INDUSTRIAL TRAINING REPORT

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DECLARATION

I sincerely declare that:

I am the sole writer of this report

The details of training and experience contained in this report describe my involvement as a trainee in the field of **mechanical engineering**.

All the information contains in this report is certain and correct to the knowledge of the author

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ACKNOWLEDGEMENTS

First and foremost, I would like to thank Taylor's University for providing a golden opportunity for me to experience working in an Engineering field and having an experience to be an engineer during the Internship. I would like to thank my academic supervisor, Dr. Koay Seong Chun for giving me advice during my internship training. Besides, I would like to express a great appreciation to the career service center in Taylor's University for giving support constantly. I would like to thank the module coordinator, Dr. Ku Pei Xuan for keeping us updated constantly.

Secondly, I would like to express a great appreciation to my Industrial Supervisors, Mr. Kenny James Ling Neng Hui and Mr. Low Lee Leong for giving endless opportunities to me for handling projects that benefited me lots. I would like to also thank Dr. Wai Meng for giving me the opportunity of being an intern in DRDM. I am grateful for everyone who helped and taught me during my internship.

ABSTRACT

I had completed my internship in Daikin Research and Development Malaysia Sdn. Bhd. (DRDM) as a Technology Research Intern. The company was established back in 1998. DRDM is the largest HVAC R&D center in South East Asia. There are two sections in the Technology Department, namely Research & Application and Computer Aided Engineering (CAE). Throughout the Internship, I was assigned to help in two projects, which are the Heat Reclaim Project and Material Accuracy for Explicit Simulation Project which both were provided by the Research & Application section and CAE respectively. I was assigned to collect raw data from site and further analyze the raw data in the Heat Reclaim Project. For the Material Accuracy for Explicit Simulation Project, I was responsible to identify the material properties of the metal part of Daikin's outdoor unit and to correlate or validate the output results between the experimental and simulation tensile testing.

Throughout the Internship, I gained knowledge and skills such as Financial Management on product development and Material Law for Simulation. Besides, I understood better in theories that were taught back in campus like Thermodynamic cycles and Finite Element Analysis. Other than the knowledge gained, my discipline and interpersonal skills had been improved due to the working environment in DRDM, as DRDM is a Japanese company which required the employee to have rather strong discipline. Hence, I was able to build up connections with experts from different backgrounds during the internship. At the same time, the internship helped me to improve my resume by adding the experience with the valuable knowledge or skills that I gained.

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CHAPTER 1 INTRODUCTION

1.1 Background of Industrial Training

Internship training was implemented in all the programs at Taylor's University for all the undergraduates. Students are required to pass the internship training for the graduation by taking the internship training in any organizations which are relevant to the studies.

Penultimate Mechanical Engineering students of Taylor's University are required to complete the industrial training with at least a period of 12 weeks at the respective organizations. Students are free to choose to work in either government or private organizations with no restriction imposed. 6 credit hours will be provided to students upon completion of the industrial training.

The aim of the industrial training is to help the students to apply knowledge learnt from the studies in the real world and strengthen their skills at the same time. Two supervisors, namely Academic Supervisor and Industrial Supervisor are the one who assess the trainee based on their working ethnic, performance and written reports.

Apart from the exposure to the real work challenge, it is also an opportunity for the students to gain more hands-on experience. Besides, developing the work ethics, communication and management are important to the students as well. Students can relate the theoretical knowledge and rationale when applying during the industrial training.

Teoh Zhi Heng (0331188) has started industrial training in Daikin Research and Development Malaysia Sdn. Bhd (DRDM) in the department of Technology Research from 23rd December 2019 to 20th March 2020.

1.2 Background of Daikin Research and Development Malaysia Sdn. Bhd. (DRDM)

Daikin Research and Development Malaysia Sdn. Bhd., also known as DRDM in short. It devotes its research and development to innovative HVAC (Heating, Ventilation and Air-Conditioning) technologies that helps support the environment and provide reliable solutions for worldwide consumers.

DRDM has operated since 1998. DRDM has a total built up area of 7340 square meters which makes it the largest HVAC R&D Centre in South East Asia. The DRDM building and research facilities such as laboratories were invested with USD 13 million to develop innovative products with high quality to fulfil the market needs. In total, there are 15 test rooms that are able to conduct various testings and simulations which apply from intense heat and humidifying the freezing environment. DRDM has two special test rooms that can carry out noise level tests accurately, namely Anechoic and Reverberation test rooms. On top of it, Intertek certified these test rooms as ETL Approved Performance Test Facility and Recognized SATELLITE Laboratory. The core activities of DRDM involves product designing and development which involves residential, light and heavy commercial air conditioner units, mini chillers, water source, inverters and many more. The product certification, part qualification, reliability testing, research and advanced technology innovation are key support and backbone of each and every product design and development. DRDM claims to be one of the best research centres in the world which requires a large sum (close to 10 million Malaysian Ringgit) annually for its operations and maintenance.

Revolutionary Built-in Starter and Fast Cooling Technology are the success of R&D. Over the years, DRDM created and produced many innovative products and resulted in DRDM to set a benchmark in the HVAC industry.

The core values of Daikin Research and Development Malaysia Sdn. Bhd.:

1. Understand and fulfill customer requirements including any regulatory requirements.
2. Operate within a documented quality management system.
3. Establishing and reviewing measurable objectives.
4. Continually improve on the product, process and system.
5. 3C
    a. **Comply** with applicable environmental legal and other related environmental requirements and regulations to efficient utilization of electrical energy.
    b. **Conserve** the natural resource
    c. **Continue** to improve the environmental management system

6. 4R
    a. **Reduction** of environmental pollution and electrical energy consumption by managing efficient electrical energy utilization.
    b. **Recycle**, **Recover** and **Reuse** of natural resources.

1.2.1 Daikin Research and Development Malaysia Sdn. Bhd History

Back in 1974, Daikin Research and Development Malaysia Sdn. Bhd. was owned by OYL Industrial Sdn. Bhd. In 1992, OYL Research and Development Centre (OYL R&D Centre) was first set-up in Shah Alam, and was also a member of the Hong Leong Group Malaysia. Then, it moved to Sungai Buloh in 1998, becoming the largest R&D centre within South East Asia. Furthermore, OYL R&D became a member of Daikin Group in 2006. In 2015, OYL R&D Centre changed and rebranded its company name to Daikin Research and Development Malaysia Sdn. Bhd (DRDM) after hosting the 1st Daikin Asia Oceania Technology Forum.

Plenty of amazed developments developed in this company in ascending timeline:

- In 1980, developed the 1st outdoor condensing unit (MC Round)
- In 1985, developed the 1st Ceiling Exposed unit

- In 1990, developed the 1st Multi Split unit and 1st Wall Mounted unit
- In 1991, developed the 1st generation Air-source Heat Pump
- In 1996, developed the 1st Ceiling Cassette unit
- In 2001, developed the 1st generation Inverter Air Conditioning System
- In 2003, developed the 1st Rooftop unit
- In 2008, developed the 1st Daikin Wall Mounted (GSN) with Daikin Japan
- In 2015, developed the 1st Floor Standing unit

Besides, the company obtained and awarded with plenty of certification and awards:

- Obtained MS ISO 9001:2000 Quality Management Systems Certification from SIRIM in 2002.
- Awarded certificate of Supervised Manufacturer Testing (SMT) recognition for the safety and EMC testing by Intertek SEMKO in 2004.
- Awarded Malaysia Good Design Mark (MGDM) for the Wall Mounted G Series & Ceiling Convertible CE-E Series by Majlis Rekabentuk Malaysia (MRM) in 2005.
- Awarded certificate of ETL Approved Performance Test Facilities by Intertek ETL Cortland in 2006.
- Awarded Special Product Excellence Award for R410A Mini Chiller Inverter Unit by the Ministry of International Trade and Industry (MITI) in 2006.
- Awarded ISO 14001:2004 Environmental Management Systems Certification by SGS in 2008.
- Awarded ISO 9001:2008 Quality Management Systems Certification by SIRIM in 2009.
- Awarded OHSAS 18001:2007 Occupational Health and Safety Management Systems Certification by SGS in 2010.
- Awarded Test Data Acceptance Program by Intertek Thailand in 2011.
- Awarded GOOD DESIGN awards in 2015.

1.3 Background of Technology Research

Technology Research involves two departments, namely RA (Research & Application) and CAE (Computer-c Aided Engineering). The RA department is responsible for innovating or developing new products. Other than that, they improvise existing products as well. For cases like feedback from the end user that an existing product has problems, RA is responsible to solve that as well. Besides, RA conducts testing for new product development and enhancing them. Moreover, RA also does research findings on various fields that could contribute to the innovation.

There are three sections under the CAE department, namely FEA (Finite Element Analysis), Vibration and CFD (Computational Fluid Dynamics). The CAE department is one of the more important departments within DRDM as the core business of Daikin is HVAC(Heating, Ventilation and Air-Conditioning). In HVAC products, air flow is important as it would affect the performance and efficiency of the product. Besides, some HVAC unit has the sweating (condensed water dripping) problem and this would annoy the end user. Regarding the problems above, these are some examples of what the CFD section handles. Whereas for the vibration section, they solve the unpleasant sound produced by the product by analyzing and improvising it with simulation, and this is one of the examples of their daily job scope. Other than that, In FEA, they are responsible to analyze and improvise the design of the product by improving the strength or strain of the product with simulation to minimize the damage of the product in any collision events. The CEA department from DRDM would handle projects provided by the overseas parent company - Daikin.

Organisation Chart of Technology Research:

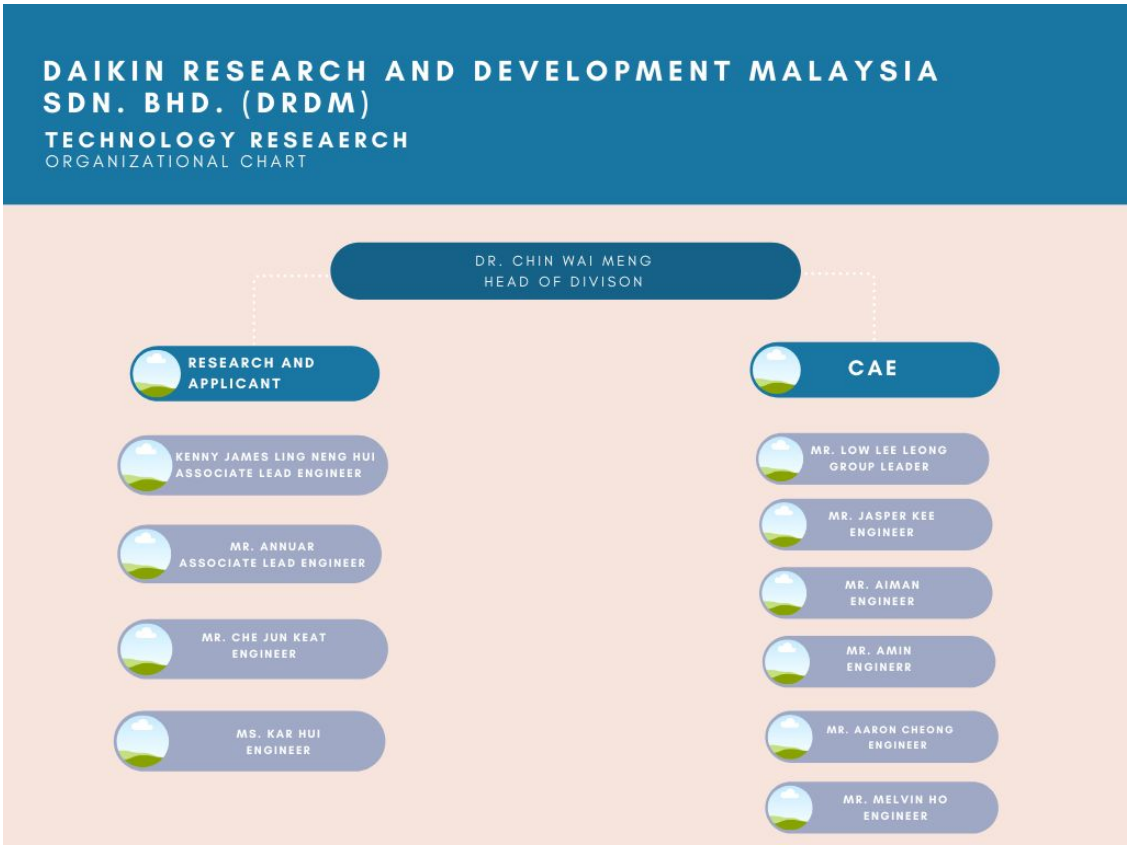

Figure 1: Organisation Chart

CHAPTER 2 CONTENT ANALYSIS

2.1 Compare Actual Practices with Theory Learned

Refrigeration cycles

Refrigeration cycle is a thermodynamic cycle that air conditioners use. Refrigerant is used to absorb or release heat by changing the state and pressure of it. The refrigerant cycle introduces the heat from the indoor air that is absorbed by the cold refrigerant in the coil when the air flows through the indoor coils. The second law of Thermodynamics can be found in the process as the heat is transferred to the cold body from a warm body. After that, the refrigerant changes its state to vapor from liquid by absorbing the heat and transferring it to the compressor. The refrigerant is now vaporized due to compression by the compressor and its temperature rises to critical high. In this stage, the second law of Thermodynamic applies again as the outdoor air with lower temperature would absorb the heat from the refrigerant when the air flows through the coils (Kagawa, Uematsu and Watanabe, 1992). The hot outdoor air after flowing through the coils is being discharged out as a waste heat. Heat Reclaim Project is the project that I was involved in throughout my internship and the waste heat that mentioned above is the core value of the Heat Reclaim Project.

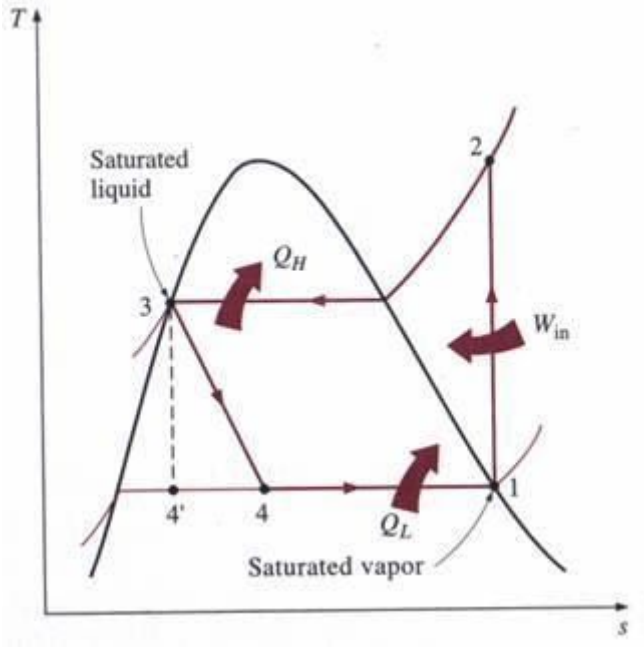

Figure 2: Refrigerant Cycle T-S Diagram

The Heat Reclaim Project fully applied the theory and mechanics of the Refrigeration cycles. Heat Reclaim Project is to develop a wall mounted air conditioning unit which can produce and store hot water. Energy conservation is one of the core values in the project as the aim of the project is to conserve the heat energy that was discharged or rejected in the condenser stage. Existing air conditioning unit rejects heat energy in the outdoor unit, while, in this project, the heat energy is conserved to heat up water for other usage. In other words, the unit can produce free hot water with no additional devices or appliances like a water heater to heat up the water. The end user could save up the electricity bill eventually by omitting one daily necessity device. Heat Reclaim Project mainly focuses on countries located near the equator and the product is targeted on light commercials such as saloon as of now. Based on research, saloons install water heaters to fulfil their working needs as they require hot water to conduct their day to day tasks especially hair washing.

Financial Management

Payback Period is a kind of financial management, also known as Payback Time. In general, Payback Period defines the amount of time needed for an investment to generate the amount of profit to be equal to the cost (Chang and Lin, 2013). Payback period is important in product development as it can be used to compare with existing products and prove that the development is better than the existing product.

Payback Period is required in the Heat Reclaim Project, this is because the product of the project is pricey as it costs approximate 3 times of the existing unit. With this huge difference in price, Payback Period plays an important role here as this can be the evidence to convince the customer or end user. However, the calculation of the Payback Period for this project is differ from the above. The Payback Period in the project is to show the amount of time needed to cover the cost of the product by saving the current cost (the cost of the water heater and the electricity bill for it). The Heat Reclaim Project develops Wall Mounted Air Conditioning units with the function of producing and storing hot water without any additional energy. Therefore, the end user does not need any water heater to generate

hot water. In short, the end user saved up the cost of buying and installing a water heater as well as saving the electricity bill.

Finite Element Method (FEM):

The numerical problem-solving methodology, Finite Element Method (FEM) is commonly used for applications like heat transfer, structural analysis, fluid flow, mass transport and anything existing as a real-world force according to engineering disciplines. Equations yielded systematically by this practice and attempted to approximate values of unknowns. Overall problem is subdivided into simpler sub-issues, also known as finite elements by this method to solve easier. Implicit / Explicit analysis are required in the finite elements. Finite Element Method is the foundation of Simulation Software. Engineers evaluate their design for tension, weak spots and so on with the simulation software before the stage of implementation or prototyping.

Time relationships break down to solve a mathematical problem for all non-linear and non-static analyses. Two groups are formed to do this, namely Time dependent and Time independent. Implicit / Explicit methods are commonly used to solve these problems. For Time dependent, it refers that the effects of acceleration are not negligible. For example, the greatest force occurs within the first few milliseconds as the item decelerates to a halt in a drop test. The declaration in this case must be accounted. Whereas Time independent refers to the loads are applied slowly onto a structure or surface. Acceleration can be neglected as the loading time is slow enough.

All these problems are expressed as Partial Differential Equations (PDE's) and the computers nowadays cannot solve the PDE's, but it's equipped to solve linear or non-linear matrix equations. There are 3 categories for non-linear equations in most of the structural problems:

- **Material Nonlinearity**: Significant in deformations and strains, applicable to polymer materials.
- **Geometric Nonlinearity**: Strains are small, but significant in rotations, applicable too thin structures.
- **Boundary Nonlinearity**: Due to non-linearity of boundary conditions, applicable to contact problems.

In different problems, PDE's simplified to a matrix equation as:

Table 1: Simplified Equation

Problems	**Simplified Equation**
Linear Problems	[K]{x} = {f}
Non-linear Static Problems	[K(x)]{x} = {f}
Dynamic Problems	[M]{x˝} + [C]{x˙} + [K]{x} = {f}

In Daikin, I worked under the CAE department and was involved in a project called Material Accuracy for Explicit Simulation. Explicit method is used in this project and the simulation was done by using the Altair Software. Explicit analysis can be used when there is a dynamic equilibrium, or the sum of all forces are equal to the mass times acceleration:

Sum of all forces = mass x acceleration

Explicit methods can only be used when the strain rate is more than 10 units per second. Strain rates have a significant effect in this method. Besides, Explicit methods can solve most complex contact conditions and extremely discontinuous events. The best examples of extreme scenarios are ballistic events, automotive crash or meteor impact (Reddy and Prathap, 1995).

Material Law:

Material Law must be selected appropriately to run a simulation. Different materials apply different material laws. According to the project I was involved in, steel is the material that I was dealing with. Therefore, Material Law 36, as known as Johnson-Cook Model was chosen to be applied in the project to run the simulation.

This is because steel meets the requirement of being the Johnson-Cook Model. Johnson-Cook Model describes the metallic material relationship between the stress and strain under the condition of large deformation, elevated temperature and high strain rate (Abbasi-Bani, Zarei-Hanzaki, Pishbin and Haghdadi, 2014).

In Material Law 36, material constants are required to be key into the Hyper-mesh (Altair Software), such as A, B, *n*, C and *m*. A indicates as the yield stress of the material under reference conditions, B indicates as the strain hardening constant, *n* is the strain hardening coefficient, C indicates as the strengthening coefficient of strain rate, and *m* is the thermal softening coefficient. Other than these constants, the stress and strain of the Johnson-Cook that was calculated based on the experimental testing results were required to key into the hyper-mesh (Altair Software) to complete the Pre-Processing (Cao, Di, Misra and Zhang, 2014).

2.2 Critical Review of Work Experience

The internship in Daikin Research and Development Malaysia (DRDM) lasted for 13 weeks, starting from 23rd November 2019 to 20th March 2020. Throughout this internship, it helped me to develop my interpersonal skills, punctuality, self-discipline and patience. Self-discipline is very important especially in the Japanese Company due to the Japanese culture. I understood that working in a workplace for 9.5 hours per day is not easy throughout the internship as it required us to have mentally and physically fit to be committed. Besides, I've got the opportunity to build up my connection with experts or colleagues from different backgrounds, gaining more knowledge from different fields and broaden my vision as well.

On the first three days of my internship, I joined the orientation organized by the company. There are two big divisions in DAIKIN Sungai Buloh, namely the Production section and Research & Development section. On the first day of my internship, I was briefed about the company's profile, ethics, motto, history, safety regulations and more. Besides, they brought me on a ground tour around the production line and showed me how the production line operates from A to Z. The second day of Orientation, I was briefed about the safety precautions, features and

procedures which are important when working in a factory compound. I was given the fire evacuation plan, as of what to do and how to evacuate when fire happens. Besides, there are also practical hands-on sections where I had the opportunity to utilize common tools used by Daikin during manufacturing. This is a golden opportunity which I am not able to get in touch with in university. On the last day of Orientation, I was brought on a tour around the Research & Development section which I will be working in for the next 3 months. On the tour I was brought to visit all test rooms that are available in the R&D section.

In the first month, I was briefed about the project that I will be involved in and be told what tasks I should do. My supervisor, Kenny, will be the one supervising and guiding me throughout my project. The project that I am involved in is called Heat Reclaim Project. In this project, I was assigned to assist in Field Test data collection (before installation of the prototype) and assist in Reliability and Functional Testing. The Field Test data collection will be started in January 2020 and I was assigned to collect the data everyday from the site for a straight duration of two months. The Reliability and Functional Testing was planned to start in February 2020. Therefore, I started with the Field Test data collection. The location for the Field Test data collection was at a hair saloon located at Sungai Buloh. Throughout, I installed 3 Power Meters to record the power consumption of the Water Heater, CE unit (Ceiling Expose) and CK unit (Ceiling Cassette). These 3 units are the existing mechanisms that operate daily for the selected saloon. Therefore, these 3 units needed to be monitored in every visit. Analysis of the data collected from the saloon would be done at the end of the internship. Moreover, thermocouple was installed in 3 locations in the saloon, namely Indoor 1, Indoor 2 and Outdoor for the purpose of recording the temperature for further analysis.

Data collection at the saloon started on 7th January 2020. The collected data was compiled and calculated its average daily. Apart from the assigned project, I helped to install 10 thermocouples into the Water Tank of the Heat Reclaim Project

for future testing and analysis. In mid January, I was told that the Reliability and Functional Testing was postponed to April due to the technical problem of the software for the prototype. Therefore, I was assigned to help in the CAE department in the meantime. In the CAE department, I was working under the FEA section that deals with the structural testing simulation.

The FEA section mainly deals with simulation in drop test and material testing. In FEA, Aiman was my supervisor and he assigned me with a project called, Material Accuracy for Explicit Simulation. The objectives of this project were to identify the material properties of the metal part of Daikin's outdoor unit and to correlate or validate the output results between the experimental and simulation tensile testing. The methodologies of carrying out the project are:

1. Conducting Experimental Tensile Testing
2. Analyzing the Experimental Tensile Testing Raw Data
3. Conducting the Simulation Experimental Tensile Testing
4. Validating the Simulation Test Results with the Experimental Test Results

Three materials were involved in the testing and there are all steels, namely SGCD1-Z18, SGCC-Z18 and SGCC-F06. Material SGCD-Z18 was used to fabricate the Base Plate and Fan Motor Bracket. Material SGCC-Z18 was used to fabricate the Control Box, Partition Panel and End plate while Material SGCC-F06 was used to fabricate the Valve Plate. For Experimental Tensile Testing, Universal Tensile Testing with grip was used to carry out the testing.

Figure 3: Universal Tensile Testing

All the material specimens were tested in the shape of dog bone. 5 specimens were tested with a constant speed and the testing would be completed with 5 different speeds, hence, there were 15 results in total for each specimen. Due to the shortage of material specimens for SGCC-F06, there were 3 specimens tested with a constant speed for SGCC-F06.

The main challenge throughout the experimental tensile testing was where the slippage occurred during the linear part of Stress-Strain graph in the experiment tensile testing and this could lead to the results to be useless. The easiest way to solve this problem is to install the Axial Extensometer as shown in the figure below.

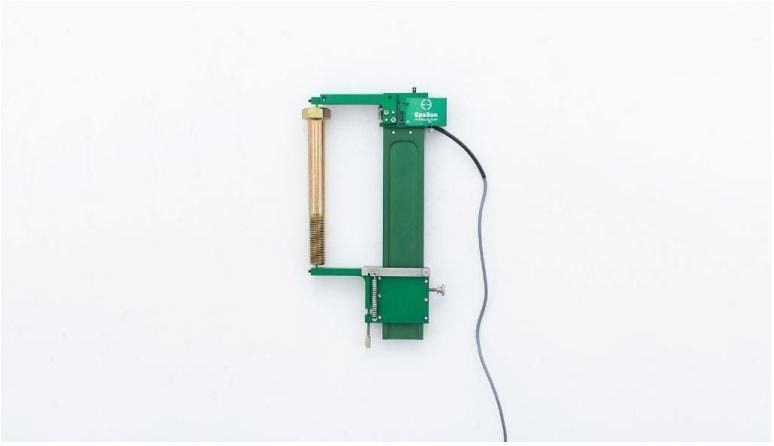

Figure 4: Axial Extensometer

The extensometer wasn't available in the lab therefore, the supervisor, Aiman suggested to use an alternative way by applying the data provided from the material manufacturer to construct the linear part of the Stress-Strain graph. Aiman explained that the linear part was fine to input with the manufacturer's data as the linear part was controlled and the part after the yield strength or the Ultimate Tensile Testing were unpredictable. The unpredictable part is rather important for the validation.

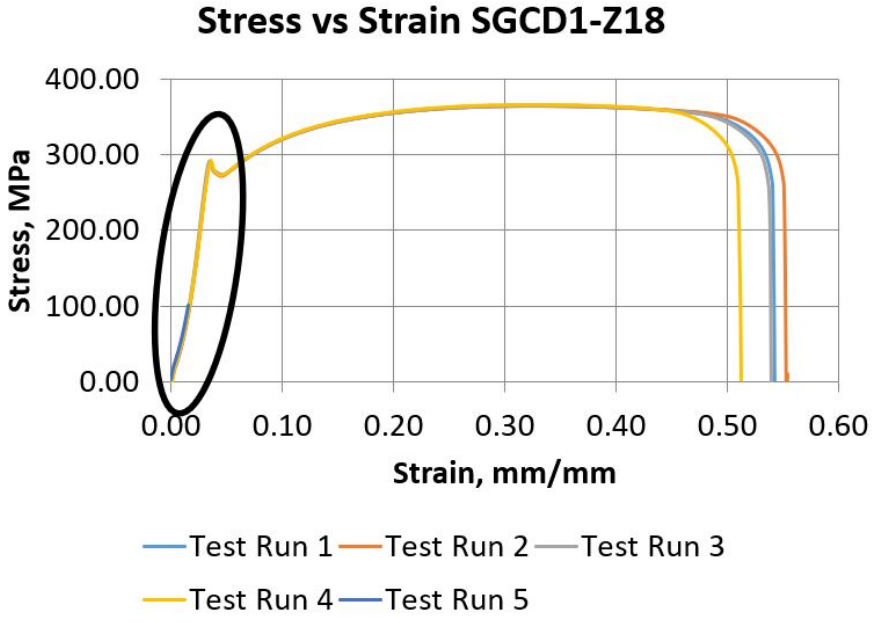

Figure 5: Stress vs Strain Graph SGCD1-Z18

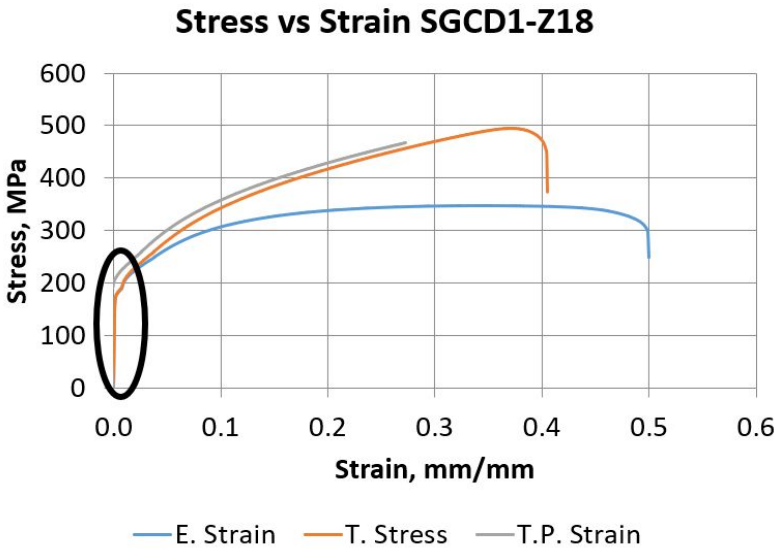

Figure 6: Stress vs Strain SGCD1-Z18

After the Experimental Tensile Testing was conducted, I had to analyze the raw data from the Experimental Tensile Testing by averaging the data. Then calculate the Low Strain Rate, followed by Swift Voce, the Johnson Cook and finally the Strain Rate to determine the Material Constant. All these steps were calculated with the given formula and excel format. Due to confidentiality, I am not able to show the formula and excel format in this report but the flow of analyzing the raw data to determine the strain rate and Material Constant are as shown below:

Average Data ⟹ Low Strain Rate ⟹ Swift Voce ⟹ Johnson Cook ⟹ Strain Rate

Material constants were determined after the analysis of the raw data and the constants were used to conduct the Simulation Tensile Testing. The Simulation Tensile Testing was run with the Material Law 36 (Johnson Cook). Constants and Material Law were set up in Hyper-Mesh (Altair Software) during the pre-processing stage. Boundary conditions were set up during the stage as well. In the Solution Stage, the model was run with the RADIOSS (Altair Software) to determine the results for the Simulation Tensile Testing.

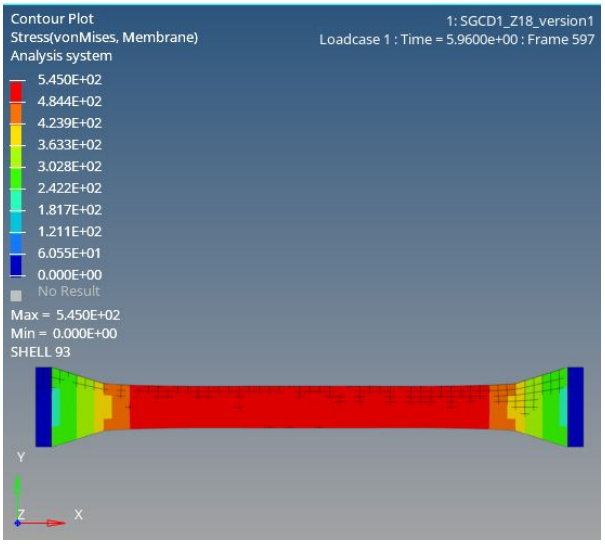

Figure 7: Sample of Simulation Tensile Testing

Lastly, Validation had to be done after the Simulation Tensile Testing. The validation was done by comparing the Experimental and Simulation Tensile Testing for each material. Taking the difference of the stress at the Ultimate Tensile Stress and Yield Stress between the Experimental and Simulation Tensile Testing to determine the percentage error. In this stage, we call it as Results Validation. For fundamental level, the acceptance percentage error should be lower than 20%. For the CAE department in Daikin, the acceptance percentage error should be lower than 5%. According to the validation, all the materials had the percentage error that is lower than 5% except the material SGCC-F06. The SGCC-F06 had a percentage error of 5.5%. However, Aiman told me it could be accepted as the difference is mild and negligible.

At the end of the Internship, I analyzed the data collected from the Saloon. In the analysis, I was determined to find out the relationship between the Water Usage and Water Heater Power Consumption, and the relationship between Temperature and CK/CE unit Power Consumption.

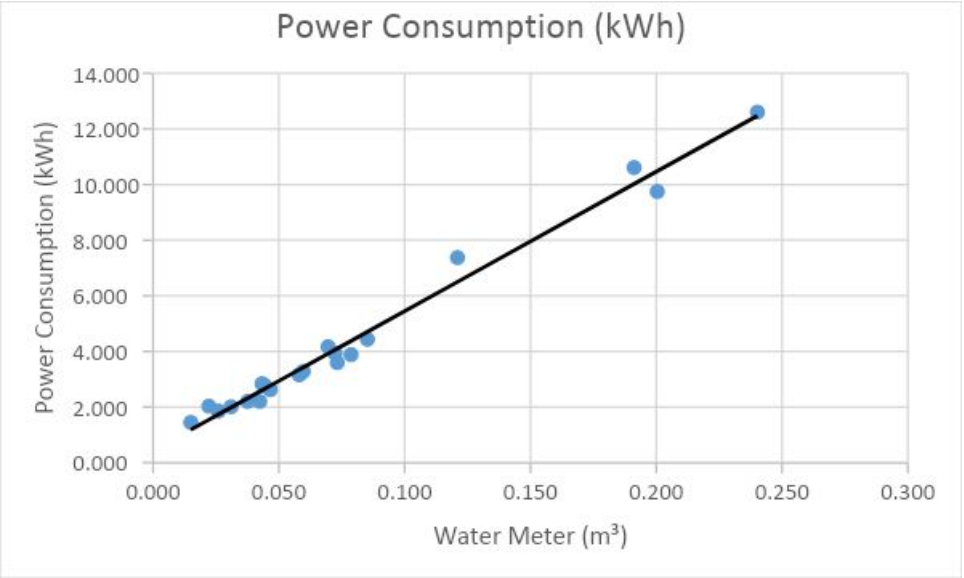

Figure 8: Power Consumption vs Water Meter Graph

According to the figure above, it shows that the Water Heater Power Consumption has a linear relationship with the Water Usage. The higher the Water Usage, the higher the Water Heater Power Consumption. This information is useful for product development in future for analysis purpose and calculation for Payback Period.

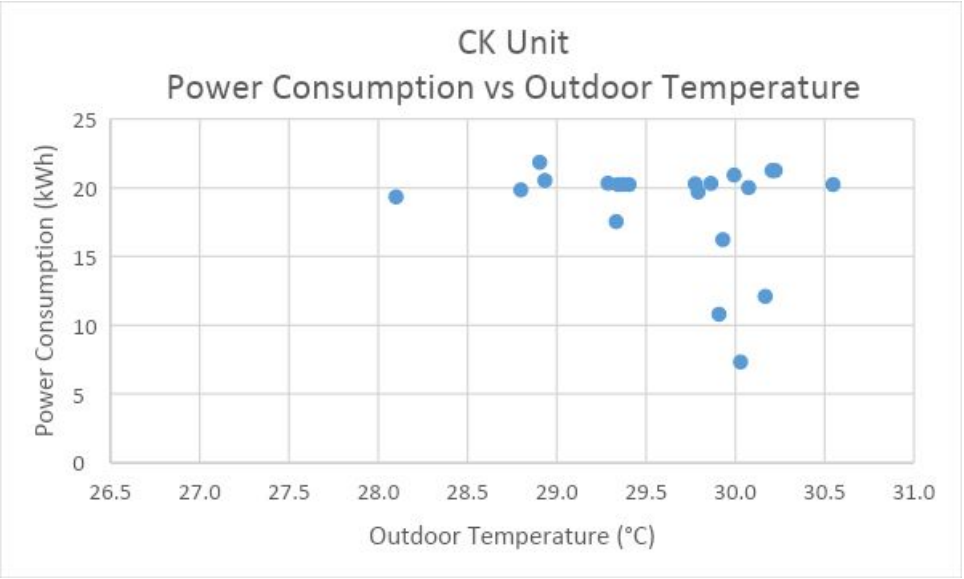

Figure 9: Power Consumption vs Outdoor Temperature Graph

According to the figure above, it shows that there was no clear relationship between the Outdoor Temperature and the CK unit Power Consumption. The

correlation was also the same for Indoor temperature and the CE unit, hence the graph of the result was similar to the graph above. One of the reasons for having no relationship might be because both the air-conditioning units were not controlled with the same temperature.

2.3 Outcome

Throughout the internship, the process of it was relatively important, yet the outcome was the most valuable part. The internship benefits me by giving me insider experiences and added value to me as a whole. First and foremost, I got the opportunity to expose myself to simulation software like Altair Software that I had not learned on the campus. While working in the simulation project, I was exposed to the real-world challenge as I was contributing to a real Engineer project. I understood that the simulation that was taught on campus was fundamental compared to what I was doing in the simulation project. This could brush up my resume by having experience in doing simulation projects that are involved with real-world challenges.

In the midst of working in the simulation project, I built up connections with experts in the CAE department, leading me to understand what it was like being a part of the department. I was interested and keen in gaining knowledge in CFD (Computational Fluid Dynamics) and the experts were willing to show and share the knowledge with me regarding CFD. They had briefly introduced CFD to me and showed me their past CFD projects. They demonstrated the challenges occurring in the previous CFD projects and showed me what kind of skills or techniques are best to solve the problems. It was an eye-opening session and it benefited me that I received the opportunity to widen my exposure and to understand the theory and mechanics of CFD before taking the CFD module in my future semesters.

In the Heat Reclaim Project, I gained knowledge on how the theory and mechanics of the Refrigerant cycles were fully applied into the project. Due to confidentiality, I couldn’t disclose in detail on how the project will apply the theory

and mechanics of the Refrigerant cycles. On top of it, this Heat Reclaim Project impressed and inspired me that if we could fully utilize theories as supports, the product or outcome would be impressive. Other than that, I learnt that project management is very important especially in developing a new project or product. A new development of a project involves a lot of experts from different sections or departments, therefore strong communications and appropriate project management are important to ensure project flow to be smooth. Besides, I learnt to set some buffer time for unpredicted events, for example there were delays in the Heat Reclaim Project.

Daikin Research and Development Malaysia Sdn. Bhd. (DRDM) holds a Japanese culture. Therefore, discipline and punctuality are rather important here. We must strictly obey the rules and regulations in the company as the rules and regulations were mainly set to prevent any accident to happen and injure the employees. Also, I enhanced my discipline by obeying the rules and being punctual to work and to attend any organized events like meetings. Besides, I gained valuable knowledge and experience on meeting experts from different backgrounds or sections in the workplace. I am grateful that the people I met were kind, and are willing to teach and share their knowledge with me. Moreover, supervisors had given a lot of advice to me regarding the projects as well as the working ethics.

CONCLUSION

Before I started my internship, I did not have any expectation on what I would be experiencing in a working environment that I never had before. However, it turned out to be a worthy and memorable one. The internship helped to improve myself by being more independent and organized as I was dealing most of the tasks alone. I dropped my bad habits such as throwing everything at the last minute and not planning time properly aside day by day. Therefore, I could brush up my discipline and my time management. Besides, the internship helped me to develop my intellectual skills and my analytic skills as well. I could gain more knowledge and boarded my sight through the tasks assigned to me. Most importantly, I got the opportunity to experience the real life of an Engineer.

Daikin Research and Development Malaysia Sdn. Bhd. (DRDM) has a good environment to develop engineering skills. There are many departments in DRDM such as Design, Research, Control, Software, Simulation and so on. Therefore, I could enhance my skills in different areas by communicating with experts from different departments and they are willing to help and teach.

Moreover, I was able to enhance my simulation skills during the internship. The simulation that I was taught back in campus was fundamental and I received the chance to handle the real-world challenge. Through the simulation, I could understand that everything must be done precisely, such as validation must be done even from the beginning step. If there was a small mistake, everything must be redo over again. Other than that, I am glad that I could work closely with my supervisor, Kenny as he had 10 years working experience in DRDM and he was willing to share a lot of knowledge with me. He explained in detail on how they fully applied the theories of the Refrigerant Cycles to the project.

I couldn’t experience the life of being a real Engineer on usual days. I appreciate that this internship provided me an opportunity to learn and grow. I could experience the hands-on task and gain knowledge from all the tasks I was involved in. Through this internship, I could find the path that I am passionate about and I would continue to fight for my goals and achieve it.

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APPENDICES

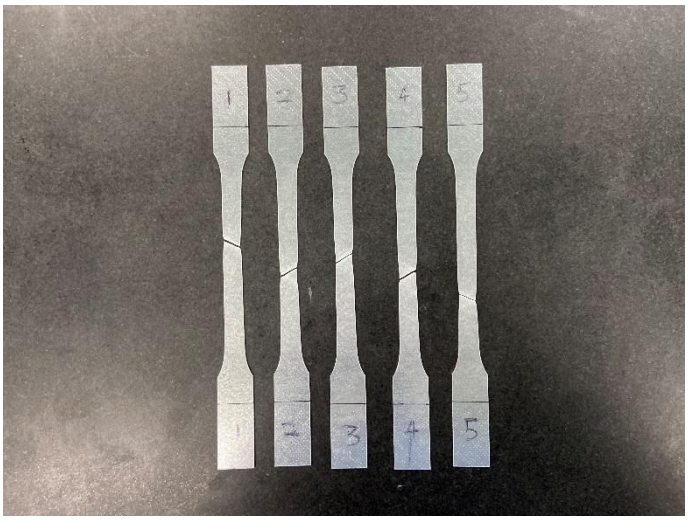

Figure 10: SGCD1-Z18 Specimens

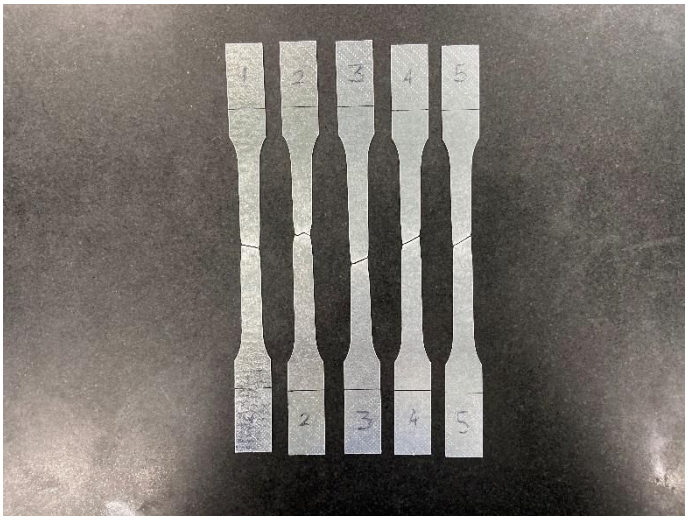

Figure 11: SGCC-Z18 Specimens

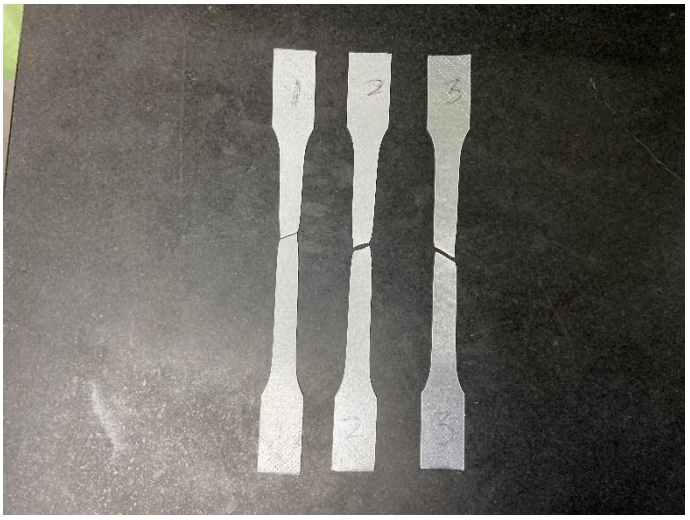

Figure 12: SGCC-F06 Specimens