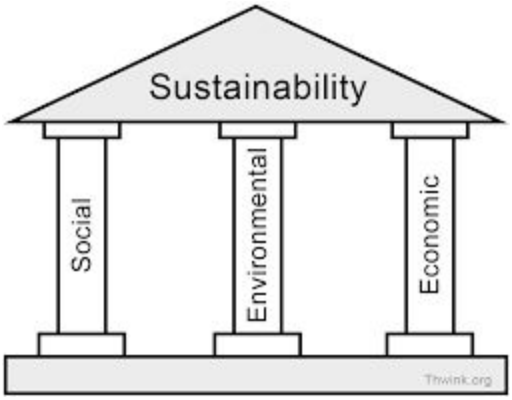
7.0 Sustainability



To meet the requirement of the current generation is called sustainability without compromising the flexibility of the future generation to fulfill their needs. Three pillars that compose the concept of sustainability are economic, environmental and social which is also known as profits, planet and people. Phase change material was chosen as the solution to the defrosting issue which affects the efficiency of the heat pump based on these three pillars of sustainability.

Environmental Pillar

The environmental pillar is the eye-catching pillar of all as most companies are focusing on taking care of the environment by reducing carbon footprints, waste, and water which will affect the environment. PCM was chosen due to the huge impact when it comes to environmental sustainability. One of the key measures is to reduce greenhouse gas emissions. Currently, most buildings use air conditioning units which increase the energy demand of the building due to the high usage of electricity. In addition, the increased usage of air conditioning will increase the carbon gasses emission which will lead to the thinning of the ozone layer. Hence, Phase change materials have been introduced in buildings to improve energy efficiency and to reduce the energy consumption in buildings. PCM can remove excess heat from a room during the day and release it at night. This is achieved by storing heat for cooling and releasing heat when it is demanded. The usage of PCM also helps to improve the performance of heating, allowing better ventilation and also uses minimum energy.

Economic Pillar

The economic pillar is what most businesses will put their attention on. To ensure that the object is sustainable, the business from the product needs to be a profitable business. Conventionally, a heat pump would require to constantly go through different load shifts which consumes a high amount of electricity. During extreme weather conditions, frost is formed on the outer coil which will be melted by drawing heat from the indoor unit. This happens by switching the cycle of the

heat pump as only one cycle can run at a time. By implementing PCM, it is able to store and release heat when the condition is required without affecting the defrost cycle. This will ensure that the amount of electricity will reduce which will benefit the user to save the electricity consumed by the whole product. Moreover, PCM is longer lasting which will have a longer lifespan and the maintenance of the product is not that expensive to change the PCM in the storage tank.

Social Pillar

The social pillar states that with the support and approval of the employees and stakeholders that are working on the project will produce a sustainable business in terms of social pillar. It also relates to the product is safe to use and will bring benefits to the employee and the end user of this product. When designing this PCM heat exchanger, we take many aspects into consideration. The main goal of this product is to ensure that PCM is able to defrost the ice formed on the outdoor unit without affecting the comfortness of the user that is living in the house during the winter. The build of the materials used is also safe to use as the PCM is only corrosive to metal. To solve the storage tank, ABS plastic is used to build this tank to store the PCM while the copper pipe is immersed in it. When designing the model, few aspects such as weight, height and mobility of the tank is taken into consideration as the tank should not be heavy and tall for the user or the technician to move it during the installation and during the maintenance. A small hole was designed to ease the technician when changing the PCM during maintenance.