 281 – TAMAN REMIA)

Before Treatment:

- Colour of Aeration Tank was dark grey.
- No foul odour was reported at Aeration Tank, however a strong pungent smell was detected at Final Effluent (FE) point.
- Aeration pump ran a total of 18 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank remains unchanged with the exception of reflectivity after 3 months of treatment higher.
- Absence of foul odour was maintained at Aeration Tank and significantly reduced at Final Effluent point.
- Aeration pump was reduced to 3.6 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (SPI 404 – TAMAN IKS BUKIT TENGAH)



Conclusion (SPI 404 – TAMAN IKS BUKIT TENGAH)

Before Treatment:

- Colour of Aeration Tank was green-brownish with no floating solids.
- Clumps of floating sludges / oil & grease can be seen at surface of Clarifier Tank.
- Slight oil / grease smell was detected at both Aeration & Clarifier Tank.
- Aeration pump ran a total of 18 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to bright grey with no floating solids.
- Oil / grease smell was able to be eliminated at both Aeration & Clarifier Tank.
- Clumps of floating solids / oil & grease was successfully eliminated after 3 months of treatment.
- Aeration pump was reduced to 3.6 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (SPI 262 – TAMAN BUKIT MINYAK)

Before



After



Before



After



Conclusion (SPI 262 – TAMAN BUKIT MINYAK)

Before Treatment:

- Colour of Aeration Tank was brownish dark grey.
- Floating solids covers almost half of surface of Clarifier Tank.
- Aeration pump ran a total of 18 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to greenish-grey with an increase in reflectivity of water.
- Aeration pump was reduced to 3.6 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (SPI 239 – KAW INDUSTRI RINGAN JURU)



Conclusion (SPI 239 – KAW INDUSTRI RINGAN JURU)

Before Treatment:

- Colour of Aeration Tank was orange-reddish with slightly oily smell.
- Water surface of Clarifier Tank was covered with thin black film of oil & grease sludge.
- Aeration pump ran a total of 12 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank changes to a greenish-grey colour with significant reduction in oily smell.
- Film of oil & grease was successfully removed via a combination of diatom & microbial activities.
- Aeration pump was reduced to 2.4 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (SPI 162 – TAMAN HARAPAN)

Before



After



Before



After



Conclusion (SPI 162 – TAMAN HARAPAN)

Before Treatment:

- Colour of Aeration Tank was greenish-brown colour with minimal foul odour detected.
- Small amount of floating clumped solids was observed at both Aeration and Clarifier Tank.
- Aeration pump ran a total of 14 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank was seen to be dark in colour, however no foul odour was reported.
- Floating clumped solid was successfully removed at both Aeration and Clarifier Tank.
- Surface water of Clarifier Tank becomes more reflective after 3 months of treatment.
- Aeration pump was reduced to 2.8 hours daily (80% reduction).
- Final Effluent remain compliance with DOE standards despite 80% in Aeration pump timer.

Status:

- Successful

Aeration & Clarifier Tank (PEG 136 – TAMAN SRI INDAH)

Before



After



Before



After



Conclusion (PEG 136 – TAMAN SRI INDAH)

Before Treatment:

- Colour of Aeration Tank was greenish-brown colour with minimal foul odour detected.
- A number of municipal solid waste (baby diapers, plastic bags, etc) was seen at Aeration Tank.
- Clarifier Tank was seen to be covered with films of floating sludges.
- Aeration pump ran a total of 12 hours daily.

After 3 Months of Treatment:

- Colour of Aeration Tank was seen to be greenish-gray in colour, minimal foul odour was still detected.
- Film of floating sludges was successfully removed at Clarifier Tank.
- Municipal solid waste was still present at Aeration Tank.
- Surface water of Clarifier Tank appears to be more reflective after 3 months of treatment.
- Aeration pump was reduced to 2.4 hours daily (80% reduction).
- Final Effluent did not comply with DOE standards with 80% in Aeration pump timer.

Status:

- Unsuccessful out of 19 treated STPs in Pulau Pinang.

Causes:

- PEG 136 is a partially enclosed aeration system, reducing sunlight penetration for Diatoms to carryout photosynthesis process to provide fine oxygens for surrounding aerobic bacteria & microbes to digest pollutants.

Project Conclusion

- ❖ Indah Water Konsortium was able to reduce its electricity consumption on aeration system by 80% in all 18 sewage treatment plants while still complying with DOE standards.
- ❖ Final Effluent (FE) of STPs were able to comply due to the nano-scale oxygen released by Diatoms. AquaBiosolution provides Diatom with sufficient nutrients needed to proliferate and carry out photosynthesis process to release fine oxygen that will then be consumed by aerobic bacteria & microbes, enabling them to carry out aerobic respiration to digest and disintegrate organic & inorganic pollutants contained in sewerage effluents.
- ❖ AquaBioSolution is a sustainable green technology that is able to treat sewerage effluent without causing secondary pollution while reducing reliance on mechanical means (Aeration System) thus reducing electricity and maintenance costs while complying to DOE standards. This is proven through 3 months POC trials in 19 STPs throughout Pulau Pinang & Seberang Prai.
- ❖ However, it is to be noted that application of AquaBioSolution is ineffective against STPs with fully or partially enclosed system as it reduces photosynthesis process of Diatoms. Thus Nuaim Corporation will only accept fully opened system for future treatment projects.