



اَبُو سَيِّدِي تَكْوَلُو كِي مَبَارَا
UNIVERSITI
TEKNOLOGI
MARA



INDUSTRIAL TRAINING REPORT (CHE353)

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1.0 INTRODUCTION

Industrial training (CHE353) is a final course for students in Diploma in Chemical Engineering. This course is compulsory for every students and will be performed in the last semester (Semester 6). Moreover, this course is a training for students before stepping up in a real working scenario and will give students some exposure on type of work done by engineers and how it will be done. Students will need to apply all the knowledge and theories that has been learnt during the five semester into their internship. Students will be able to perform some basic practices in engineering such as technical report writing, project handling and train their communication skills among colleagues to perform the task given better. Furthermore, in working scenario, high level of integrity, ethical and accountability is important and this can be learned throughout the internship.

For my internship, I managed to become a trainee at a company called Bechem Technologies Sdn. Bhd.. I did my training for 17 weeks from 22nd of March 2021 until 30th of July 2021 with 2 weeks leave due to full movement control order (FMCO). I was placed in the technical department where I managed to do hands-on work. The major job scope in the technical department will be doing the servicing and doing some piping for other company. However, I also managed to do some research and technical report writing for the company. During my internship, all my tasks that have been given were supervised by the managing director of the company, Ir. Dr. Beh Chin Lai.

2.0 CONTENTS

2.1 Organizational Chart & History of the Company

2.1.1 Organizational Chart

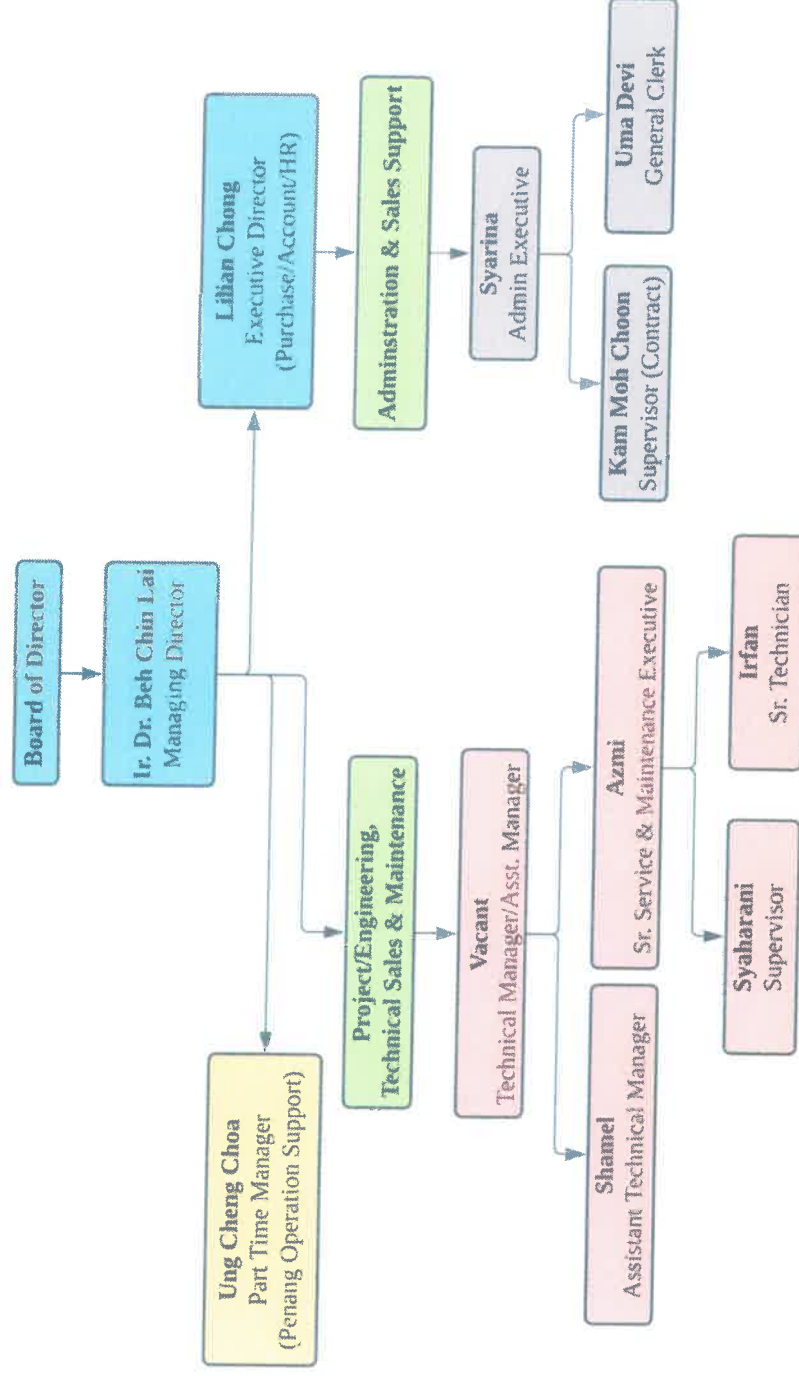


Figure 1. Organizational Chart of Bechem Technologies Sdn. Bhd.

2.1.2 History of the Company

Bechem Technologies Sdn. Bhd. was established and operated since March 2005. Bechem Technologies headquarter is located in Shah Alam, Selangor. This company were founded by Ir. Dr. Beh Chin Lai as he also comes from chemical engineering background. The core of this company is that they are specialised in industrial wastewater treatment. They provide solution for factories in any industry that wants their wastewater treated before being released to the environment.



Figure 2. (a) Logo of Bechem Technologies Sdn. Bhd.; (b) Location of Bechem Technologies Sdn. Bhd.

Company's Mission and Vision

Mission – To be leader and customer-driven service & products provider that will contribute to the industrial and environmental as well as human's need & enhancement.

Vision – To be leader and customer-driven service & products provider that will contribute to the industrial and environmental as well as human's need & enhancement. To be recognized as world-class organization of industrial & environmental excellence.

Nature of Business

Bechem Technologies have been in the wastewater treatment industry for more than 10 years until now, which means they have a lot of experience in dealing numbers of problems. They will provide free consultation for the client's industrial problems and will handle the project with full responsibility. At Bechem Technologies, they believe

that they are efficient and master in water & environmental engineering as they have a strong maintenance team that will be able to service and troubleshoot the problems encountered to achieve the client's satisfaction. Other than servicing and maintenance, Bechem Technologies also provide quality and cost effective chemical products and equipments such as coagulant, flocculant, caustic and filter press.

As mentioned above, Bechem Technologies provides quality products and efficient work services. For filtration product, they provide two types of filtration which is filter cartridge and filter bag & housing. For filter cartridge, three types of cartridge can be found which is BCT-P series, BCT-M series and BCT-S series and these types of cartridge provides different purposes.

Table 1. Different types of cartridge and usage.

Types of Cartridge	Characteristics and Uses
BCT-P	<ul style="list-style-type: none"> • PP Pleated Filter Cartridge. • Uses latest gradient density microfibre media technology. • Special combination of polypropylene media with variation in the fibre diameter. • All components used in the manufacturing process are biologically safe, chemically inert and meet GMP standard and other internationally requirements. • Polypropylene offers and extremely wide chemical compatibility making it suitable for many applications.
BCT-M	<ul style="list-style-type: none"> • High Performance Melt Blown Cartridges • 100% polypropylene construction • Excellent chemical resistance to bases, acids, salts and organic solvents in wide range of applications. • Uses FDA listed materials of construction (Safe for food & beverage contact). • Continuously graded pore construction enhances contaminant holding capacity. • Optional high strength polypropylene center core (Optimization of filtration medium & enhances the cartridge's mechanical properties).
BCT-S	<ul style="list-style-type: none"> • Precision Wound Cartridge

For filter bags & housing, the products can be seen as below,

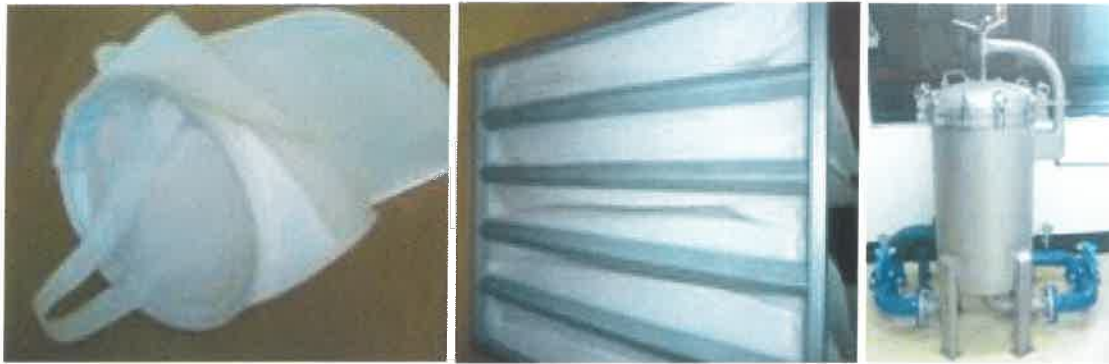


Figure 3. (a) Filter Bag; (b) Multi Pocket Filter; (c) Bag Filter Housing

Moreover, Bechem Technologies provide water treatment & services as they be able to design and built a wastewater treatment plant. They have a wide selection of chemicals, equipments and system targeted for the treatment process. Example of the system done are such as iron removal system, ion exchange system, media filtration system, membrane system, chemical treatment system, non-chemical treatment system, biological treatment system and cooling water system. However, for the chemical, they be able to provide coagulants, flocculants, corrosion inhibitor, biocides, ion-exchange resin and softener resins. In order to maintain the system in good condition, the maintenance team in Bechem Technologies have high skills in installation of new equipment and service maintenance and not to forget the engineer's efforts to analyze the wastewater and also doing the Department of Environment (DOE) report submission.



Figure 4. Examples of System Done

2.2 Process Flow of the Company

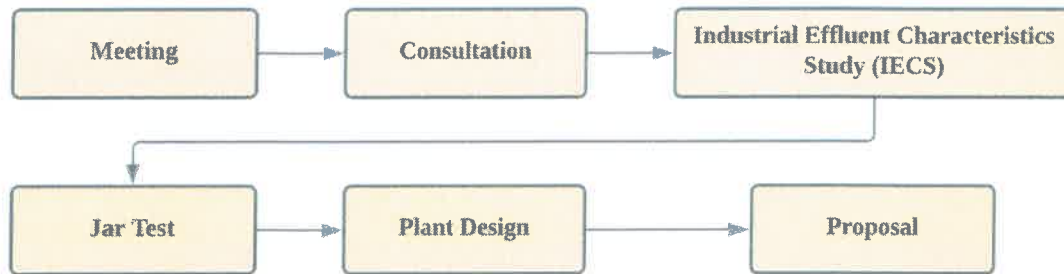


Figure 5. Process Flow of the Company

Behind the company's success, proper workflow must be done to earn client's trust and making the work efficiency higher. As shown in the figure 5, the company went through 6 process before building a new wastewater treatment plant (WWTP). Firstly, Ir. Dr. Beh Chin Lai and engineering team will have a meeting with the client to know the needs and requirement for the new wastewater treatment plant from customers. Then, consultation will be made by Bechem Technologies after discussion with the team towards the client to show the best solution and method to treat the raw wastewater.

Next, after agreement have been reached, Bechem Technologies will do a study called Industrial Effluent Characteristics Study (IECS) where the purpose of this step is to know the physical and chemical characteristics of the raw wastewater and the volume and mass of raw wastewater discharged from the industry. After the characteristics of the raw wastewater know, jar tests will be made on the sample of the wastewater to determine the best chemical and dosage needed to treat the wastewater. While jar tests are being made, the engineer will plant the design accordingly to achieve the best efficiency and cost effective. Lastly, all the results and design will be compiled to be proposed to the clients to have client's agreement.

2.3 Brief Daily & Weekly Activities

For my daily and weekly activities, most of the time is that i was given a task to study on how the technical report were done such as IECS report and also DOE submission report. Both of these reports are important for wastewater treatment industry as they both needed for approval before building any wastewater treatment plant.

I managed to write both of these report which IECS report for Vnotion Materials while DOE submission is for a process plant at Penang, Malaysia called Southern Steel Rod (SSR). From DOE report, I managed to learn a lot where all the requirements needed before building a new wastewater treatment plant such as the calculation of wastewater discharged, the dimension of each equipments, the characteristics of the wastewater (raw and treated), the operation and manual of the plant and also description of each equipments used.

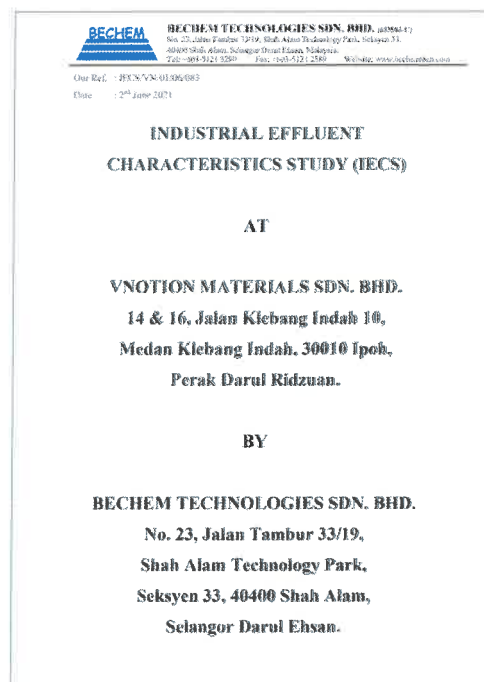


Figure 6. Cover page of IECS report.

Furthermore, sometimes I also was given some sample water from the technician that went to some of the process plants such as Matrix Flavours & Fragrances to do some lab testing such as the COD test, turbidity test and also hardness test. The result then will be shown to our supervisor for further actions. From here, I managed to learn

on how to do the procedure and importance of these kind of testings. The result can be used for research and also troubleshooting purpose.



Figure 7. COD test on the treated water at Matrix Flavours & Fragrances Sdn. Bhd.

There will be two method for COD testing which are the first one, we heat up the tube at the temperature of 160°C for 30 minutes. Second one is we heat up the tube at 148°C for 2 hours. The first method is suitable for on-site testing due to shorter time and second method will be used at office's lab and this method is more accurate compared to the first one.

Moreover, I have done a slides title of 'Operation Manual of TWWTP' for Matrix Flavours & Fragrances with other trainee. This slides were used for learning process of the technicians at their process plant. The slides consist of standard operating procedure (SOP) and the maintenance of the plant. The making of this slides was due to bad result at the final discharged point due to wrong operating procedure done and lack of maintenance at the process plant.

2.4 Description Of Mini Project

There are a few mini project that were assigned to me such as project for Vnotion Materials Sdn. Bhd., Matrix Flavours & Fragrances Sdn. Bhd., Kohoku Electronics (M) Sdn. Bhd..

2.4.1 Vnotion Materials Sdn. Bhd.

Vnotion Materials Sdn. Bhd. is a sister company of Le Inoova Sdn. Bhd. that was established on the 5th of January 2018. Vnotion Material Sdn. Bhd.'s headquarter is located in Klang, Selangor but however their chemical process plant is located in Ipoh, Perak. This company's main businesses are rubber processing which will be used for rubber glove making and also chemical trading purposes.



Figure 8. Location of Process Plant.

Vnotion Materials requested to perform an Industrial Effluent Characteristics Study (IECS) where we will go to the plant to study the raw wastewater characteristics. I went to Ipoh, Perak with one of my colleague, Mr. Shamel from 3rd of May 2021 until 6th of May 2021. One of the requirement for this study is to actually study the wastewater for 3 days (4th of May 2021 – 6th of May 2021). The purpose of this study is to actually determine the physical and chemical characteristics of the raw wastewater, the amount of mass and volume discharged from the plant and lastly, determine the concentration of the constituents in the raw wastewater mixture collected.

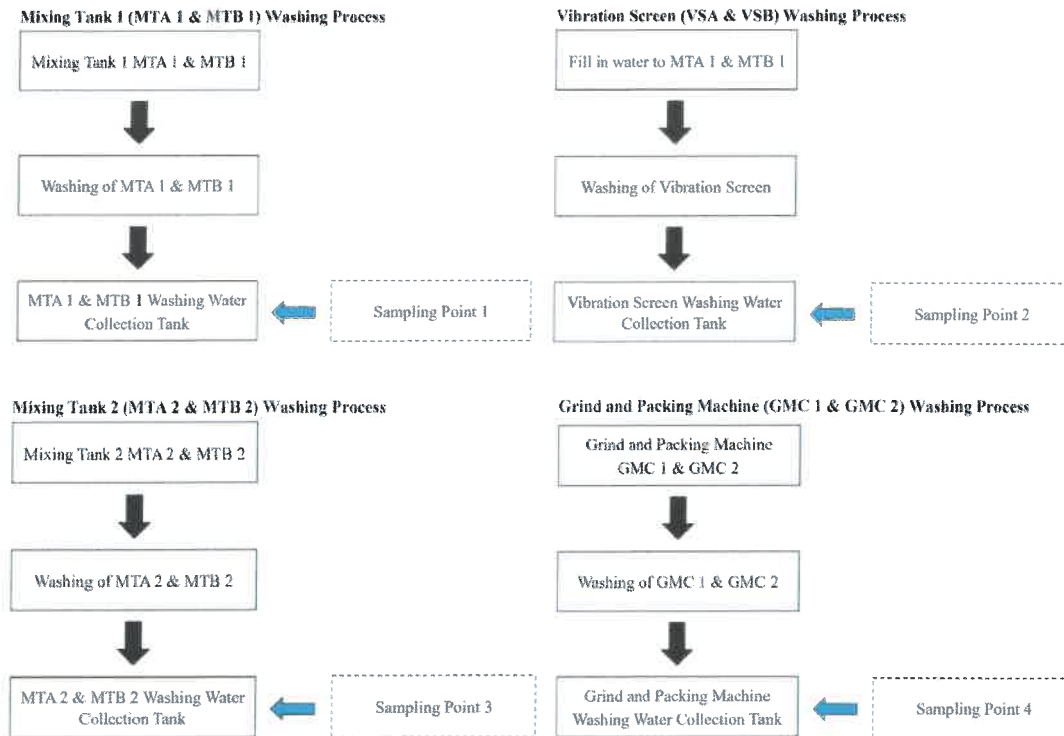


Figure 9. Process Flow & Sampling Point at Vnotion Materials Sdn. Bhd.

After the sampling point has determined, the wastewater will be collected into blue drums for mixing tank and grind and packing machine while vibration screen will be collected into an intermediate bulk containers IBC tank due to large volume of wastewater discharged. These amounts will then be calculated using a PVC pipe and measuring tape and the numbers will be recorded into data sheet.



Figure 10. Volume of wastewater discharged

After the total volume from all sampling points has been calculated, the ratio will be calculated before mixing them to become a mixture. From the mixture, vibration screen washing water will have the highest ratio due to higher number of volume discharged. The mixture then will be put into a container for lab purposes. All this steps are repeated for three days.

Moreover, mixture of the wastewater will be taken back to office for jar test experiment. The purpose of this test is to determine the chemical and dosage for the water treatment. We started by using different chemical first to see which will have a reaction. The chemicals used are RM-10 variants, poly aluminium chloride (PAC), Alum and Ferric Chloride. From this 3 chemicals, we neglected the RM-10 variants as it shows no changes at all for the wastewater.



Figure 11. Result shown from left is RM10-4005, RM10-3001, RM10-5001 and RM10-2009 after 1 hour of settling time.

Then, we decided to use PAC, alum and ferric chloride at concentration of 1000 ppm and the results start showing. However, the PAC and alum chemicals took a long time for the settlement. Hence, we chose ferric chloride for this water treatment. We started to use different dosage for ferric chloride such as 600 ppm, 800 ppm, 1000 ppm and 1200 ppm but the best result is at 1000 ppm only as it shows clear water and fast settling time.



Figure 12. From left is when lime powder was added with lime and the remaining beakers are when there is no lime powder added.



Figure 13. Comparison between 30 minutes and 1-day settling time for the chemical usage of PAC 16%.



Figure 14. Figure shown is the comparison between 30 mins and 1-day settling time for the usage chemicals of Ferric Chloride 38-40%.

After doing chemical oxygen demand (COD) and turbidity test on treated water using ferric chloride, the number shows good results. For COD test, before treatment the COD is more than 1500 mg/L while after treatment is below than 100 mg/L. The turbidity before treatment is at 246 NTU, while after is 0 NTU. However, we still need to do some pH adjustment using caustic after treatment due to the pH value became acidic (4-5).

2.4.2 Matrix Flavours & Fragrances Sdn. Bhd.

Matrix Flavours & Fragrances Sdn. Bhd. is a process plant for food flavouring that is located nearby to our office which is at Telok Panglima Garang, Selangor. For this project, we (trainees) are required to perform a study for the temporary wastewater treatment plant (TWWTP) before building a permanent wastewater treatment plant. We came there weekly either to study the troubleshoot or doing some preventive maintenance.



Figure 15. Location of TWWTP.

During the early days of our intern, we were required to study the process flow and the procedure of the TWWTP to make our studies for troubleshooting, maintenance and improvement easier. With the help from our supervisor and technician, we managed to understand the process flow easier as it was our first experience there.

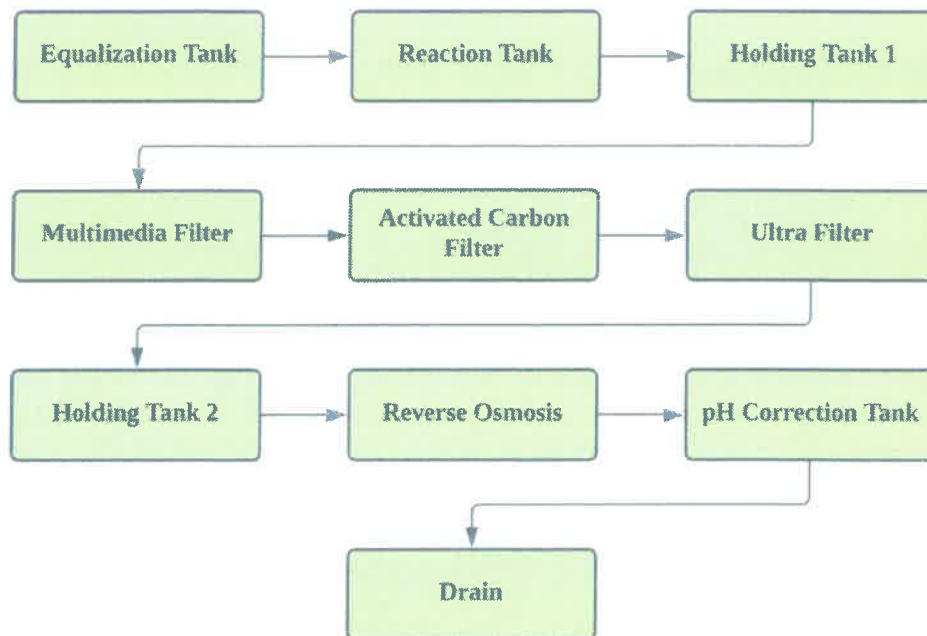


Figure 16. Process flow of TWWTP.

From figure 14, the process starts where the wastewater from equalization will fill the reaction tank with the amount of 5000 litres. Then in the reaction tank, all the chemicals will be mixed such as Befes-2P, Beper-205 and BCT-RM10 (8008M). After all the reactions happened, the wastewater will be transferred to holding tank 1 for aeration purpose to lower down the temperature due to exothermic reaction. Then, the wastewater will go through various of filters which are the multimedia filter, activated carbon filter (to remove colour and smell) and ultra filter. Then, the wastewater will go through a reverse osmosis system and lastly, doing some pH adjustment at the pH correction tank before being discharged.

Furthermore, we also did some troubleshooting and preventive maintenance. The troubleshoot done were at the reverse osmosis system due to low flowrate. We changed the position of the pump and cleaned the filter to gain higher flowrate. For preventive maintenance, we changed the activated carbon and also doing some cleaning at the plant due to high number of COD at the final discharged. We cleaned the filter press equipments, holding tank and also membrane filters. However, before we changed the activated carbon, we did learn on how to do piping bypass to prevent any leaking from the pipes.



Figure 17. Process of changing activated carbon for Activated Carbon Filter.



Figure 18. Cleaning process of filter press equipments.



Figure 19. Troubleshooting process of reverse osmosis system.

2.4.3 Kohoku Electronics (M) Sdn. Bhd.

Kohoku Electronics (M) Sdn. Bhd. is a company that manufacture electronics equipment such as antennas, switches and waveguides. This company also located nearby to our office which is at Telok Panglima Garang, Selangor. As this is our last mini project, we did not manage to finish this project due to further movement control order (FMCO). However, we did some work during the start of this project.

For this project, Kohoku Electronics requested to make a face piping for their wastewater treatment plant. They wanted to change from multiport valve to a manual valve. This means they will need to change the orientation of the valve manually during filtration, backwash and also service. The purpose of this is to reduce their budget on maintenance.

We studied the process flow of the wastewater treatment plant with the senior technician, Mr. Azmi and Mr. Irfan to prevent any error during installation such as wrong direction of the flow and measurement error.



Figure 20. Study of the process flow for the wastewater treatment plant.



Figure 21. Bracket measurement for the piping.

3.0 CONCLUSION & RECOMMENDATION

In conclusion, I managed to learn a lot during my internship mostly regarding wastewater treatment plant for industry. I can relate a lot from my knowledge and theories learned from five semesters of my diploma in chemical engineering. I learned about the process flow, the safety precautions and also some technical reports. Doing my internship at Bechem Technologies Sdn. Bhd. are really balanced as I did hands-on and also office works.

Working experiences really changed my perspective in engineering because I learn most during my internship due to different situation and problems during work. This somehow trained my ethics, communications and increased my confidence level at work. I can manage my time better and strengthen my basic skills and character. I do recommend for other students to have a training here as it really helps for chemical engineering students.