UNIVERSITI TEKNOLOGI MARA

INDUSTRIAL TRAINING FIELD REPORT

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LI DURATION	: 22 MARCH 2021 – 16 JULY 2021
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1.0 INTRODUCTION

Industrial Training CHE535 is the final course in Diploma of Chemical Engineering at Universiti Teknologi MARA (UiTM). Semester 6 students must complete this industrial training in order to complete their diploma studies. Students must search and apply for an internship at any organization that is relevant to the chemical engineering field before entering the real world experience for the job related to chemical engineering. They are also required to submit important document such as resume and internship letter upon their application.

The objective of this course is to provide students with exposure and opportunities to participate in real-world job experiences. They will benefit from this course because they will be able to broaden their understanding, understand more about modern chemical markets, and adapt the ideas they learned during their diploma to real-world scenarios.

Students must compete in this industrial training programme for at least 16 weeks in order to earn a total of 7 credit hours. The 16-week period of this industrial training is required by the Board of Engineers Malaysia (BEM) for undergraduate students to meet the standards of the Engineering Technology Accreditation Council (ETAC).

2.0 CONTENT

2.1 HISTORY OF COMPANY

Pahang Berhad Water Management (PAIP) was legally established on February 1, 2012 through the Pahang Air Supply Position (JBAP) corporation and is a subsidiary company that fully belongs to Pahang. With the JBAP Corporation, the state cleverly handed over the operational affairs of caring for, providing, cleaning and collecting water products instead of the sale of clean water which had been controlled by JBAP to PAIP.

PAIP has been licensed by Suruhanjaya Perkhidmatan Air Negara (SPAN) as a water supply operator for Pahang Country in line with the allotment of Akta 655 (Akta Industri Perkhidmatan Air 2006). With that, PAIP serves to provide users with satisfactory clean water supplies in terms of quantity and quality in the most economical way to meet the needs of the social and economic development of the State of Pahang Darul Makmur.

Apart from that, PAIP is also responsible for the design, construction and management of the Pahang Darul Makmur State Water Supply System as well as collecting and collecting water supplies for the Kingdom of Pahang State. PAIP also acts as an advisor or negotiator to the Kingdom of Pahang on matters involving the water supply industry.

Figure 1 : PAIP Logo

2.2 OBJECTIVE

1) Improve the operational efficiency of water supply
2) Comply with the national clean water quality assurance program
3) Cultivate preventive maintenance for the entire water supply system
4) Improving results
5) Meet customer and stakeholder satisfaction
6) Strengthen financial management
7) Reducing the NRW rate
8) Improving personnel competencies
9) Fostering a corporate culture in the organization

2.3 VISION

Become a world-class water service provider.

2.4 MISSION

1) Focus on customer needs
2) Manage the Water Supply System using best practices
3) Develop human capital based on innovation and creativity
4) Being ICT as a driver to organizational excellence
5) Manage NRW reduction effectively and continuosly

2.5 FOCUS

1) Zero blackspot
2) Quick in action
3) Planned spending
4) Avoid wastage
5) Increased yield
6) Pleasant user experience

2.6 WORKING HOURS

All workers and staffs start working on 8 a.m and finish their works on 5 p.m by fingerprint as a proof their presence to work. They work five days per week. Due to some emergency cases, they work on weekends.

2.7 NUMBER OF STAFFS

The number of workers and staffs in Pengurusan Air Pahang Berhad (PAIP) is approximately 140. This number is including workers and staffs from two offices which are Rompin office and Muadzam Shah office.

2.8 SCOPE OF JOB

During the internship program, I was assigned to the Compliance and Water Quality Division in the Department of Operation in Pengurusan Air Pahang (PAIP) Bhd. My job scope during the internship was doing the quality check for the water sample. Check the water sample every week and recorded all the results. The quality check consist check the parameter of the water according to the drinking water quality standard Malaysia.

2.9 ORGANIZATION CHART PAIP DAERAH ROMPIN

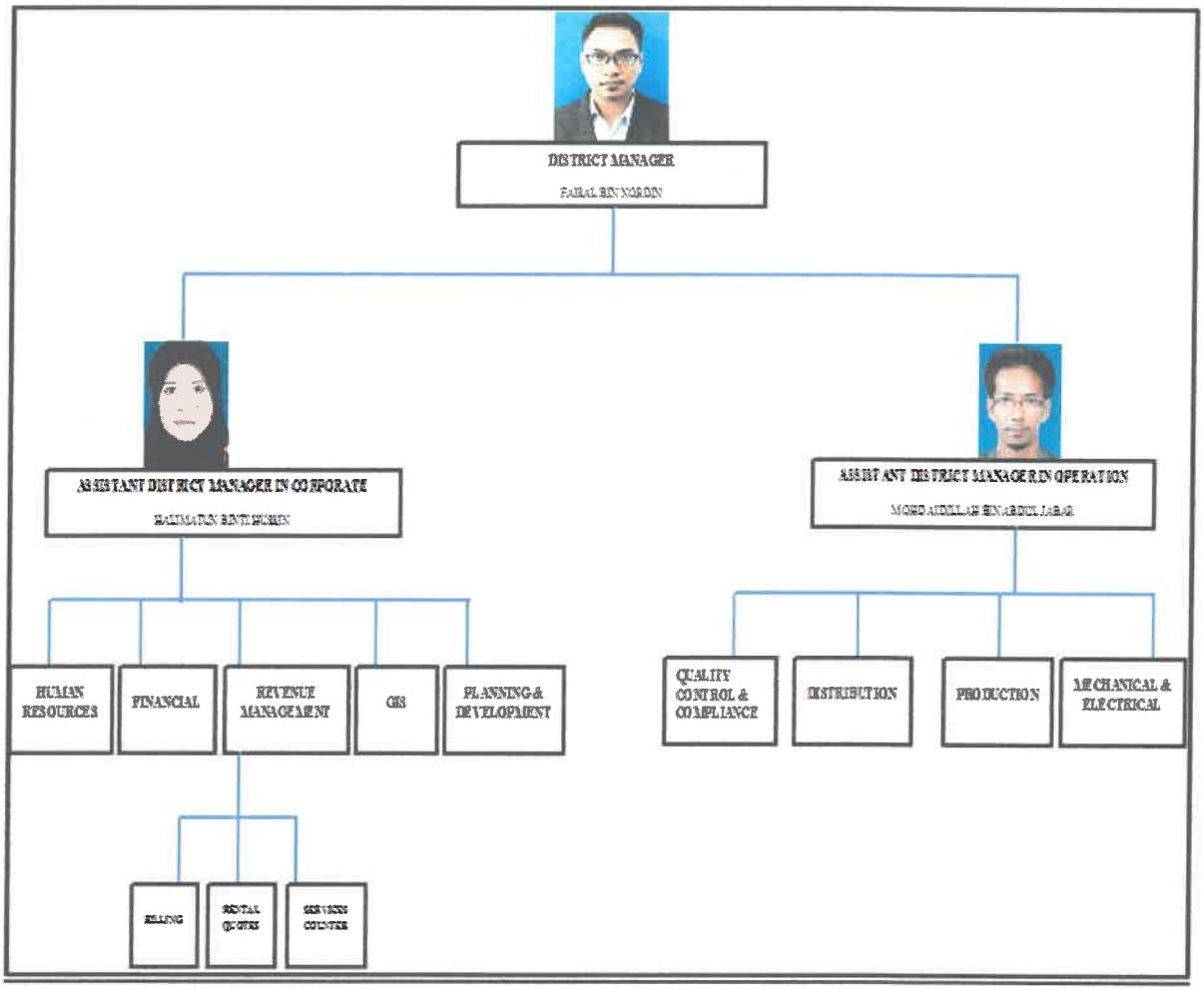
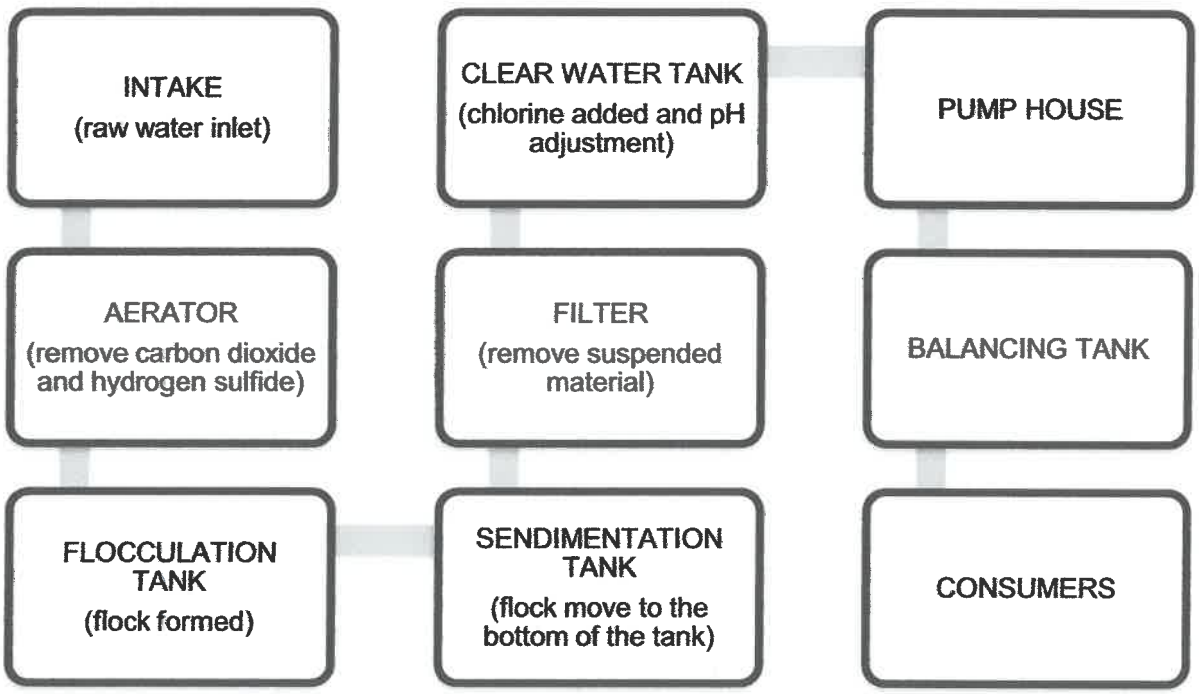


Figure 2 : Pengurusan Air Pahang Berhad Daerah Rompin

3.0 PROCESS FLOW FOR WATER TREATMENT PLANT



1. Intake

    - Raw water are taken from the dam or river. At the intake low lift pump are use to pump the water into the plant.
    - There are also have filteration process to process to remove deposition of sendiment, soil, mud and other suspended meterial.

2. Aerator

    - Aeration process first process in the water treatment plant. Release gases such as hydrogen sulphide and carbon dioxide.
    - Break down water molecules in the presence of oxygen, convert water-soluble substances (iron, manganese) to water-insoluble as well as get rid of volatile gases and eliminate odors and tastes.
    - Insceased dissolved oxygen content in water.

3. Coagulation and flocculation processes

    - Alum use as coagulant are dos to the raw water.
    - Chemical blending process for the purpose of stabilizing colloidal materials
    - Optimal chemical dose are getting from jar test before dose to the water.
    - Flock formed when the chemical the coagulant react with the water.

4. Sendimentation process

    - To deposit flock to the bottom of the tank for removal purpose, slow motion of water are used.
    - There are two type of sendimentation tank with are horizontal flow and love flow.
    - The raw water that have been clean and the flock have been remove must follow the standart quality of water quality.

4.0 DAILY/ WEEKLY ACTIVITY

During my internship period at Pengurusan Air Pahang Berhad (PAIP) I was given several task by my supervisor. Each activities and task will be brief in this section.

List of Activities

1. Water quality analysis with health inspector from 'Kualiti Mutu Air Malaysia' (KMAM)
2. Water quality analysis for internal data.
3. Jar test

4.1 Water Quality Analysis with KMAM

This analysis is done to test the water sample from selected stations to testify chlorine balances, pH and turbidity. This analysis is performed by Kawalan Mutu Air Kebangsaan (KMAM) agents and been inspected by health inspector The selected stations involved are Service Reservoir Outlet (SRO) Bandar Rompin, SRO Sabak, SRO Tanjung Gemok, SRO Loji Sepayang, Treatment Plant Outlet (TPO) Loji Air Sepayang and TPO Loji Air Selendang. Then, the samples are sent to Jabatan Kimia Malaysia Pahang in Kuantan for further tests such as E-coli, Total Coliform and Alum test.

The water sample from each section are taken from the sampling box located at each point. The function of the sampling box is to take the water sample for the test. The test usually been do one per week to make sure the water quality are follow the National Drinking Water Quality Standard. Below are the instruments used by KMAM in testing chlorine, pH and turbidity.

Figure 3 : Sampling Box

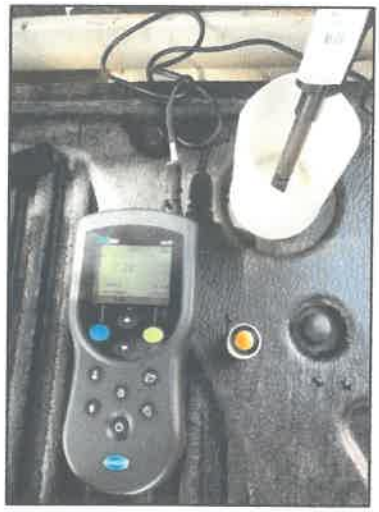


Figure 4 : HACH HQ40d(pH test)

Figure 4 : HACH 2100Q (turbidity test)

Figure 5: HACH Pocker Colorimeter (cholorine test)

4.2 Water Quality Analysis for Internal Data

Water Quality Control is the analysis of clean water samples to determine the level of chlorine, aluminum, turbidity and pH value in the samples. This analysis was done personally by PAIP staff, purpose of this analysis is to find out the level of chlorine, aluminum, turbidity and pH value are safe to consume and the values should be in between the minimum and the maximum values according National Drinking Water Quality Standard. All units used are milligram per liter (mg/l) unless stated. KKA analysis usually has been done in two days due to two separate routes and stations which are Sepayang route and Selendang route.

The routines are applying all the safety and personal protection measures before doing analysis, taking and recording pressure gauge meter in sampling box, calibrating every apparatus that will be used with distilled water, collecting water sample for each stations and testing the water to testify their turbidity (NTU), chlorine balances, aluminum and pH and recording all the values in data sheet.

1. Preparation water samples

Procedures:

1) The water is been flushed for 5 minutes to remove any impurities, cloudy and rusty water.
2) After 5 minutes, sample water is taken and filled inside a bottle slowly.
3) Noted that there are no bubbles inside the bottle. The presence of bubbles will reduce the accuracy and precision of the results.
4) The sample is ready for Turbidity, pH, Aluminium and Chlorine balances test.

Figure 6 : Taking water sample from sampling box

2. Turbidity (NTU) Test

Procedures:

1) Sample bottle is washed with water sample from every stations.
2) 20ml of water sample is been injected into the bottle sample.
3) The bottle sample is been wiped with small tower or handkerchief.
4) Then, the bottle sample is been put in the instrument (WTW TURB 430 T).
5) Button "START/ENTER" is pressed.
6) The NTU value is been recorded.

Figure 7 : WTW Turbidity 430T

Figure 8 : Water Sample for turbidity test

3. Chlorine Balances Test

Procedures:

a) Low range chlorine test

1) Sample bottle is washed with water sample from every stations.

2) 10ml of water sample is been injected into the bottle sample using a syringe.

3) Vario N06C Chlorine FREE-DPD F25 (as solvent) is put inside bottle sample and the water is been stirred to dissolve in water.

4) The bottle sample is been wiped with small tower or handkerchief.

5) The code program is standardized with 325.

6) Then, the bottle sample is been put in instrument (WTW pHoto Flex).

7) Button "START/ENTER" is pressed.

8) The chlorine value is been recorded.

Figure 8 : Vario N06C Chlorine FREE-DPD F25

Figure 9 : Chlorine water sample

Figure 10: WTW pHotoflex STD

b) High range chlorine test

1) Sample bottle is washed with water sample from every stations.

2) 10ml of water sample is been injected into a bottle using a syringe.

3) Then, 15ml of dimineralized water is injected into the bottle.

4) After that, Free-DPD F10 W05 C (as solvent) is put inside the bottle and the water is been stirred to dissolve the solvent.

5) Next, 20ml of the solution is been injected into bottle sample using.

6) The bottle sample is been wiped with small tower or handkerchief.

7) The code program is changed from 325 to 326.

8) Then, the bottle sample is been put in instrument (WTW pHoto Flex).

9) Button "START/ENTER" is pressed.

10) The chlorine value in mg/l is been recorded.

Figure 11: FREE-DPD F10 WO5 C

Figure 12: Demineralized water

3) Then, Aluminium no.2 tablet is inserted and the sample is stirred until the colour turned to pale yellow.

4) The bottle sample is wiped its surface before been put into the instrument.

5) The "Test" button is pressed twice until wait for 5 minutes.

6) After 5 minutes, the alum values is been recorded in KKA form.

Figure 14: Water sample after add the reagent

Figure 15: Lovibond MD600

5. pH Test

Procedures:

1) The rod is dipped into distilled water.

2) Then, the rod is wiped with clean handkerchief or cloth to dry the surface around the rod.

3) The WTW pH 330i is switched on and 'AR' button is pressed.

4) The rod is dipped into water sample.

5) 'RUN/ENTER' button is pressed and wait until the pH indicator is stopped blinking.

6) After the pH indicator stopped blinking, the pH value is been recorded.

Figure 16: WTW pH3110

4.3 Jar Test

Introduction of Jar Test

Jar Test is one of the most common test has been doned in lab. The aims of Jar Test are:-

1) to obtain the optimum pH and optimum coagulant dose and is used as a guide to determine the actual dose in the operation of the dosing system and the treatment of raw water in the plant

2) to ensure that operating costs are optimal – the use of coagulants, the life of the filter

3) to ensure the quality of the treated water complies with the standard quality of drinking water

Jar Testing should be conducted:-

1) everyday
2) every 8 hours or per shift
3) when the turbidity of raw water changes above 50 NTU or increases continuously
4) when the turbidity of water exceeds 5 NTU
5) when no flocc or small-sized floccs are formed in the flocculation tank
6) when the water is not clear in sendimentation tank

Usually, jar test uses 6 beakers (commonly 4 to 6 beakers). It is also known as a mini plant. We can say that the jar test is the interpretation from the actual plant. Three parameters had been tested when doing jar test. There are pH, Turbidity and Aluminium. After getting the results, we need to prepare the graph and from the graph, the dosage will be obtained. After graphing is done, we have to do some calculations to transfer certain dose from the jar test to the plant.

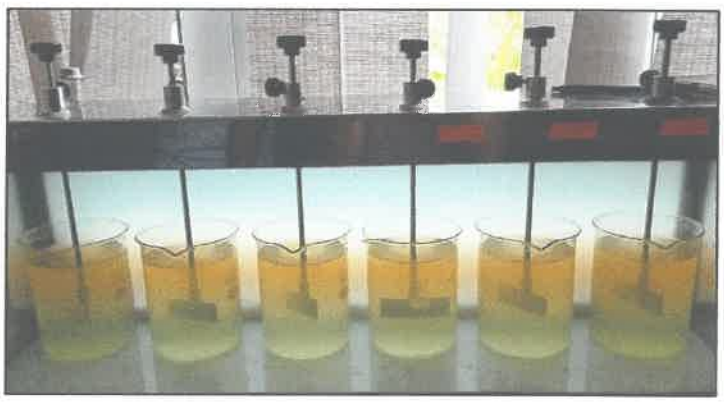


Figure 17: Jar test experiment

13) Tablet/reagent/powder pack

14) Small handkerchief/lab towel

15) Tissue

16) Distilled water

17) Calculator

18) Graph paper

19) Note book

Procedures Jar Test

1) A 1% coagulant stock solution was prepared.
2) The beakers had been rinsed with raw water.
3) 1000 ml of raw water is filled in every 1000 ml beakers.
4) The parameters had been tested and the readings are recorded.
    i. Turbidity
    ii. pH
    iii. Aluminium
    iv. Ferum
    v. Manganese
    vi. Ammonia
5) With high speed (300 rpm), the beakers had been stirred by stirrer.
6) The stirring process stopped.

7) Coagulant with needed dosage are been inserted into the beaker.

8) The jar test is carried out as follows:

Speed Adjustment	**Speed (rpm)**	**Time (s)**
1. Fast speed	200 - 300	30
2. Medium speed	70 - 100	180
3. Slow speed	10 – 50	900
4. Sedimentation process	0	1800 – 2400

9) After sedimentation process is done, the parameters of each beaker were analyzed and recorded in Jar Test Results (Table 1) to obtain the best results.

Table 1: Jar Test Results

Beaker	1	2	3	4	5	6
Coagulant dose (mg/l)						
Coagulant dose (mg/l)						
ACH dose (ml)						
pH						
NTU						
Al (mg/l)						

B. Liquid Alum

1. Using 100 ml volumetric flask.
2. Noted that S.G Liquid Alum 1000 = 1.312
3. Weight of 1% stock solution of Liquid Alum = 1g
4. Volume of Liquid Alum stock solution needed

$$S.G = \frac{Weight}{Volume}$$

$$Volume = \frac{Weight}{S.G}$$

$$= \frac{1}{1.312}$$

= 0.76 ml liquid alum needed and dissolved with distilled water.

Volumetric Flask (ml)	100	500	1000
Volume of Liquid Alum (ml)	0.76	3.80	7.60

5. 0.76 ml liquid alum is filled into 100 ml volumetric flask.
6. Add distilled water to the mark.
7. Move upside down the solution.
8. Check its viscosity by using hydrometer where the hydrometer reading must show a reading of 1005.

C. PAC 10

1. Using 100 ml volumetric flask.
2. Noted that S.G PAC 10 = 1.21.
3. Weight of 1% stock solution of PAC 10 = 1g
4. Volume of PAC 10 stock solution needed

$$S.G = \frac{Weight}{Volume}$$

$$Volume = \frac{Weight}{S.G}$$

$$= \frac{1}{1.21}$$

= 0.83 ml PAC 10 needed and dissolved with distilled water.

Volumetric Flask (ml)	100	500	1000
Volume PAC 10 (ml)	0.83	4.15	8.30

5. 0.83 ml PAC 10 is filled into 100 ml volumetric flask.
6. Add distilled water to the mark.
7. Move upside down the solution.
8. Check its viscosity by using hydrometer where the hydrometer reading must show a reading of 1005.

D. PAC 18

9. Using 100 ml volumetric flask.

10. Noted that S.G PAC 18 = 1.34.

11. Weight of 1% stock solution of PAC 18 = 1g

12. Volume of PAC 18 stock solution needed

$$S.G = \frac{Weight}{Volume}$$

$$Volume = \frac{Weight}{S.G}$$

$$= \frac{1}{1.34}$$

= 0.75 ml PAC 18 needed and dissolved with distilled water.

Volumetric Flask (ml)	100	500	1000
Volume PAC 18 (ml)	0.75	3.75	7.50

13. 0.75 ml PAC 18 is filled into 100 ml volumetric flask.

14. Add distilled water to the mark.

15. Move upside down the solution.

16. Check its viscosity by using hydrometer.

5.0 MINI PROJECT

WATER CRISIS AT KERATONG, MUADZAM SHAH, KUALA ROMPIN PAHANG.

This water crisis was happen because of the leaked bottom of third RISDA anaerobic pond from the distance of 20 kilometres from the inlet of Keratong Water Treatment Plant, Muadzam Shah that has caused the raw water become smelly, oily and coloured. It also have kill the aquatic life in the river. Tuesday, 6 july 2021 PAIP have been inform by RISDA about the leak of the efluent tank that contain a chemical waste of palm oil mill and the waste have been flow into the river. Respond to the incident PAIP immedietly standby at the intake of Keratong Water Treatment plat intake to check the raw water. Wenesday, 7 july 2021 at 7.00a.m the operation of water treatment plant have been stopped due to the polluted water have arrive at the intake. For this crisis, i have been assigned by my supervisor several task wich are check the raw water quality, jar test and supply clean water to consumers.

Figure 18 : Intake of Keratong Water Treatment Plant

5.1 Raw Water Quality Check

I have been signed to check the parameter of Rekoh river with is the source of the raw water by my supervisor. The quality check are done every hours. Parameter such as odor, pH, turbidity, colour, Manganese and amonia are been tested. Each data are recorded to observed the change of the polluted water.

Figure 19 : Water sample of polluted water

Figure 20: Turbidity and pH test.

Figure 21: Ammonia test

Figure 22: Odor test

EXAMPLE OF DATA

DATE: 7 JULY 2021 (WENESDAY)

TIME	ODOR (TON)	pH	TURBIDITY (NTU)	COLOR (PtCo)	Ferum (mg/l)	Manganese (mg/l)	Ammonia (mg/l)
0700	2	6.96	228	345	>3.00	0.552	0.73
0730	4	7.21	213	378	>3.00	0.588	0.96
0800	6	7.30	194	405	>3.00	0.608	1.06
1000	6	7.42	174	424	>3.00	0.625	1.33
1100	6	7.39	156	506	>3.00	-	1.44
1200	6	7.38	126	511	>3.00	0.644	1.48
1300	6	7.27	104	536	>3.00	0.648	>1.50
1400	6	7.15	78.9	666	>3.00	0.742	>1.50
1500	6	7.10	76.9	674	>3.00	0.755	>1.50
1600	**RAINING UNTIL 1900**						
2000	5	7.26	75.4	504	>3.00	0.552	>1.50
2200	5	7.22	62.5	722	>3.00	0.740	>1.50
0000	5	7.10	64.8	704	>3.00	0.748	>1.50

Physical observation of water

0700: Water surface oily, smelly, water turn into black

0800- 0000: Water surface is oily, smelly, colored, blackish, fish died and foamy.

Result for parameter odor and ammonia at intake Keratong River.

Date	Odor (TON)	Ammonia (mg/l)
7hb Julai 2021	2-6	0.73- 1.50
8hb Julai 2021	6	1.50
9hb Julai 2021	5-6	1.55- 3.25
10hb Julai 2021	5-6	1.62- 3.88
11hb Julai 2021	0-1	0.12- 2.10
12hb Julai 2021	2-5	0.32- 0.68

The polluted water contains high level of ammonia and have strong odor. Guided by my supervisor the quality check are done started from 7 July until 12hb that conduct by me. The sample are taken each hours to know if the water are become more clean or become worst. The slow flow of the river make the flow of water become much slower and the chemical waste move very slowly. From the spot of leaked of chemical waste it take about 12 hours and the distance was 20 kilometers. Many other agency such as Suruhanjaya Air Negara (SPAN), Jabatan Alam Sekitar and also Jabatan Penairan dan Saluran involve with this crisis. Each team responsible to check the polluted water and find a solution and take action to the cause of this crisis.

5.2 Jar Test

Jar test are done to know if the polluted water are ready to treat become a clean water and safe to use. Lead by my supervisor, the jar test was performed. the first jar test was perform on Monday, 12 July, 9.30 pm. the purpose of this jar test was to know if zeolite can decrease the level of the ammonia in the water. Zeolite are microporous, aluminosilicate minerals commonly used as commercial adsorbents and catalysts.

My supervisor Mr Md Yani, have choose to use zeolite as initiative to treat the polluted water. By using zeolite powder, 10% of zeolite solution are prepared to use in jar test to know

the optimum dose to remove the ammonia. Several jar test are done to know the efficiency of the zeolite toward polluted water. Below are the result of the jar test.

JAR TEST USING ZEOLITE

Raw Water Analysis

Time : 9:30 pm, 12hb Julyi 2021 (Monday)

pH	Turbidity n (NTU)	Ammonia (mg/l)	Odor (TON)
6.88	56.8	0.22	2

Jar test 1:

Jar	1	2	3	4	5	6
Zeolite (mg/l)	4	6	8	10	12	14
pH	6.99	6.97	6.95	6.97	6.98	7.01
Turbidity (NTU)	55.4	56.5	55.3	54.7	56.0	55.7
Ammonia (mg/l)	0.21	0.22	0.21	0.17	0.21	0.21

Jar test 2:

Jar	1	2	3	4	5	6
Liquid Alum (mg/l)	35	37	39	41	43	45
Zeolite (mg/l)	4	6	8	10	12	14
pH	4.54	5.00	6.05	6.01	6.12	6.14
Turbidity (NTU)	12.9	19.7	9.7	7.62	16.4	14.5
Aluminum (mg/l)	>0.8	0.769	0.127	0.115	0.197	0.130
Ammonia (mg/l)	0.19	0.24	0.19	0.12	0.18	0.19

Jar test 3:

Jar	1	2	3	4	5	6
Liquid Alum (mg/l)	40	40	40	40	40	40
Zeolite (mg/l)	10	10	10	10	10	10
pH	6.32	6.31	6.29	6.29	6.30	6.28
Turbidity (NTU)	7.4	6.9	5.2	3.4	2.5	3.6
Aluminum (mg/l)	0.125	0.114	0.078	0.061	0.050	0.116
Ammonia (mg/l)	0.204	0.116	0.112	0.007	0.003	0.009

Based on the result get from the jar test, PAIP have confirm to use zeolite as initiative to treat the polluted water. Solution of zeolite was prepared in a tank and supply to the intake of Keratong River. The zeolite are mix with the raw water before enter the plant.

Figure 23: Preparation of zeolite solution

Figure 24: Jar test using zeolite

5.2 Supply Clean Water to Consumers.

Because of the polluted water, about 11,500 of consumers are affected. Clean water are really important in daily life use. PAIP have been help by SPAN and other water agency in Malaysia to supply the clean water to the consumers. By using water tanker, the clean water are taken from Gadak Water Treatment Plant, Muadzam Shah. Total of 48 water tanker are involve in this crisis. Because the large are have been effected a lot of man power are used. I have been helping in organize the flow of the water supply for each zone. I also have assist to supply the clean water to the consumer. Static tank also are install in some area to easy the supply of the clean water. Clean water have been supply started from 9 July until 17 July 2021.

Figure 25: Supply clean water to consumers

Figure 26: Static tank

6.0 Conclusion

Universiti Teknologi MARA (UiTM) has always strived to develop well-rounded students with strong academic accomplishments, improved communication skills, and leadership abilities that would help them succeed in their future endeavours. Students enrolled in this industrial training programme have had the chance to get real-world job experience and learn more about contemporary issues.

This industrial training has been one of a kind experience for me as a student to learn and gain experience for real life working experience in chemical industry. Going through industrial training at Pengurusan Air Pahang Berhad (PAIP) I have gain so much knowledge for water treatment industry. Start from the raw water until become clean water that safe to consume by consumers, all the process have been toughed to me by the staff at PAIP. I am truly grateful to be surrounded by the great people in this company and for the new knowledge they had given upon me despite their busy working schedule.

In conclusion, I am truly grateful that I have successfully completed my industrial training in the span of 16 weeks despite the pandemic COVID-19. I would like to also express my deepest gratitude to Encik Faisal bin Nordin, Encik Aidillah bin Jabar and Encik MD. Yani bin Abdul Manan of Pengurusan Air Pahang Berhad (PAIP) for accepting my internship, giving me endless support, guidance and lastly providing great hospitality along the way.