'I/We approve that we have read this thesis thoroughly and in my/ our opinion, this thesis has fulfilled the criteria covering all the aspects of scope and quality and satisfied to be awarded for Bachelor of Mechanical Engineering (Thermal-Fluid).'

Signature :……………………

Supervisor I :……………………

Date :...............................

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THE USAGE OF SOLAR ENERGY TO REDUCE THE WARM TEMPERATURE IN THE CAR

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This report is written as a partial fulfillment of terms in achieving the award for Bachelor of Mechanical Engineering (Thermal-Fluid)

Faculty of Mechanical Engineering
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APRIL 2008

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“I admit that this report is all written by myself except for the summary and the article
which I have stated the source for each of them.”

Signature :……………………

Writer :……………………

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DEDICATION

To beloved family, friends and lectures who supported me throughout this project.

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ACKNOWLEDGEMENT

In this great opportunity, I would like to thank Allah for providing me strengths to finish up this project and finally it was completed. Here, I would like to acknowledge and appreciate all those people who helped and guided me till the completion of this project.

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Hopefully this report would become a reference for related future studies. Finally, I would like to express my appreciation to everyone especially to all my friends and family who helped and supported me. Thanks for your guidance and cooperation. May Allah bless all of you. Amin..

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ABSTRAK

Apabila sebuah kereta diletakkan di bawah matahari selama beberapa jam, ruang dalaman kereta itu akan menjadi panas. Keadaan ini disebabkan oleh rekabentuk kereta yang tertutup dimana ia mengakibatkan udara panas terperangkap. Hal ini akan menyebabkan ketidakselesaan apabila seseorang memasuki kereta. Selain itu, udara panas yang terperangkap ini mendatangkan banyak permasalahan lain, antaranya memendekkan jangka hayat komponen dalaman kereta, merbahaya kepada manusia dan haiwan peliharaan di dalam kereta dan menyebabkan pembaziran kerana pengguna akan menghidupkan penghawa dingin pada paras maksimum bagi mengurangkan udara panas. Tujuan projek ini adalah untuk mencari penyelesaian bagi permasalahan ini. Idea utama adalah untuk menggunakan tenaga solar bagi menghidupkan motor/kipas seterusnya menyedut udara panas keluar dari kenderaan melalui saluran penghawa dingin kereta. Pada akhir projek, adalah disasarkan untuk menyiapkan sebuah produk berkonsepkan aksesori. Produk yang akan dihasilkan adalah sebuah sistem pengudaraan dan bukanlah sistem penghawa dingin. Kajian mengenai perbezaan dan perubahan suhu dijalankan menggunakan peralatan *Data logger* dan *Thermocouple*.

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ABSTRACT

Park a car under the sun for a couple of hours and it gets very hot. It would be too hot to get into. This is due to the design and the material of the car which is closed thus trapping hot air. Due to the hot air in car it is not comfortable to sit in the car. On top of that, many other problems also occur such as decreasing the lifespan of the car interior, dangerous to pets or human in car and wastage of air condition as the user would switch it to maximum level to get rid of the hot air. This project is done to find solution to overcome these problems. The main idea is to use solar panel which would power a blower/fan to suck the hot air out of the car by harnessing the power of solar. The result would be to come out with a product which would fit as an accessory. What this product will/won't do: This is not an air conditioner, it is a ventilation system, and it will reduce the interior temperature of the vehicle, but not cool it (like an air conditioner would). The study of temperature difference in the car is done by using thermo couples and data logger. This is done to prove the effectiveness of the product.

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CHAPTER I

INTRODUCTION

Already in 2008 there have been at least thirty-eight deaths of infants and children after being left inside a hot vehicle. Last year there were a total of at least thirty-five such fatalities in the United States due to hyperthermia after they were left in hot cars, trucks, vans and SUV's. This sadly followed 42 and 30 child deaths in 2006 and 2005 respectively. Since 1998 there have been at least a total of 364 of these needless tragedies. These are among the problems which occur due to hot air in car.

The atmosphere and windows are relatively “transparent” to the sun’s shortwave radiation and are warmed little. The shortwave energy does however warm objects that it strikes. A dark dashboard or seat can easily reach temperatures in excess of 60°C. These objects (e.g., dashboard, steering wheel, child seat) heat the adjacent air by conduction and convection and also give off longwave radiation which is very efficient at warming the air trapped inside a vehicle.

Current ventilation product available in market such as Auto Cool has received many complaints of its poor performance. The design does not satisfy the need of customer as of the lack ness of security as it is fixed on the car window and this would damage the product and causes water to drip in if it rains.

As solution for these problems, this project would use solar panel which would power a blower/fan to suck the hot air out of the car by harnessing the power of solar. The hot air would be channeled out of the car through the air conditioning

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manifold. The result would be to come out with a product which would fit as an accessory

1.1 Problem Statement

This project has been carried out to reduce the hot stuffy air on scorching unbearable days. It should reduce the interior temperature, protecting and prolonging the life of the cars interior and equipment such as the stereo system. The heat also makes passengers not comfortable to sit in the car. Normally lot’s of power is wasted as the driver would switch the air cont to a high level to get rid of the hot air.

Another major problem is that sometimes parents leave their kids in the car while doing some groceries or so. This act puts danger to the life of the children. Heatstroke occurs when a person's temperature exceeds 40°C and their thermoregulatory mechanism is overwhelmed. Symptoms include: dizziness, disorientation, agitation, confusion, sluggishness, seizure, hot dry skin that is flushed but not sweaty, loss of consciousness, rapid heart beat, hallucinations. A core body temperature of 41.7°C is considered lethal as cells are damaged and internal organs shut down. Children's thermoregulatory systems are not as efficient as an adult's and their bodies warm at a rate 3 to 5 times faster than an adult’s.

The result from data obtained shows that the interior temperature easily reaches 45°C by just after 18 minutes parked. And it can reach as high as 60°C after two hours.

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1.2 PSM flow chart

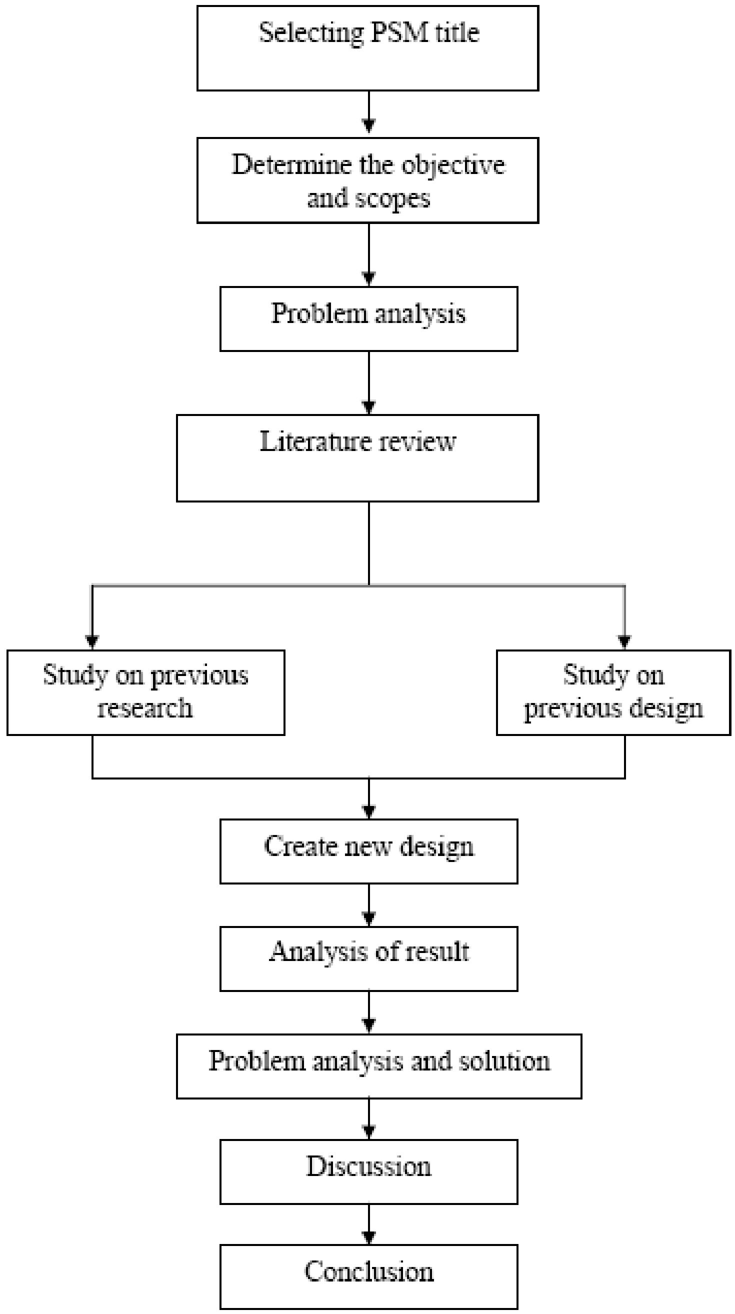

Figure 1.1 PSM flow chart

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1.3 Scope and Objective

Objectives:

- To identify the suitable photovoltaic solar panel to run a small fan/blower.
- To study the effect of the blower to the temperature in the car.
- To come out with a product which is silent and the ventilator fan runs directly on energy harnessed by the solar panels.

Scopes:

- To investigate the capability of photovoltaic solar to power a small fan/blower.
- The blower will absorb the heat in the car space during hot weather and release to the outside through air-conditioner ventilation.
- To use data logger and thermocouple to study the effect of the blower to the temperature in the car.
- To investigate the difference of temperature of a car that uses sunshade protector compared to a car which doesn't use a sunshade protector.

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CHAPTER II

LITERATURE REVIEW

2.1 Photovoltaic module

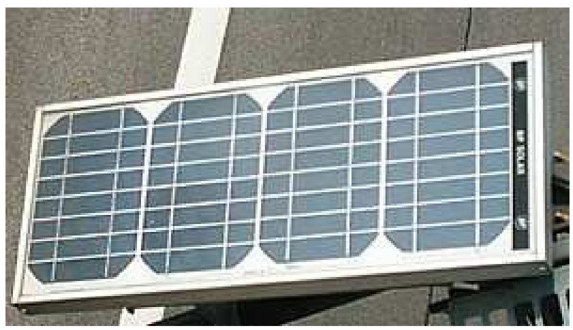

Figure 2.1: Photovoltaic module

(Source: http://en.wikipedia.org/wiki/Photovoltaic_module)

In the field of photovoltaic, a photovoltaic module is a packaged interconnected assembly of photovoltaic cells, also known as solar cells. An installation of photovoltaic modules or panels is known as a photovoltaic array or a solar panel. Photovoltaic cells typically require protection from the environment. For cost and practicality reasons a number of cells are connected electrically and packaged in a photovoltaic module, while a collection of these modules that are mechanically fastened together, wired, and designed to be a field-installable unit, sometimes with a glass covering and a frame and backing made of metal, plastic or fiberglass, are known as a photovoltaic panel or simply solar panel. A photovoltaic installation typically includes an array of photovoltaic modules or panels, an inverter, batteries (for off grid) and interconnection wiring. [1]

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2.1.1 Theory and construction

The majority of modules use wafer-based Crystalline silicon cells or a thin film cell based on cadmium telluride or silicon (see photovoltaic cells for details) crystalline silicon, which is commonly used in the wafer form in photovoltaic (PV) modules, is derived from silicon, a relatively multi-faceted element.
In order to use the cells in practical applications, they must be:

- connected electrically to one another and to the rest of the system
- protected from mechanical damage during manufacture, transport and installation and use (in particular against hail impact, wind and snow loads). This is especially important for wafer-based silicon cells which are brittle.
- protected from moisture, which corrodes metal contacts and interconnects, (and for thin film cells the transparent conductive oxide layer) thus decreasing performance and lifetime.
- electrically insulated including under rainy conditions
- mountable on a substructure

Most modules are rigid, but there are some flexible modules available, based on thin film cells.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired amount of current source capability. Diodes are included to avoid overheating of cells in case of partial shading.

Since cell heating reduces the operating efficiency it is desirable to minimize the heating. Very few modules incorporate any design features to decrease temperature, however installers try to provide good ventilation behind the module,
New designs of module include concentrator modules in which the light is concentrated by an array of lenses or mirrors onto an array of small cells. This allows the use of cells with a very high cost per unit area (such as gallium arsenide) in a cost-competitive way.

Depending on construction the photovoltaic can cover a range of frequencies of light and can produce electricity from them, but cannot cover the entire solar spectrum. Hence much of incident sunlight energy is wasted when used for solar

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panels, although they can give far higher efficiencies if illuminated with monochromatic light. Another design concept is to split the light into different wavelength ranges and direct the beams onto different cells tuned to the appropriate wavelength ranges. [1] This is projected to raise efficiency to 50%. Sunlight conversion rates (module efficiencies) can vary from 5-18% in commercial production.

A group of researchers at MIT has recently developed a process to improve the efficiency of luminescent solar concentrator (LSC) technology, which redirects light along a translucent material to PV-modules located along its edge. The researchers have suggested that efficiency may be improved by a factor of 10 over the old design in as little as three years. 3 of the researchers involved have now started their own company, called Covalent Solar, to manufacture and sell their innovation in PV-modules. [2]

2.1.2 Rigid thin-film modules

In rigid thin film modules, the cell and the module are manufactured in the same production line.The cell is created directly on a glass substrate or superstrate, and the electrical connections are created *in situ*, a so called "monolithic integration". The substrate or superstrate is laminated with an encapsulant to a front or back sheet, usually another sheet of glass.

The main cell technologies in this category are CdTe, amorphous silicon, micromorphous silicon (alone or tandem), or CIGS (or variant). Amorphous silicon has a sunlight conversion rate of 5-9%. [1]

2.1.3 Flexible thin-film modules

Flexible thin film cells and modules are created on the same production line by depositing the photoactive layer and other necessary layers on a flexible

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