



TAYLOR'S UNIVERSITY

Wisdom • Integrity • Excellence

**Bachelor Of Quantity Surveying (Honours)
Individual Assignment**

Building Services 2
BLD 60503/ QSB 2714

Name: Kenneth Tan Sin Kwang

Student ID: 0322482

Word Counts : 1989 Words

Lecturer : Dr Kam Kenn Jhun

Date of Submission : 29th May 2017

Title : Enhancement Green Technology via Air Conditioning

1.0) Introduction

In the recent decades, there has been tremendous growing awareness regarding the environmental impact due to man's activities. After further studies, it has become clear that buildings have been known as the primary sources that caused environmental degradation. This is because of the carbon impact of the fossil fuel that've been used to operate a building, which is the major factor of caused global warming or climate changes. Green technology is known as the application of the equipment or process used to minimize waste of natural resources, reduce environmental impact, reduce negative impact of human activities and also promote the use of natural renewable sources.

However in Malaysia, the National Green Technology has been launched on 24th July 2009 by the Prime Minister of Malaysia. There are 4 pillars for the policy to focused on which are the Energy, Economic, Environmental and Social. The objective of this policy is to ensure sustainable development & conserve environment for future generations and to minimize growth of energy consumption while enhancing economic development.

In this report, we will be focusing on how air conditioning systems can enhance green technology. In order to have energy efficient air conditioning system, the designer have to carry out different type of process correctly. Few of the important criteria needed to be aware of during the selection process are the spatial requirements, maintainability, flexibility, reliability and etc. All these factors should be understand by the designer in order to make sure energy efficient air conditioning system are achieved. However, there are several new green technologies are invented purposed is to obtain energy efficient air conditioning system. The system are thermally driven air conditioning, the ice powered air conditioning, quiet duct wrap, energy analysis software and the geothermal cooling pump.

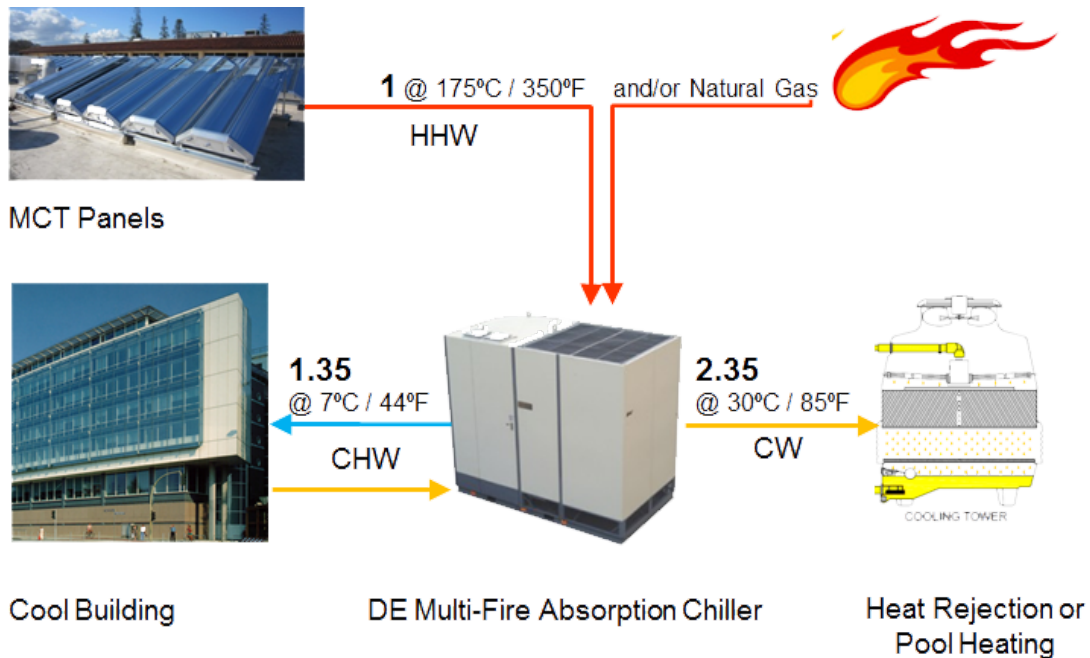
2.0) Thermally Driven Air Conditioning System

The first type of air conditioning system that i'm going to discuss is thermally driven air conditioning system is an alternative to traditional air conditioning system. The use of thermally driven air conditioning system is to provide lower electricity cost to the user as compared with air driven conditioning. This system utilised solar thermal energy to function and also can be supplemented by some amount of cheap natural gases. The solar air conditioning system uses the solar heat from the sun to superheat the refrigerant and delivers it directly to the condenser by passing the compressor. The superheated refrigerant enables the compressor to work less. The reason why this system is very efficient is because that it utilised double effect chillers that required very high temperature as a driving temperature as it is perfect for Chromasun MCT Panels. These systems use the evaporation of fluids such as water at low pressure to remove heat from the environment it is an energy-efficient cooling method. (7 Green Technologies That Are Changing HVAC". *HVAC Classes*. N.p., 2017. Web. 24 May 2017)

This system consist of a MCT panel which is a latest technology high performance solar collector that utilise the similar technology as utility scale solar systems. This panel are small in size which is designed to be installed for rooftop integration. This panel work by sunlight enter the panel through the glazing and been reflected off the glazing strips. After that, the light is then concentrated as it is focused on the receiver. There is a stainless steel pipe in the receiver purpose is to absorb the sunlight. This pipe can receives up to 20 times concentrated sunlight and working temperature up to 204 degree celsius can be achieved. Any suitable heat transfer fluid can be circulated and heated in the receiver pipe. ("Chromasun". *Chromasun.com*. N.p., 2017. Web. 24 May 2017)

However, this system consists of four main components which are the absorber, the generator the evaporator and the condenser. The concentrated absorbent solution absorbs refrigerant vapour in the absorber and is thus diluted. This is known as the exothermic process and the heat of absorption has to be rejected to the environment. The evaporating refrigerant in the evaporator produces the cooling effect. The diluted solution is pumped to the generator. The solution is heated up in the generator by the driving heat and the refrigerant vapour is desorbed. Thus the solution is concentrated again. The refrigerant vapour flows to the condenser where it condenses releasing the heat of condensation to the heat rejection system, and back to the evaporator through a throttle. The concentrated solution flows back to the absorber to close the solution Cycle. In order to increase the efficiency of the system a solution heat exchanger is installed between the flows of the cold and diluted solution from the absorber to the

generator and the hot and concentrated solution back to the absorber recovering some of the sensible heat in the solution.



There are several advantages of using this system. The first advantages are lower cost because of the use of solar energy and gas, the electricity cost are definitely being reduced and demand charges are also reduced. The driven chillers also provide lower cost as compared with the electricity driven compressors. Next, the system is also reliable is because that the driven chillers consists of moving parts and have longer lifespan as compared with the electrically driven mechanical vapors compressor. However, this system is also efficient as the chiller provide more cooling effect as compared with the photovoltaic systems. Waste heat can be harvested easily as well and used as 'free' pool or DHW pre-heating where appropriate. Lastly, it is also solar compatible as the thermally driven chillers are also compatible with efficient MCT panels which allow significant offsets in gas consumption and better environmental performance.¹

¹ (7 Green Technologies That Are Changing HVAC". *HVAC Classes*. N.p., 2017. Web. 24 May 2017)
 ("Chromasun". *Chromasun.com*. N.p., 2017. Web. 24 May 2017)

2.1) Ice Powered Air Conditioning System

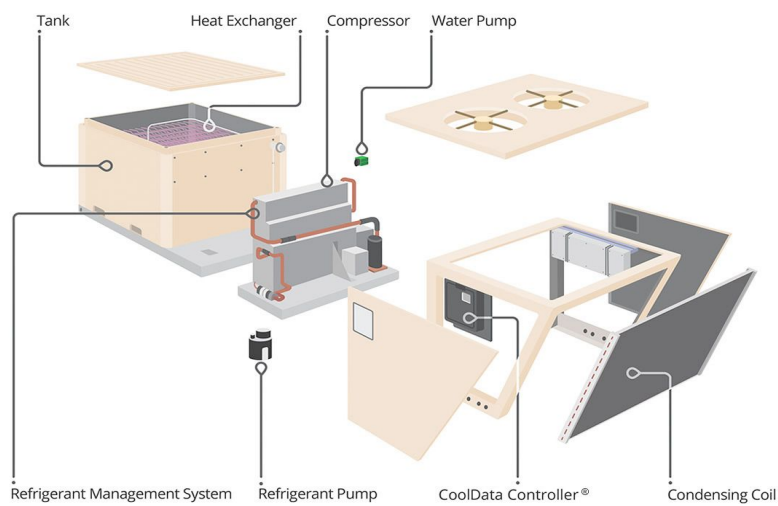
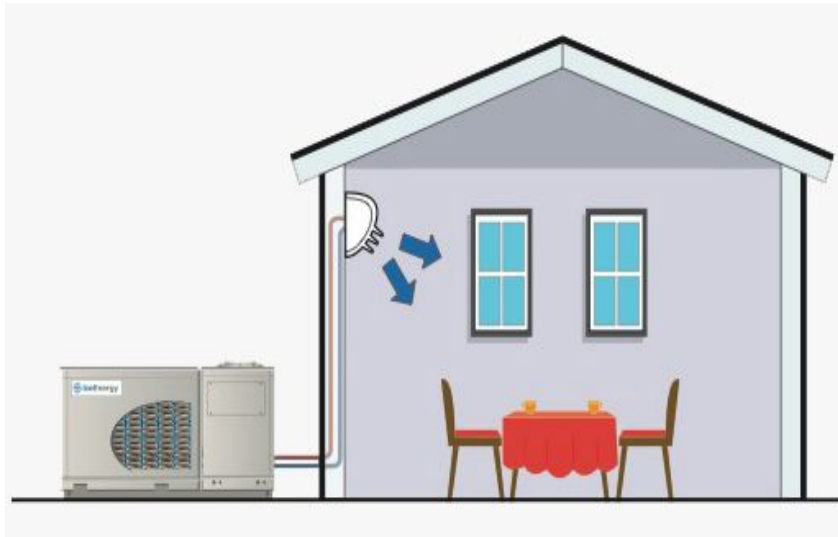
The second type of air conditioning system is ice-powered air conditioner is the process of using ice as thermal energy storage purpose is to cool down the temperature within the buildings or use it to cool the existing air conditioning units refrigerant during the day. This system also eliminate the electricity cost for the users. The system usually produced ice pile at night through a standard chillers. After that, the water is the circulated through the pile during the day to produce chilled water that would normally be the chiller's daytime output. This system usually run in ice making mode which is around 16-18 hours daily and melting process for 6 hours a day.

However, this system consists of several components which are tank, water pump, heat exchanger, compressor, refrigerant pump, condenser coil, cooldata controller and refrigerant management system. During the peak hours, the store ice delivers up to 4 hours of cooling and using only up to 5% of the power that is usually required. However at the off peak hours, insulated tank is used to store freezing water in order to provide cooling energy to the home. With this system, the quality of the environment can be enhanced and user also feel more comfortable as it helps to reduce their electricity bills.

This system uses ice as a condensing medium for the refrigerant. In this case, regular refrigerant is pumped to coils where it is used. Rather than needing a compressor to convert it back into a liquid, however, the low temperature of ice is used to chill the refrigerant back into a liquid. This type of system allows existing refrigerant-based HVAC equipment to be converted to Thermal Energy Storage systems, something that could not previously be easily done with chill water technology. In addition, unlike water-cooled chill water systems that do not experience a tremendous difference in efficiency from day to night, this new class of equipment typically displaces daytime operation of air-cooled condensing units. ("Ice-Powered Air-Conditioner Could Cut Costs". *CNET*. N.p., 2017. Web. 24 May 2017.)

However, the advantages of this system are it is able to save the electricity cost up to 40% annually as compared with the traditional method. It is very flexible as it is suitable to be installed in both commercial and residential units. Besides that, the reason why this system is environmental friendly as it reduce carbon emission to the atmosphere and reduce toxic material or greenhouse effect toward the environment is because ice melts when it cools down the refrigerant from the tank to the evaporative coil during the day, but it will again be freeze each night. The battery is also very durable where it can last for at least 20 years and suffer with no degradation. Lastly, the system consists of ice

storage firm solar capacity and make productive use of solar over generation. ("Technology - Ice Energy". *Ice Energy*. N.p., 2017. Web. 24 May 2017.)



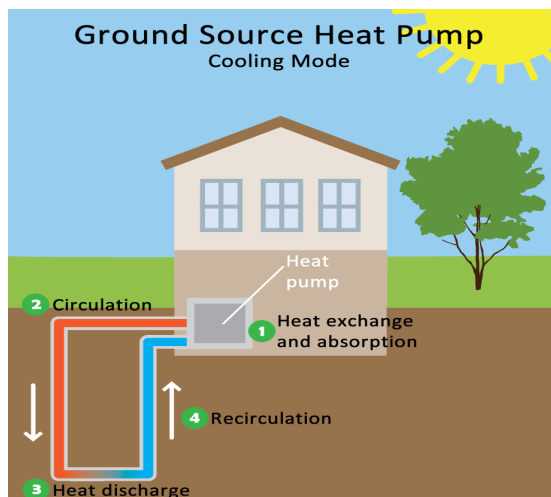
2

² ("Ice-Powered Air-Conditioner Could Cut Costs". *CNET*. N.p., 2017. Web. 24 May 2017.)
("Technology - Ice Energy". *Ice Energy*. N.p., 2017. Web. 24 May 2017.)

2.2) Geothermal Cooling Pump System

The third air conditioning system is geothermal air conditioning system. The reason why this system can enhance green technology is because that geothermal energy is considered a renewable source. Geothermal cooling pump system is the heating or cooling system that transfer heat energy to or from the ground. This system offers significant emission reduction potential and also green house effect. This system capitalize energy in the ground on earth. This system consists of a lopping pipe which is the dig into the ground. The liquid fluid in the pipe usually circulates underground and which it carries and absorb the heat indoor during winter time purpose for heating the indoor environment. However during summer time, this system acts as a cooling system where the warm air is carried out from the home through the pipe and deposited to the ground below.

However there are several benefits of using these system which are energy saving, versatility and eco friendly. This system is four times more energy efficient as compared with the traditional HVAC system as it does not require any usage of fossil fuel to function and also helps to reduce the cost of electricity up to 40% annually. Besides that, this system is versatility is because it can be used as a heating or cooling system by just flicking the switch. Lastly, this system does not require the usage of non renewable source such as fossil fuel. There is no release of polluting emissions that enter into air. ("Meyers, Glenn, and Glenn Meyers. "Air Conditioning Alternatives: Thermally Driven Cooling Systems - Green Building Elements". *Green Building Elements*. N.p., 2017. Web. 24 May 2017.)



There are also several steps describing how this system as a cooling system in order to remove heat from the building and transfer it into the ground. First is the heat exchange and absorption. There is a component installed in this system which is known as heat exchanger. Water absorb heat from the air inside the building through this heat exchanger. Second will be circulation where the heated fluid is moved through the buried pipes or ground loops. Moving on will be heat discharge as the heated fluid will then discharge the heat off to the cooler ground, rocks, soil or water surrounding the pipe as it passed through the ground loops. Lastly it's recirculation. After the fluid has already released the heat to the ground, the fluid will then return at a lower temperature to the building where it will absorb heat again. This process is repeated over and over again to cool down the temperature within the building. ("Geothermal HVAC: The Best In Green Technology". *Mike Merritt Heating & Air*. N.p., 2017. Web. 24 May 2017.)

In conclusion, due to the latest technology advancement of the air conditioning. There are no longer causing to the environmental issues. However there are several alternatives that can helps to enhance green technology. In my opinion, I will choose the ice power air conditioning system. Although this system has high initial cost, but it offer lower long term cost or operating costs. The main reason why I've chosen this system is because that reduce carbon emission to the atmosphere and reduce toxic material or greenhouse effect toward the environment .

Other than that, this system also can save the electricity bills of users up to 40% annually can be installed in both commercial and residential units. Having green energy air conditioning system not only brings benefits for the user but also toward our mother earth. Based on scientific analysis, the traditional air conditioning system had also contributed to greenhouse effect, climate change and global warming. Lastly, in order to avoid further damages to our earth, individual as well as government must be responsible in promoting all these alternatives to enhance the quality of our environment and prevent it from further damages.

3

³ ("Meyers, Glenn, and Glenn Meyers. "Air Conditioning Alternatives: Thermally Driven Cooling Systems - Green Building Elements". *Green Building Elements*. N.p., 2017. Web. 24 May 2017.)
("Geothermal HVAC: The Best In Green Technology". *Mike Merritt Heating & Air*. N.p., 2017. Web. 24 May 2017.)

Bibliography

"Geothermal HVAC: The Best In Green Technology". *Mike Merritt Heating & Air*. N.p., 2017. Web. 24 May 2017.

"7 Green Technologies That Are Changing HVAC". *HVAC Classes*. N.p., 2017. Web. 24 May 2017

"Ice-Powered Air-Conditioner Could Cut Costs". *CNET*. N.p., 2017. Web. 24 May 2017.

"Chromasun". *Chromasun.com*. N.p., 2017. Web. 24 May 2017.

"Meyers, Glenn, and Glenn Meyers. "Air Conditioning Alternatives: Thermally Driven Cooling Systems - Green Building Elements". *Green Building Elements*. N.p., 2017. Web. 24 May 2017.

"Chromasun". *Chromasun.com*. N.p., 2017. Web. 24 May 2017

"Technology - Ice Energy". *Ice Energy*. N.p., 2017. Web. 24 May 2017.

