INDUSTRIAL TRAINING FIELD REPORT

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PROGRAMME

Diploma in Chemical Engineering

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LI DURATION

17 weeks (22/3/2021-15/7/2021)

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ACKNOWLEDGEMENT

First and foremost, I would like to express my sincere gratitude to the organization, Vance Bioenergy Sdn Bhd. and to Mrs Farhana binti Ibrahim, QC and Lab Manager of this company giving me the opportunity to do my internship training here. I was assigned to the Quality Control department under IETS (Industrial Effluent Treatment System) and this company has helped me to gain many new experiences throughout the 17 weeks of training period. Heartfelt gratitude shall be conveyed primarily to senior chemists, Miss Maryam and junior chemist executives, Miss Priya Rakupathy and Miss Fatin Adilah, for the guidance and support during the internship to accomplish my internship. I sincerely thank them for providing the assistance as well as the relevant material required to carry on with the tasks given. I would also like to express my gratitude to the lab technicians, executives of the company and as well to the other trainees for their support, wise guidance and sharing of knowledge for me to complete my tasks and responsibilities successfully in these 17 weeks. Finally, I would like to thank my internship coordinator, Miss Hidayu Binti Abdul Rani and Faculty of Chemical Engineering, Universiti Teknologi Mara (UiTM) Pasir Gudang, Johor for the opportunity given for diploma students to gain experience and learning to adapt ourselves in the real working environment.

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CHAPTER 1

INTRODUCTION TO INDUSTRIAL TRAINING

1.0 Introduction

Industrial training is an important subject in the academic system division in most of universities. Plus, it is important to undergo industrial training in order to complete the course and graduate. Industrial training probably gives student opportunity to apply knowledge from all subjects that have been learned in the classroom to the real working environment. By having these big opportunities, student should be able to learn new skills and develop it at the working place and increasing networking by building connection with senior worker. Duration of the internship is 17 weeks starting from 22 March 2021 until 15 July 2021.

The objectives of industrial training include:

i. Apply theories learned during classes in university
ii. Enhance the students' knowledge and skills
iii. Implant students' good qualities of integrity, responsibility and self confidence
iv. Enhance students' communications skills
v. Improve students' hard and soft skills

CHAPTER 2

BACKGROUND OF INDUSTRY

2.1 Company profile

Vance Bioenergy Sdn. Bhd. Is a leading ISO 9001 licensed manufacturer of fatty acid methyl ester (Vance Biodiesel), pharmaceutical-grade subtle glycerine (Vance Refined Glycerine) and other oleochemicals to be used in lots of industries. Vance Bioenergy Sdn. Bhd owned two sites located at Keluli and Nibong, Pasir Gudang Industrial Estate of Johor, Malaysia. One is the Keluli site and another one is the Nibong site. Keluli site is focused in production of palm methyl ester, glycerine and Vitamin E while Nibong site is focused in production of palm methyl ester, CAPB and CDE. Vance Bioenergy benefits from its accessibility to Johor Port, which has major storage and berthing facilities, as well as its access to fresh palm oil from the oil palm refineries in Pasir Gudang with nearly about 7 million metric tonnes of palm oil refining capacity.

Vance Bioenergy has two methyl ester plants which amounting to 150,000 metric tons of annual production capacity and has two largest single standing glycerine refineries in Asia that produce up to 40,000 metric tons of pharmaceutical-grade refined glycerine per annum on sites. VBSB has its own storage tanks with a total capacity of 25,000 metric tons that equipped with nitrogen blanketing. The fully integrated clean room class drumming line and warehouse get to ensure the constancy to the highest quality and hygiene standards.

In 24/7/365 on-site laboratory houses, the latest testing equipment is staffed by a full team of chemists, laboratory managers and technicians in order to maintain the stringent quality assurance standards. The team also involves in R&D and ongoing efforts to improve the quality of products, increase the product lines and enhance production processes. The logistics team at VBSB also play an important role to guaranteeing exact time to deliver products to customers worldwide as they are experienced in handling variety of packaging and shipping resolutions.

Vance production specialists have more than a century worth of work experience in the oleochemical and vegetable oil industry. As VBSB has both the technology and expertise to deliver high quality products, they get to meet and exceed customers' expectations. VBSB are socially and environmentally responsible company that has been an active member of the Roundtable on Sustainable Palm Oil (RSPO) since 2006 and is known as a subsidiary of Vance Group Ltd, a diversified and financially strong business group headquartered located in Singapore.

2.2 Accreditation and Certification

VBSB are awarded by the following accreditations, such as:

I. **GMP according to Recommended International Code of Practice General Principles of Food Hygiene** CAC/RCP 1-1969 (Lloyd's Register LRQA) – Refined Glycerine & Palm TRF
II. **HACCP based Food Safety System** (Lloyd's Register LRQA) – Refined Glycerine & Palm TRF
III. **Food Safety System Certification 22000** (including ISO22000 and ISO22002-1) (Lloyd's Register LRQA) – Refined Glycerine & Palm TRF
IV. **ISO 9001:2015** (Lloyd's Register LRQA) – Palm Methyl Ester, Refined Glycerine & Palm TRF

2.3 Vision & Mission

I. **Vision**: To ensure a healthy environment for current and future Generation

II. **Mission**: Our philosophy is to do our best to fulfil our customer's needs and constantly improve our products and services

2.4 Quality policy

I. Providing quality Biodiesel, Refined Glycerine a Palm Tocotrienol Rich Fraction (Palm TRF) products to customers.

II. Achieving excellence through training and guidance of our employees, and thus providing them with growth opportunities.

III. Having a joint commitment for continuous quality improvement with our suppliers.

IV. Deploy a risk-based thinking approach to act as a proactive and preventive measure to be ahead of risk and challenges may arise.

2.5 Company corporate logo

Figure 2.5.1 Company logo

2.6 Main products and services

Vance Bioenergy Sdn Bhd. is an oleo-chemical based product producer based in Malaysia. It produces fatty acid methyl ester, biodiesel (Vance Biodiesel), pharmaceutical-grade refined glycerine (Vance Refined Glycerine), Vitamin E, cocoamido-propyl betaine (CAPB) and cocodiethanolamide (CDE). These products used palm oil as its main ingredients. These products also have their specific characteristic and usage as table below:

Products	Characterization/usage
Fatty acid methyl ester, biodiesel (Vance Biodiesel)	• Used in standard diesel engines • Produced from the vegetable and waste oils or blended with petrodiesel in any proportions (B7 & B10). • Biodegradable and non-toxic
Pharmaceutical-grade refined glycerine (Vance Refined Glycerine)	• 99.7% purity refined glycerine used in pharmaceuticals, food, paints, textiles, cosmetics, daily chemicals. • RG from VBSB meets USP, BP, EP and Food Grade Specification
Vitamin E	• Clear Reddish Amber liquid ingredient in cosmetic, personal care, dietary supplement
Cocoamidopropyl betaine (CAPB)	• Amphoteric/zwitterionic surfactants commonly used in the manufacture of various liquid cleansing products. • It is compatible with an-ionic, Non-ionic and cationic surfactants. • Provides excellent foaming and viscosity-building properties when used together with primary anionic surfactant systems.
Cocodiethanolamide (CDE)	• Viscous non-ionic surfactant used in various cleaning liquid products • Has foam boosting and stabilising properties as well as viscosity building properties.

Table 2.6.1 Products characterizations and usage

2.7 Department in VBSB

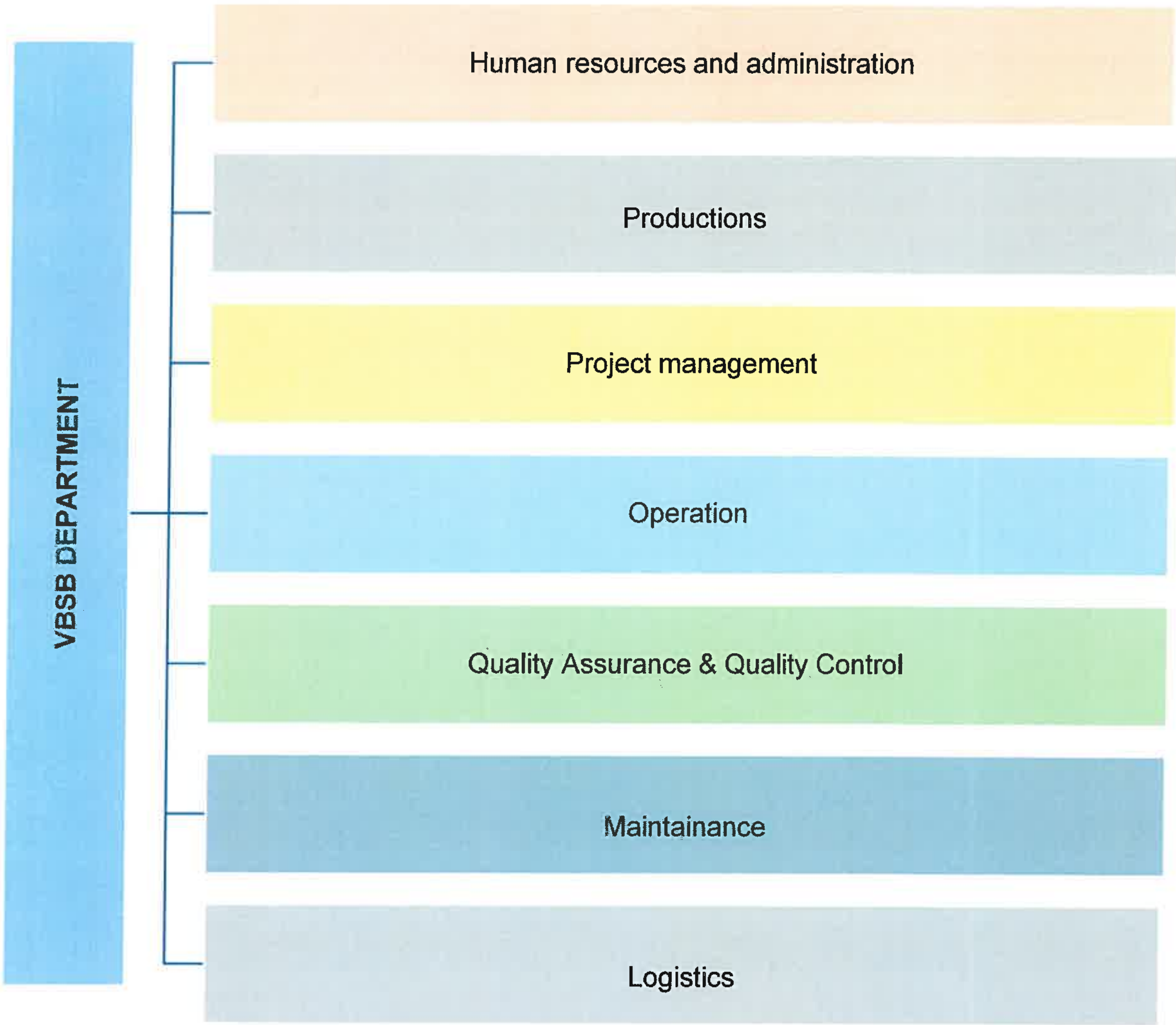


Figure 2.7.1 Departments in VBSB

CHAPTER 3

QUALITY CONTROL DEPARTMENT OF VBSB

3.1 Introduction

Quality control department is coordinated by the senior manager of the company which is Mr. Khairul Anuar. The department compromises of lab and quality control manager, senior chemist, junior chemist and lab technician. Job scope given was under IETS (industrial effluent treatment system) where the waste water treatment is being monitored starting from 22 March 2021 until 15 July 2021 under the supervision of Mrs. Farhana Binti Ibrahim.

3.2 Responsibilities

Responsibilities of quality control department includes:

I. Set up the standard and specification of each product produced by VBSB.
II. Monitor and conduct test for the quality of raw materials, samples in process and final products.
III. Monitor the waste water parameters from the plant according to the standards.
IV. Maintain detailed records of the testing that's been carried out, as well as relevant additional information, and various metrics.
V. Monitor the operations.

3.3. Organization chart of QC department

The figure below shows organization chart of the quality control department lead by Mr. Hatta Bin Abu, general manager of VBSB, assisted by Mr. Khairul Anuar, senior manager.

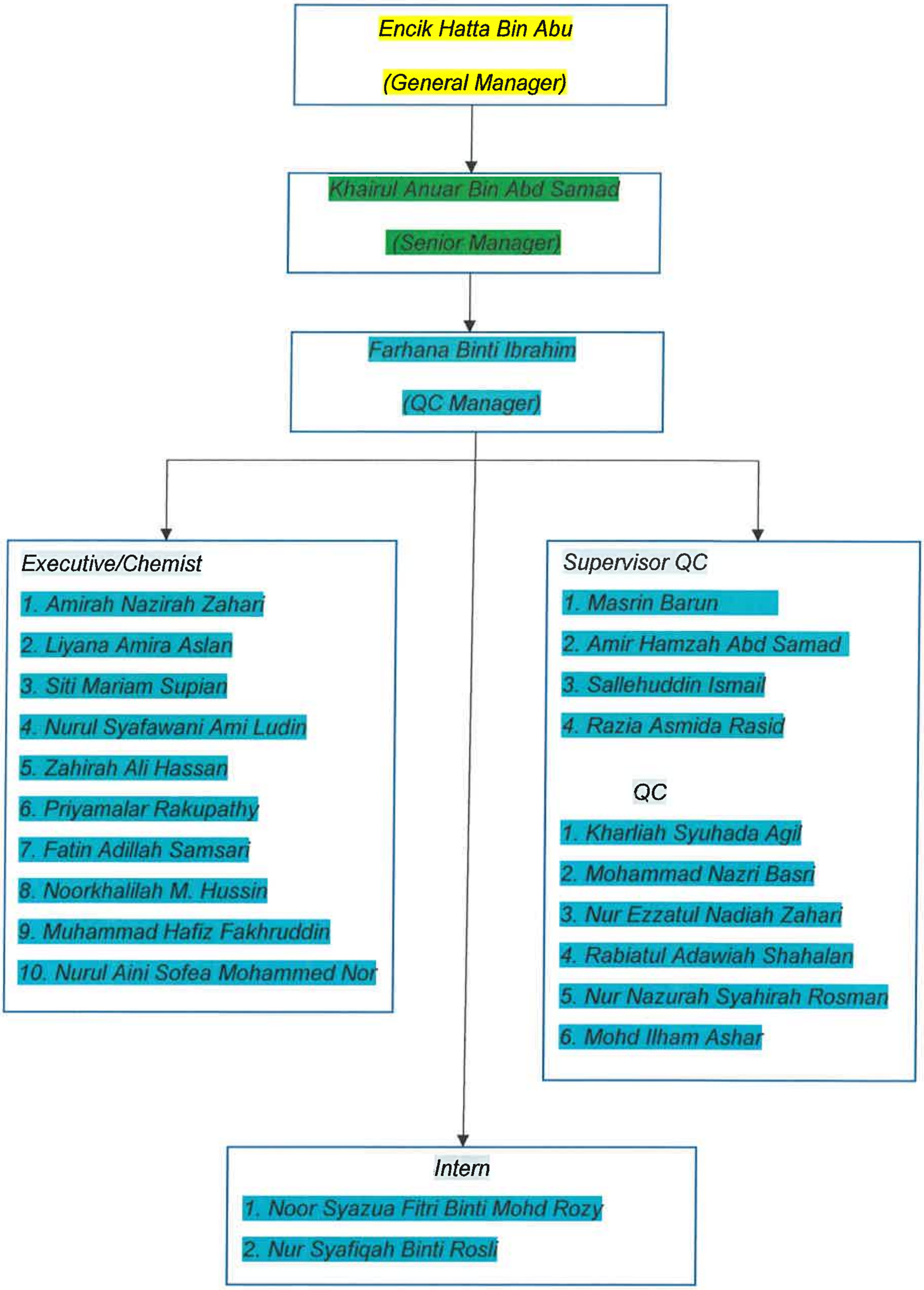


Figure 3.3.1 Organization chart of QC Department

CHAPTER 4

PROCESS FLOW OF PRODUCT

4.1 Introduction

The products produced in VBSB are fatty acid methyl ester, refined glycerine, vitamin E, CAPB and CDE. Below is the process flow of some products produce by VBSB.

4.2 Process flow of palm methyl ester and glycerine

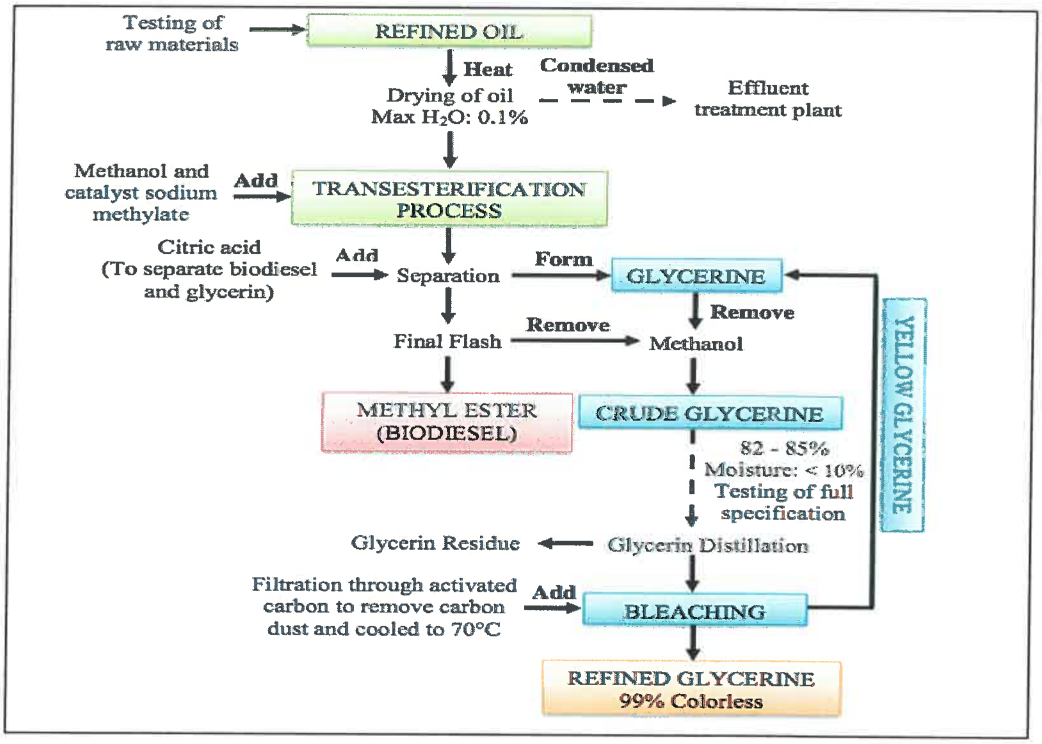


Figure 4.1.1 shows process flow of palm methyl ester and glycerine productions

Based on figure above, the refined oil is heated then undergoes transesterification process to converts the triglycerides to fatty methyl esters (FAME) and glycerine. Then, the biodiesel undergoes a clean-up or purification process in order to remove residual catalyst, excess alcohol and soaps. Next, the glycerine then undergoes glycerine distillation to produce refined glycerine.

4.3 Process flow of vitamin E

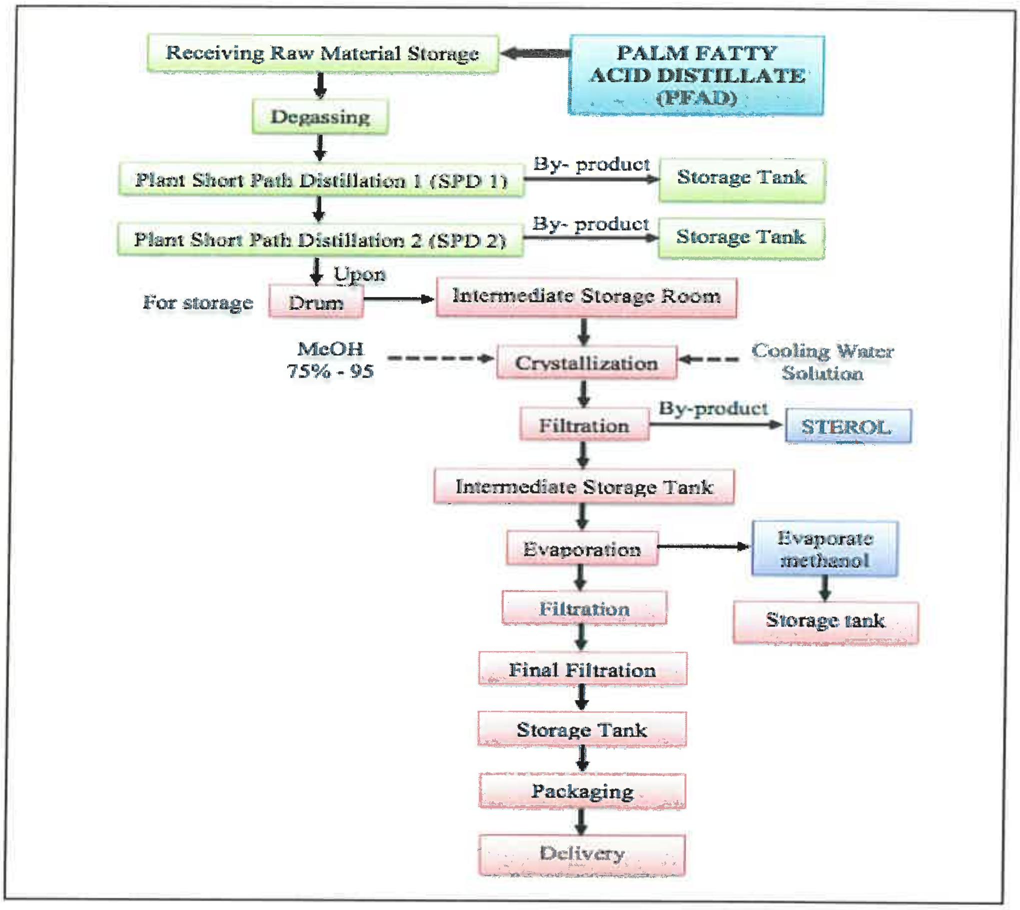


Figure 4.1.2 shows process flow of vitamin E production

The raw material for the production of Vitamin E is the Palm Fatty Acid Distillate (PFAD). PFAD were processed through short plant distillation to produce T1T3 at the concentration of 20-45%. Cooling process was conducted through cooling water solution to crystalize the T1T3 through addition of catalyst methanol. Then continued to undergoes the evaporation process to evaporate the methanol. At final stage the concentration of T1T3 should be between 30-60% and the methanol 18 content should be less than 100ppm.

4.4 Process flow of CAPB and CDE

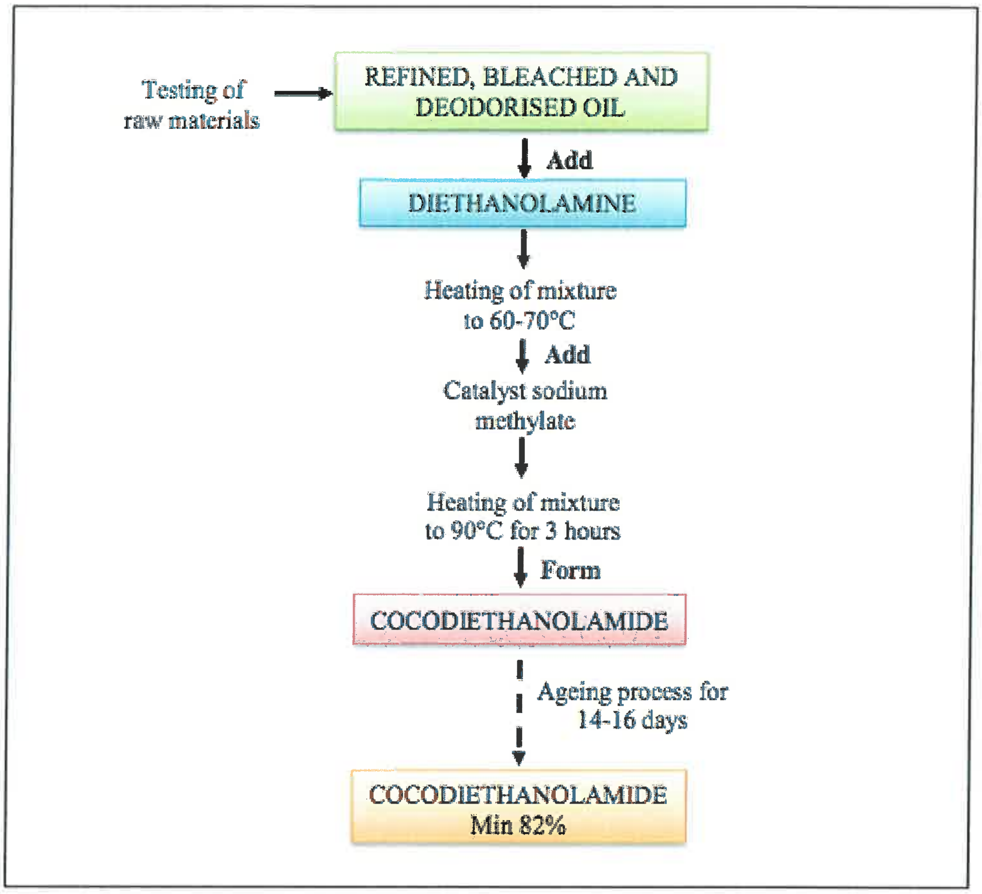


Figure 4.1.3 shows process flow of CAPB & CDE production

The production process of CDE involves the batch process whereby the process occurs in a single vessel. The raw materials used are triglyceride and diethanolamide are being heated then pumped into the vessel and being stirred to let it homogenize. The sodium methylate is used as catalyst and were added when the temperature reached 60-65°C. The mixture is heated until it reached 90°C and was maintained for 3 hours to form cocodiethanolamide.

CHAPTER 5

DAILY ROUTINES

5.1 Introduction

From 22 March 2021 until 15 July 2021, all tasks given and assigned in the quality control was under IETS (Industrial Effluent Treatment System) by the supervision of Mrs. Farhana Binti Ibrahim, manager of quality control and laboratory and assisted by two chemists, Miss Siti Maryam Binti Supian and Miss Priya Rakupathy. The job scopes during industrial training were to do waste water analysis. During 17 weeks of industrial training, there was many tasks and assignment that are being assigned such like running the test for samples, assist chemists to do waste water analysis and monitoring trial for research and development (R&D).

5.2 Daily routines tasks for waste water analysis

- Chemical Oxygen Demand (COD) Test
- Oxygen Updated Rate (OUR) Test
- Ammoniacal Nitrogen (AN) Test
- Mixed Leaker Suspended Solid (MLSS) Test & Mixed Leaker Volatile Suspended Solid (MLVSS) Test

5.3 Daily routines description

5.3.1 Chemical Oxygen Demand (COD) Test

The COD test is a test to measure the amount of oxygen consumed in order to oxidize organic water contaminants chemically to inorganic and the end products. The test is conducted under controlled conditions. Samples from aeration tank 1&2 which are top, bottom cc, v notch, point 1 and point 6 are centrifuge and filtered 3 times before putting into high range vial.

Meanwhile for plant samples it includes cooling tower, after dissolved air floatation, filtrate, TK 362, 367, 238, 232, D1, T1, HT1, HT2, P5 and filter press. Each of the samples have different dilution factor. Using micropipette, 1ml of the sample that have been filtered will be pipetted into the high range vial that contain potassium dichromate. The samples then are heated in COD reactor for 2 hours at 150℃ before reading the result using spectrophotometer.

Figure 5.3.1.2 High Range Vial for COD Test

Figure 5.3.1.3 COD heater and Spectrophotometer

5.3.2 Oxygen Updated Rate (OUR) Test

The OUR test is a test that measures the respiration rate of organisms of the waste water samples. In order to run the test, take 300 ml of samples from aeration tank 1 and 2 which are top, v notch, point 1 and point 6. Pour into beaker and put on diffuser and DO meter. Once the reading on the DO meter reach 4 ppm, put away the diffuser and start timer. Record the reading every 30 seconds in 4 minutes duration of time. High Oxygen uptake rates indicate high microbes' activity and low oxygen uptake rates indicate low microbes' activity.

Figure 5.3.2.2 DO meter used in OUR Test

5.3.3 Ammoniacal Nitrogen (AN) Distillation Test

The AN test is the test to measure total amount of toxic pollutant which is ammonia in waste water. In order to run this test, it need, preparation of samples from aeration tank 1 and 2. Composite waste water samples from AT1 (top, middle & bottom) and AT2 (point 1-point 6) then, centrifuge the composited samples. Pour 250ml of samples into beaker and mixed 25ml of borate buffer solution into the sample. Measure the pH of the solution using pH meter and adjust the pH to 9.5 using sodium hydroxide (NaOH) 1N. Pour H_2SO_4 (0.04N) into Erlenmeyer flask then set up the distillation apparatus.

Collect the distillate after 2 hours 30 minutes of heating. Pour the distillate into a 250-mL volumetric flask. Add demineralized water into to the volumetric flask. Dilute to the mark. Pour 10 ml of the distillate solution into AN tube, add ammonia salicylate and wait for 3 minutes, then add ammonia cyanurate, wait for 15 minutes. Used spectrophotometer to read the result. The higher the value, the higher amount of ammonia in the samples.

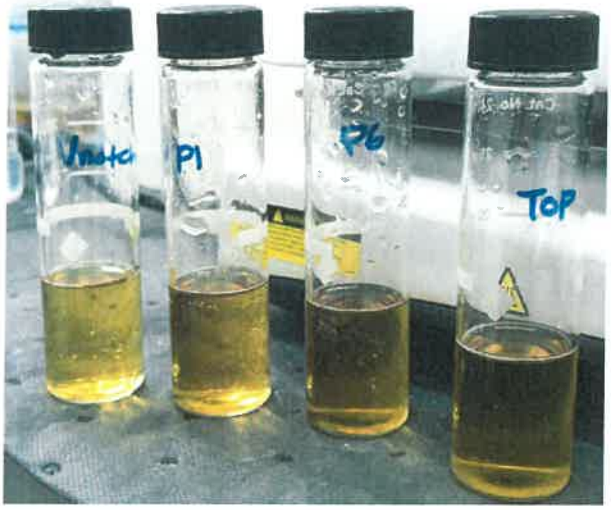


Figure 5.3.3.1 Samples of AN test from AT1 & AT2

5.3.4 Mixed Liquor Suspended Solid (MLSS) Test & Mixed Liquor Volatile Suspended Solid (MLVSS) Test

Mixed liquor is a combination of sludge and water removed from the clarifier in the wastewater treatment process and reintroduced into an earlier phase of the treatment process. The mixed liquor contains microorganisms which digest the wastes in the raw water. Most of the volatile solids in a sample of mixed liquor will consist of microorganisms and organic matter. As a result, the volatile solids concentration of mixed liquor is approximately equal to the number of microorganisms in the water and can be used to determine whether there are enough microorganisms present to digest the sludge.

The MLSS test is a test to determine the amount of suspended solid in the samples while MLVSS is a test to measure the amount of volatile suspended solid. For MLSS test, it starts from weighing the initial weight of 0.45 mm filter paper. Then take 20 ml of sample and filter using the filter paper. Put into the drying oven for 4 hours at 130°C. As for MLVSS, weight the filter paper after 4 hours, then put into the furnace at 550°C for 30 minutes. Finally, weight the filter paper again.

CHAPTER 6

MINI PROJECT

6.1 Introduction

Wastewater is water that are contaminant by domestic, industrial, commercial or agricultural activities. It contains varieties of microorganism and bacteria as well as harmful chemicals and heavy metals that can lead to various of environmental and health problems. During the internship period, a trial for research and development team was assigned as mini project as one of the efforts to overcome the wastewater issues which is high chemical oxygen demand. The solution to the problems is monitoring microbe's activity from sludge in aeration tank 2 in plant samples wastewater using coagulation-flocculation and activated carbon method.

6.2 Objectives

The objectives of this mini project are as below:

i. To monitor the activity of sludge collected from AT2 in the presence of wastewater from D1, T1 and MX4

ii. To monitor the reduction of COD in each different wastewater.

6.3 Method

a) Preparation of wastewater from plant sample, D1 & T1

i. Pour approximately about 5000 mL of the respective wastewater in a beaker.

ii. Adjust the ph to 4 to separate the oil layer on top.

iii. Add in 0.3% of 30L (flocculant) to flock all the suspended particles in the wastewater.

iv. Adjust the pH to 7 followed by addition of 3% of 20S (coagulant) to coagulate the large particles together for easier removal of suspended solids in the liquid.

v. Scoop out the suspended particles and filter the liquid using a filter bag

b) Preparation of sample from MX4 HP3

i. Evaporate about 70% of 4500 mL of the wastewater to remove methanol from the wastewater.

ii. Layer of salt will be formed at the bottom.

iii. Filter the liquid using filter bag to remove the salt.

iv. Further dilution is made to reduce the high COD level of MX4 HP3 to be used in the trial.

c) Preparation of sludge

i. Composite P1-P6 of the AT2 wastewater.
ii. Centrifuge to get the sludge and the supernatant.
iii. Prepared 2 beaker and labelled DI, T1& MX4
iv. Sludge is collected.

d) Setup of beakers

i. Three 5000 ML beakers are prepared as T1, D1& MX4 HP3 respectively.
ii. 500 grams of sludge is added to each beaker.
iii. Acid treated wastewater is added about 3500 ml in each beaker.
iv. Each beaker is aerated so that the sludge will be well mixed and to make sure enough dissolved oxygen is available in each beaker.
v. COD, MLSS/MLVSS, AN, DO and OUR is tested to get the initial quality of the trial.
vi. No feed will be present in the beakers for first five days to monitor the reduction of COD level in the absence of feed.

Figure 6.3.1 shows each trial after setup

6.4 Characterization of wastewater samples

			
AT2	D1	T1	MX4 HP3

Figure 6.4.1 shows initial appearance of wastewater

PARAMETERS	AT2	D1	T1	MX4 HP3
Color, APHA	>500	>500	>500	>500
pH	8	4.41	6.32	4
COD, ppm	2,765	15,400	26,400	368,000
BOD, ppm	1,210	10,600	18,110	163,000
MeOH %	0.1	0.4	0.1	15.2
Salt	N/D	N/D	N/D	4.8066
O&G, mg/L	76	157	1458	705
Glycerine, %	0.29	0.47	0.1%	8.57
Suspended solid, mg/L	522	217	4000	1570
Soap, ppm	2.7	N/D	1.9	0.289

Table 6.4.1.2 Characterization of wastewater sample

6.5 Result and Discussion

Initial Quality of the beakers are as follows:

TRIAL	T1	D1	MX4 HP3
Initial Quality		REPLICA OF AT2	
Initial Volume, ml	3500	3500	3500
Sludge added, g	366	366	366
MLSS, ppm	9,467	9,467	9,467
MLVSS, ppm	4,733	4733	4733
AN	0.21	0.18	>10
D.0	6.51	6.16	5.99
Temperature, °C	25	25.2	25.5
OUR	36.9	50.25	48.9
COD, ppm	15,000	24,253	30,603

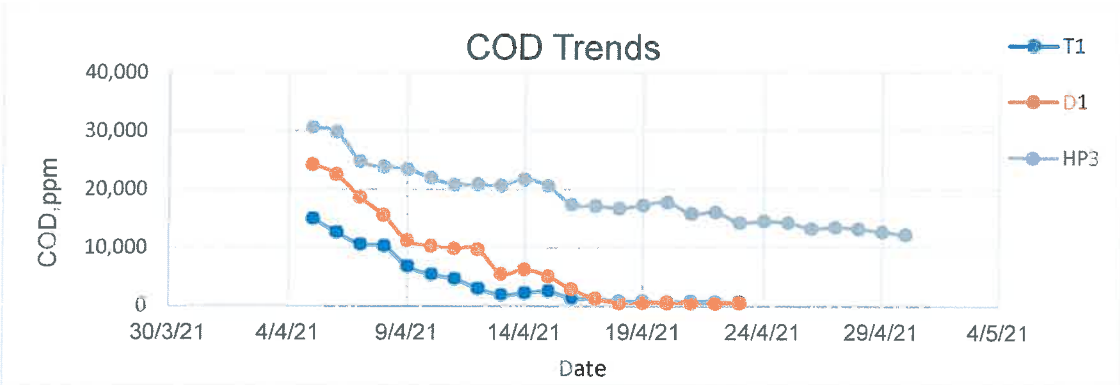
Table 6.5.1 initial result of daily routine test for trial once setup

The daily routine test was running over 3 weeks and the data of each trial's COD reduction is as table below:

DATE	T1	D1	HP3
5/4/2021	15,000	24,253	30,603
6/4/2021	12,600	22,575	29,775
7/4/2021	10,575	18,650	24,750
8/4/2021	10,275	15,600	23,850
9/4/2021	6,785	11,200	23,450
10/4/2021	5,400	10,300	21,925
11/4/2021	4,625	9,875	20,750
12/4/2021	2,975	9,700	20,850
13/4/2021	1,875	5,525	20,625
14/4/2021	2,225	6,275	21,675
15/4/2021	2,525	5075	20,550
16/4/2021	1,325	2875	17,350
17/4/2021	1,275	1275	17,100
18/4/2021	800	500	16,650
19/4/2021	782	575	17,200
20/4/2021	605	523	17,725
21/4/2021	825	510	15,750
22/4/2021	675	452	16,025
23/4/2021	535	500	14,225
24/4/2021	-	-	14,500
25/4/2021	-	-	14,225
26/4/2021	-	-	13,200
27/4/2021	-	-	13,450
28/4/2021	-	-	13,125
29/4/2021	-	-	12,675
30/4/2021	-	-	12,200

Table 6.5.1.2 shows each trial COD reduction over 3 weeks

The COD reduction trends are as below:



Graph 6.5.1 shows COD trends of trial T1, D1 & MX4 HP3 for 3 weeks

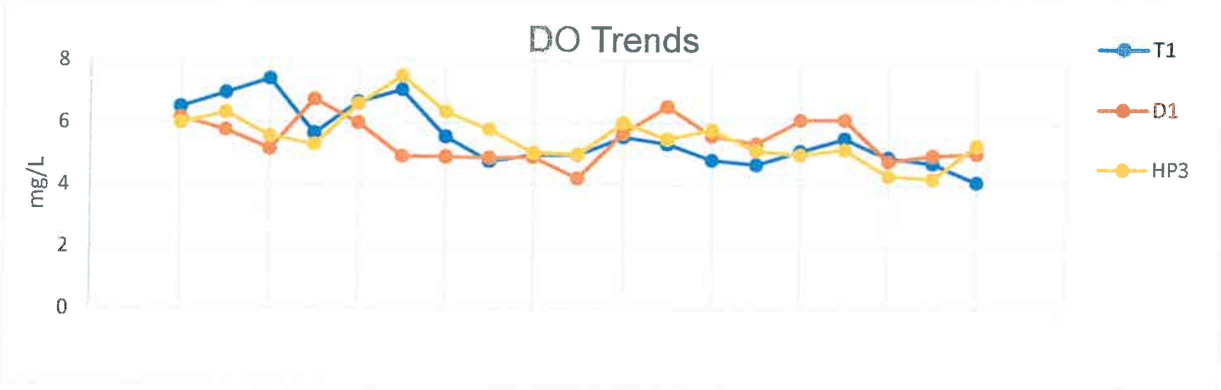
Based on the graph and table above, the COD of trial T1, D1 started to decrease on 6/4/2021 compared to MX4 HP3 that has constant value of COD for about 2 days. On 23/4/2021, trial T1 and D1 was stopped being monitored due to much lower COD reduction meanwhile for

MX4 HP3, was further continued to monitor the rate of reduction of COD for one weeks before further subjected for chemical treatment and double PAC (0.3%).

Based on the data and tables from results, the COD of the trials was reduced successfully. This is because, the method used in preparing the trial is coagulation-flocculation. Using this method to remove organic matter. it gets to eliminate the 'food' needed by the microbes to thrive making the COD decrease.

Analysis of others parameters over 3 weeks from 5/4/2021-30/4/2021

The DO trends of trials:

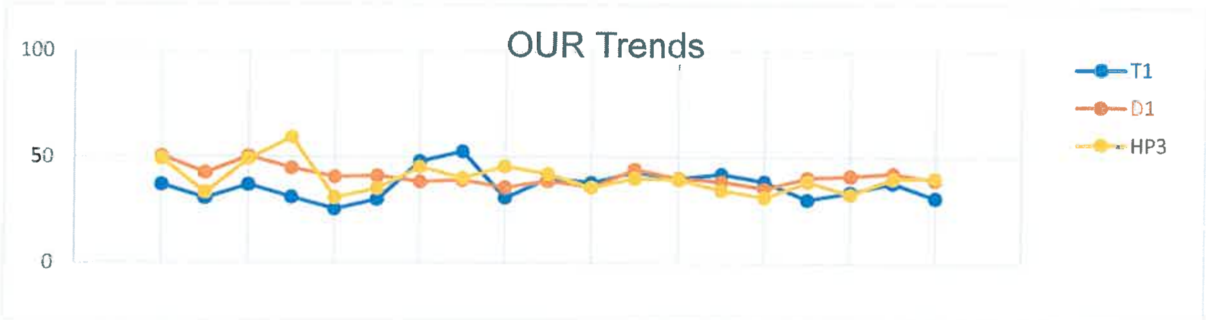


Graph 6.5.2 shows DO trends for each trial

The DO value of T1 and MX4 HP3 increase on 5/4-9/4/2021 while D1's DO value decrease on the same date. At the end of 3 weeks, the DO value of the trials is between the range 4-5.5 ppm.

The decreasing DO value of D1 may be cause by the low rate of aeration in the beaker. The increased molecular activity of water molecules pushes the oxygen molecules out of the spaces between the moving water molecules.

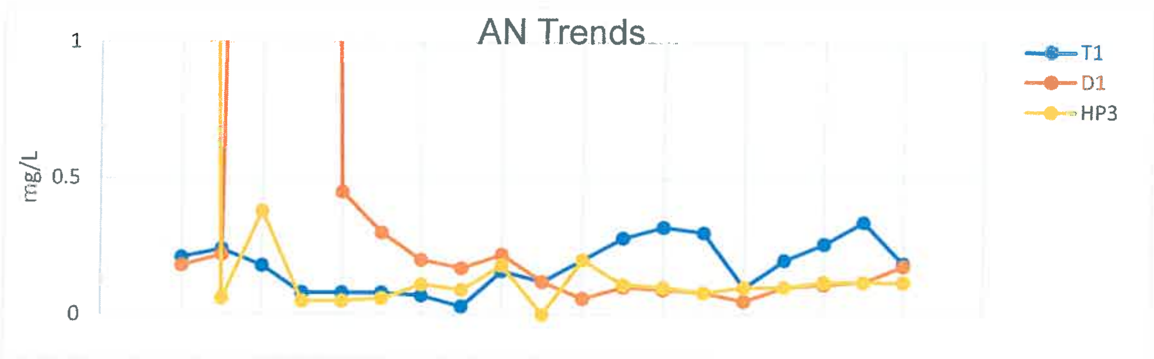
The OUR trends are as below:



Graph 6.5.3 shows OUR Trends for each of trial

Based on the graph above, MX4 HP3 and D1 has the same value of OUR which is 48.9 ppm while T1's OUR value is lower than the other trial which is 36.9 ppm. On 8/4/2021, MX4 HPS has the highest value OUR which is 59.2 ppm while on the same date, T1 has lowest OUR value which is 31.2 ppm. At the end of 3 weeks, MX4 HPS and D1 shared the same value of OUR which is 40.3 ppm and T1 has low OUR value which is 31.1 ppm. High Oxygen uptake rates indicate high microbes' activity and low oxygen uptake rates indicate low microbes' activity.

The AN trend is as below:



Graph 6.5.4 shows AN trend for each of the trials

Based on the graph above, the AN value of MX4 HP3 on 6/4/2021 is the lowest which is 0.06 ppm compared to D1 and T1 which is 0.22 ppm. On 14/4/2021, the AN value of MX4 HP3 increase to 0.22 ppm followed by D1, 0.18 and the lowest is T1, 0.16. On the last day of the observation, the AN value for MX4 HP3 decrease to 0.12ppm while for D1 and T1, the AN value increase to 0.18 ppm.

The increasing AN value is probably because of the aeration rate in the beaker. When insufficient oxygen is applied in the beaker, bacteria are not able to biodegrade the incoming organic matter in a reasonable time. In the absence of dissolved oxygen, degradation must occur under septic conditions which are slow, odorous, and yield incomplete conversions of pollutants causing the pH to decrease too making it under acidic condition that resulted to high value of AN.

<u>CHEMICAL TREATEMENT</u>

Introduction

The samples MX4 HPS, D1 and T1 are then subjected for chemical treatment. Coagulation is a chemical treatment used for further monitor the trials. Coagulation is a process used to neutralise charges and form a gelatinous mass to trap (or bridge) particles thus forming a mass large enough to settle or be trapped in the filter by using 20s as coagulant agent. After undergoing coagulation, the samples then are added with PAC 0.3%. The PAC carbon is weight 0.3% volume of the trials. The trials then are aerated using diffuser for 30 minutes before centrifuge then filter using filtration set. The purpose of the chemical treatment and double PAC is to reduce the colour of the trials and COD value

(A)

(B)

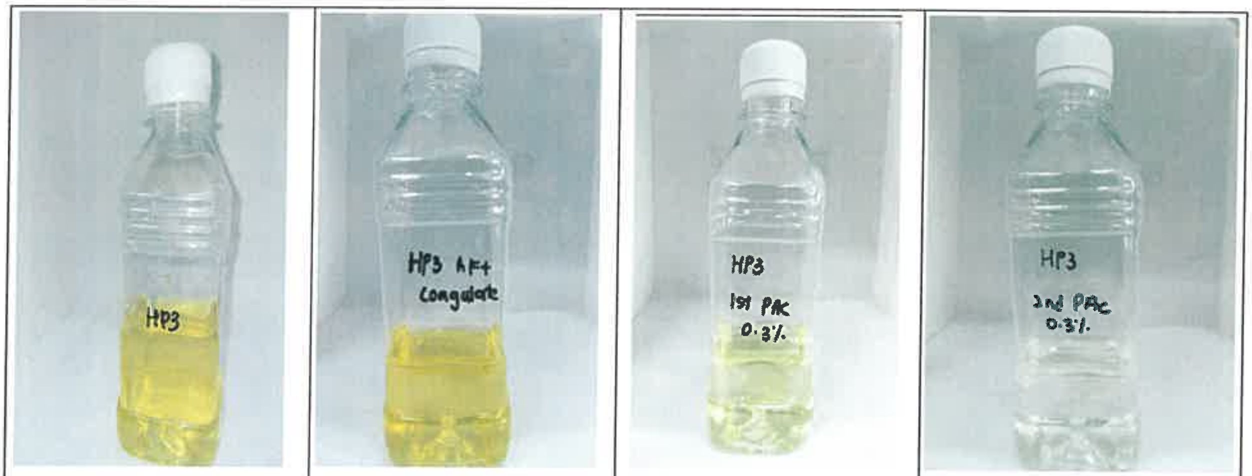
Figure A & B shows PAC carbon is weighted and added into the trial

(C)

Figure C shows trial undergoing coagulation process

The samples were further subjected for coagulation and double PAC (0.3%) are as below:

a) MX4 HP3



BEFORE COAGULATION	AFTER COAGULATION	1 ST PAC 0.3%	2 ND PAC 0.3%

Figure 6.5.5 shows the difference colour of trials after coagulation and PAC

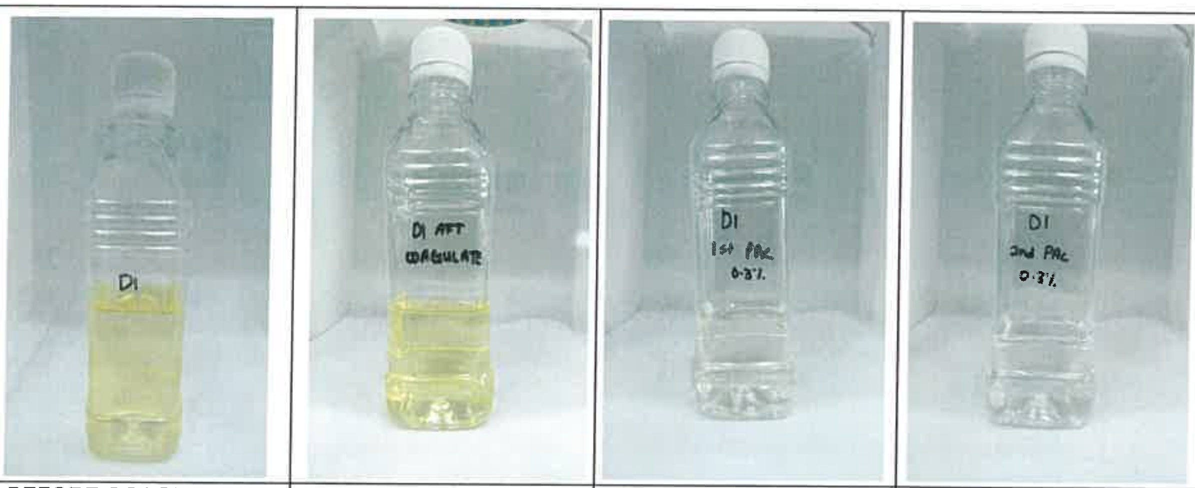
- Table below simplified the COD value of MX4 HP3:

Colour, APHA	**>500**		**118.8**	**80.8**
COD, ppm	**Initial (5/4/21)**	**Final (30/4/21)**	**After coagulation+ 1st PAC 0.3%**	**After 2nd PAC 0.3%**
	36,800	**17,200**	**11,675**	**10,225**
Total COD Reduction, %				**67%**

Table 6.5.1.3 shows COD reduction of MX4 HP3

Based on the figure and table above, MX4 HP3 colour value has been reduced about 83.84% from >500 APHA to 80.8 APHA after 2nd PAC. As for the COD reduction, after undergoing chemical treatment and PAC, the total COD reduction approximately 67%.

b) **D1**



BEFORE COAGULATION	AFTER COAGULATION	1 ST PAC 0.3%	2 ND PAC 0.3%

Figure 6.5.6 shows the difference colour of D1 before and after coagulation and PAC

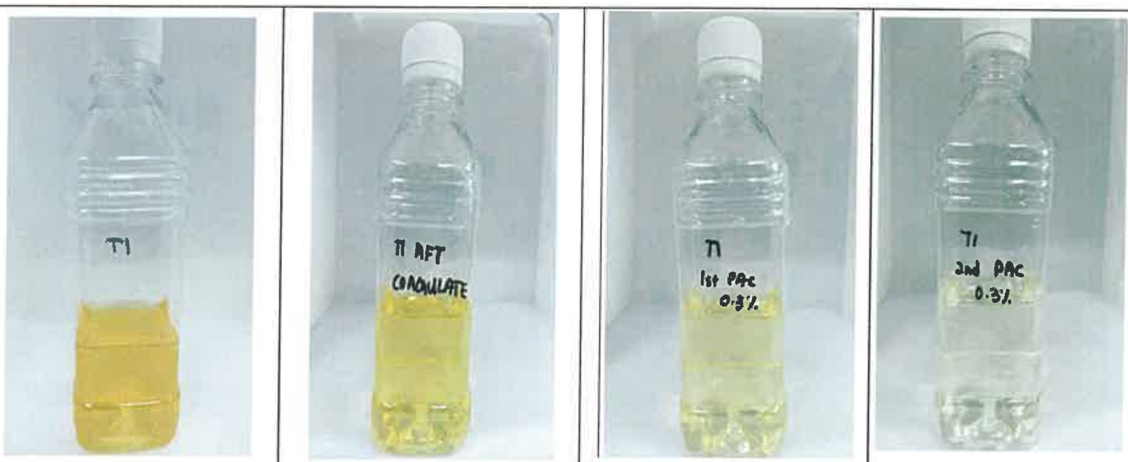
- Table below simplified the COD value of D1:

Colour, APHA	**142.5**		**40.3**	**15.6**
COD, ppm	**Initial (5/4/21)**	**Final (23/4/21)**	**After coagulation+ 1st PAC 0.3%**	**After 2nd PAC 0.3%**
	26,400	**500**	**288**	**97**
Total COD Reduction, %				**99**

Table 6.5.1.3 shows COD reduction of D1

Based on the figure and table above, the colour value of D1 decrease about 89.05% from 142.5 APHA to 15.6 APHA after 2nd PAC. For COD value also decrease about 99% after D1 undergoing coagulation and double PAC.

c) **T1**



BEFORE COAGULATION	AFTER COAGULATION	1 ST PAC 0.3%	2 ND PAC 0.3%

Figure 6.5.7 shows the colour difference before and after chemical treatment

- Table below shows COD value of T1:

Colour, APHA	**500**		**271**	**145.6**
COD, ppm	**Initial (5/4/21)**	**Final (23/4/21)**	**After coagulation+ 1st PAC 0.3%**	**After 2nd PAC 0.3%**
	15,400	**535**	**485**	**342**
Total COD Reduction, %				**98**

Table 6.5.1.3 shows COD reduction of T1

Based on the figure and the graph, the colour value of T1 has been reduced 70.88% from 500 APHA to 145.6 APHA after coagulation and 2nd PAC. The total COD reduction is 98% as it is reduced from 15,400 PPM to 342 PPM after 2nd PAC.

Conclusion of Mini Project

In conclusion, the objectives of the mini project have been achieved as the microbe's activity in sludge AT2 get to be monitored and the COD can be reduced successfully in the presence of plant wastewater. The microbes' activities in the AT2 sludge can be monitored by running the COD, OUR, DO and AN test. Each of the tests shows different activity of the microbes. Next, the reduction of COD for each of the wastewater decrease after undergoing coagulation and the addition of PAC. As we can see, D1 and T1 are most digestible compared to MX4

HP3 because the percentage of total COD reduction for D1 is the highest which IS 99% followed by T1,98% and MX4 HP3 has the lowest percentage which is 67%.

Based on the results and data collected for a month, it can be concluded that by using sludge from AT2, the COD of wastewater can be reduced efficiently. The coagulation and double PAC treatment also help in improving or reducing the colour of the wastewater and it has been proved as the percentage of colour reduction for D1 is the highest which is 89.05% followed by MX4 HP3, 83.84% and T1,70.88%. The carbon in PAC adsorbs the contaminants in the wastewater thus, helps to reduce COD and eliminate the unwanted odours, colours and others micropollutants. By using the coagulation-flocculation and double PAC the wastewater can be treated efficiently.

CHAPTER 7

CONCLUSION & RECOMMENDATION

In conclusion, 17 weeks of internship at Vance Bioenergy Sdn Bhd. served a good platform for me to develop and upgrade my skills. I am able to upgrade my technical and soft skills as well as critical thinking. I have also learned to be independent when finding solutions for the task given. The knowledge and skills that I received during the industrial training has helped me to adapt myself into a real working scenario. Throughout this practical training, I gained the skills of building a great network among the company staffs and trainees and the importance of teamwork plays when completing the tasks. Moreover, I learned to manage the time wisely when completing the tasks. I am able to improve my time and stress management skills due to the short notice task given.

These 17 weeks of internship program really helped me to gain useful knowledge about biodiesel, glycerine also Vitamin E manufacturing process. However, it is too short to explore more about the company and the manufacturing process. Thus, the duration of the industrial training program should be increased to create chances for the students to get involved in all departments by exchanging knowledge with staffs and workers from other departments. This will benefit the trainee for the future to adapt a working environment. I felt grateful for being able to complete this internship which has given a lot of useful experience for my future career path.

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