CAR COOLING SYSTEM DURING PARKING USING BLOWER

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ABSTRACT

The main objective for project 'Car cooling system during parking using blower' is to give the student experience in modify the actual system to a better system. Final year diploma student is tasked to finish this project as blower system model that will be use as apparatus in Laboratory of Mechanical Engineering in Universiti Malaysia Pahang. As per present wiring, the blower is rotating in one direction, this project will change the rotation to reverse rotation. The main part used in this wiring system is relay 87a and thermal sensor. In finishing this process need to be documented because it will be the main reference that useful for student that involved in producing new system of wiring for present car blower in market. Several experiments are done to see whether it work or not. An experiment was carried out under sun light for couples of days use real car to get the decrease effect of heat car compartment when this system use. Several weaknesses detected after the experiment completed, for instance the use of battery power that caused car facing problem to ignite. There are several method to solve this problem, one using solar power or adding another 12V battery to the car. If this problem solved, the system could have potential to be introduced in automotive industry.

ABSTRAK

Tujuan utama projek sistem penyejukkan ruang dalaman kereta menggunakan kipas penghawa dingin ketika meletakkan kenderaan ini ialah memberi pelajar pengalaman mengubahsuai sistem yang sedia ada kepada sistem yang lebih baik. Pelajar diploma tahun akhir telah diberi tugas untuk menyiapkan projek ini sebagai model penghawa dingin untuk sistem pembelajaran di dalam Makmal Fakulti Kejuruteraan Mekanikal Univesiti Malaysia Pahang. Sebagaimana sistem pendawaian yang sedia ada, kipas penghawa dingin hanya boleh berputar pada satu arah, tetapi objektif projek ini akan mengubah putaran kipas tersebut kepada dua arah. Bahan utama yang digunakan dalam sistem pendawaian ini ialah geganti elektronik dan perintang peka haba. Proses menyiapkan sistem ini perlu didokumenkan kerana ia akan menjadi sumber rujukan yang amat baik untuk pelajar yang terbabit dalam menghasilkan sistem baru untuk pendawaian sistem penghawa dingin kereta yang sedia ada di pasaran. Dalam penghasilan sistem ini, beberapa ujikaji dijalankan untuk melihat sejauh mana keberkesanan sistem tersebut. Ujikaji dijalankan dibawah sinaran matahari selama beberapa hari menggunakan kereta sebenar untuk mendapatkan kesan penurunan haba didalam ruang tempat duduk kereta tersebut apabila sistem ini digunakan. Beberapa kelemahan dikesan selepas ujikaji dijalankan seperti penggunaan kuasa bateri yang berterusan. Ini akan menyebabkan kenderaan tersebut menghadapi masalah untuk dihidupkan. Terdapat beberapa cara untuk mengatasi masalah tersebut iaitu dengan menggunakan kuasa solar atau menambah sebuah lagi bateri 12V pada kenderaan tersebut. Hasil dari projek ini boleh dipasarkan jika kelemahan pada sistem ini dapat diatasi.

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UMP	-	University Malaysia Pahang
KUKTEM	-	Kolej Universiti Kejuruteraan & Teknology Malaysia
A	-	Ampere
V	-	Volt

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CHAPTER 1

INTRODUCTION

1.1 Project Synopsis

Final year project is one of the subjects for this semester. In this subject, a project needs to do to fulfill the subject requirement. The project involves modification current blower system. This instrument could be use by the other student in order to study about blower which according to the syllabus.

This project title is about 'Car cooling system during parking using blower'. The fabrication is required to provide the instrument for blower system. This blower will cool down the air inside car during hot weather by sinking of hot air. The aim of this project is to design circuit diagram for wiring purpose. This project also acquires the skills of design, analysis, fabrication and testing.

1.2 Problem Statement

This research mainly concerned on technique to cool down the high temperature by removing hot air out to the environment. Air is a working fluid where it changes properties; temperature and pressure when there is no ventilation and being exposed to heat source.

The main question that leads to this research is 'how to employ an effective system by managing the flow inside the passenger compartment'

Secondly, the high temperature problem inside passenger compartment causes below problem:-

i) People usually cannot endure such temperatures comfortably
ii) Instrumental panel, leather seats and plastic accessories, among other items age rapidly if exposed to these temperatures for a long period.
iii) Additional loading to the engine, increasing fuel consumption when turned on the engine to cool down the passenger compartment.

1.3 Project Objectives

1.3.1 General Objectives

Diploma final year project objective is to practice the knowledge and skill of the student that have been gathered before in solving problem using academic research, to born an engineer that have enough knowledge and skill. This project also important to train and increase the student capability to get know, research, data gathering, analysis making and then solve a problem by research or scientific research.

The project also will educate the student in communication like in a presentation and educate them to defend their research in the presentation. The project also will generate students that have capability to make a good research report in thesis form or technical writing. This project also can produce and train student to capable of doing work with minimal supervisory and more independent in searching, detailing and expanding the experiences and knowledge.

1.3.2 Specific Project Objectives

The project objectives are:

i) To perform the wiring and test the cooling system.

ii) To get the lowest temperature reading on passenger compartment after employ the reverse blower technique.

iii) To fabricate apparatus for air-condition system.

1.4 Project Scope of Work

i) Design Circuit Diagram for wiring purpose

ii) The project covers only research on passenger car

iii) The data collection of temperature profile only during day time since it is crucial for heat ventilation for example (from 10 am to 6 pm).

iv) The functional blower valid for set temperature detected by heat sensor 28°C.

1.5 Project Planning

This project is begin and start with investigation and makes a research and literature review via internet, reference books, supervisor and other relevant academic material that related to this project. To make this project more accurate and suitable, study more about this topic and more than two week to make a literature review. Every week, improvement of knowledge needed to make sure this project will be performing very well.

Beginning week, need to do some schedule management for this project which included schedule management to all member in the group. All schedule will be apply in a Microsoft Excel to make a Gantt chart. It takes a week to accomplish all schedules.

Then, discuss with supervisor and continue detail research about wiring and blower system. The good sample must be chosen to make the precise calculation and easy to take the data.

The next task is preparation of progress presentation and report writing. These tasks take two week to be finish. On that particular week, preparation needed to make a presentation.

Lastly, the final report writing and prepare the presentation. This takes about one week to arrange and accomplish. A report is guided by UMP thesis format and also guidance from supervisor. Due to all problems that student facing, the management have agreed to extend the time to submit a report and presentation. All task scheduled is take around fourteen weeks to complete.

1.6 Gantt Chart

Table 1.1 : Gantt chart

Scope	Weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Literature Review														
Design and Measurement														
Material preparation														
Methodology study														
Wiring and fabrication														
Experiment														
Report Preparation														
Final Presentation														

	Planning Progress
	Actual Progress

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This project is provided the instrument for blower system in the car which can explore of considered of great significance in improving the knowledge of how blower can use to cool down an air inside proton car during hot weather by sinking of hot air. This chapter is summarizing of all the literature review gathered from many academic resources.

2.2 Automotive Air Conditioning

Automotive air conditioning is now a standard inclusion in new vehicles due to the love we have for our automobiles and the comfort we expect.

Automotive air conditioners these days are quite reliable in comparison to the first models which surfaced in the 1940's. Modern units are computerized climate controlled systems with variable air flow which is also ducted to the rear seat areas if required.

In the past an automotive air conditioner was susceptible to refrigerant gas loss during winter due to the compressor seal losing its lubrication oil seal due to the

inactivity of the winter months. This refrigerant (R12) was harmful to the environment and has since been replaced with a less harmful gas (R314A).

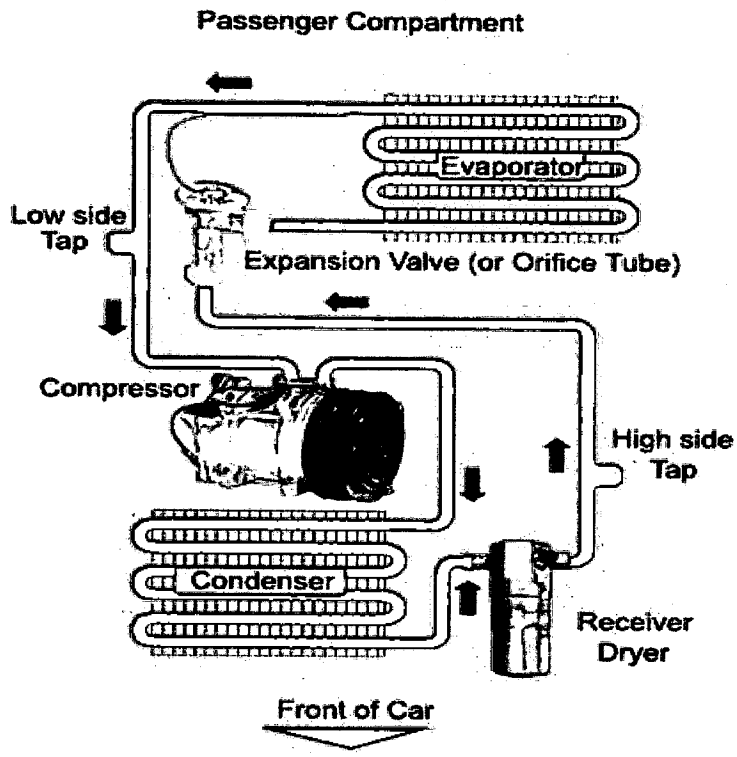

Figure 2.1 : Air – condition system

2.2.1 Compressor

Commonly referred to as the heart of the system, the compressor is a belt driven pump that is fastened to the engine. It is responsible for compressing and transferring refrigerant gas.

The A/C system is split into two sides, a high pressure side and a low pressure side; defined as discharge and suction. Since the compressor is basically a pump, it must have an intake side and a discharge side. The intake, or suction side, draws in refrigerant gas from the outlet of the evaporator. In some cases it does this via the accumulator.

Once the refrigerant is drawn into the suction side, it is compressed and sent to the condenser, where it can then transfer the heat that is absorbed from the inside of the vehicle.

2.2.2 Condenser

This is the area in which heat dissipation occurs. The condenser, in many cases, will have much the same appearance as the radiator in your car as the two have very similar functions. The condenser is designed to radiate heat. Its location is usually in front of the radiator, but in some cases, due to aerodynamic improvements to the body of a vehicle, its location may differ. Condensers must have good air flow anytime the system is in operation. On rear wheel drive vehicle, this is usually accomplished by taking advantage of your existing engine's cooling fan. On front wheel drive vehicles, condenser air flow is supplemented with one or more electric cooling fan.

As hot compressed gasses are introduced into the top of the condenser, they are cooled off. As the gas cools, it condenses and exits the bottom of the condenser as a high pressure liquid.

2.2.3 Evaporator

Located inside the vehicle, the evaporator serves as the heat absorption component. The evaporator provides several functions. Its primary duty is to remove heat from the inside of your vehicle. A secondary benefit is dehumidification. As warmer air travels through the aluminum fins of the cooler evaporator coil, the moisture contained in the air condenses on its surface. Dust and pollen passing through stick to its wet surfaces and drain off to the outside. On humid days you may have seen this as water dripping from the bottom of your vehicle. Rest assured this is perfectly normal.

The ideal temperature of the evaporator is 32° Fahrenheit or 0° Celsius. Refrigerant enters the bottom of the evaporator as a low pressure liquid. The warm air passing through the evaporator fins causes the refrigerant to boil (refrigerants have very low boiling points). As the refrigerant begins to boil, it can absorb large amounts of heat. This heat is then carried off with the refrigerant to the outside of the vehicle. Several other components work in conjunction with the evaporator. As mentioned above, the ideal temperature for an evaporator coil is 32° F. Temperature and pressure regulating devices must be used to control its temperature. While there are many variations of devices used, their main functions are the same; keeping pressure in the evaporator low and keeping the evaporator from freezing; A frozen evaporator coil will not absorb as much heat.

2.2.4 Pressure Regulating Devices

Controlling the evaporator temperature can be accomplished by controlling refrigerant pressure and flow into the evaporator. Many variations of pressure regulators have been introduced since the 1940's.

2.2.5 Orifice Tube

The orifice tube, probably the most commonly used, can be found in most GM and Ford models. It is located in the inlet tube of the evaporator, or in the liquid line, somewhere between the outlet of the condenser and the inlet of the evaporator. This point can be found in a properly functioning system by locating the area between the outlet of the condenser and the inlet of the evaporator that suddenly makes the change from hot to cold.

Most of the orifice tubes in use today measure approximately three inches in length and consist of a small brass tube, surrounded by plastic, and covered with a filter screen at each end. It is not uncommon for these tubes to become clogged with

small debris. While inexpensive, usually between three to five dollars, the labor to replace one involves recovering the refrigerant, opening the system up, replacing the orifice tube, evacuating and then recharging. With this in mind, it might make sense to install a larger pre filter in front of the orifice tube to minimize the risk of of this problem reoccurring. Some Ford models have a permanently affixed orifice tube in the liquid line. These can be cut out and replaced with a combination filter/orifice assembly.

2.2.6 Thermal Expansion Valve

Another common refrigerant regulator is the thermal expansion valve. This type of valve can sense both temperature and pressure, and is very efficient at regulating refrigerant flow to the evaporator. Several variations of this valve are commonly found. Another example of a thermal expansion valve is Chrysler's "H block" type. This type of valve is usually located at the firewall, between the evaporator inlet and outlet tubes and the liquid and suction lines. These types of valves, although efficient, have some disadvantages over orifice tube systems. Like orifice tubes these valves can become clogged with debris, but also have small moving parts that may stick and malfunction due to corrosion.

2.2.7 Receiver-Dryer

The receiver-drier is used on the high side of systems that use a thermal expansion valve. This type of metering valve requires liquid refrigerant. To ensure that the valve gets liquid refrigerant, a receiver is used. The primary function of the receiver-drier is to separate gas and liquid. The secondary purpose is to remove moisture and filter out dirt. The receiver-drier usually has a sight glass in the top. This sight glass is often used to charge the system. Under normal operating conditions, vapor bubbles should not be visible in the sight glass. The use of the sight glass to charge the system is not recommended in R-134a systems as cloudiness and

oil that has separated from the refrigerant can be mistaken for bubbles. This type of mistake can lead to a dangerous overcharged condition. There are variations of receiver-driers and several different desiccant materials are in use. Some of the moisture removing desiccants found within are not compatible with R-134a. The desiccant type is usually identified on a sticker that is affixed to the receiver-drier. Newer receiver-driers use desiccant type XH-7 and are compatible with both R-12 and R-134a refrigerants.

2.2.8 Accumulator

Accumulators are used on systems that accommodate an orifice tube to meter refrigerants into the evaporator. It is connected directly to the evaporator outlet and stores excess liquid refrigerant. Introduction of liquid refrigerant into a compressor can do serious damage. Compressors are designed to compress gas not liquid. The chief role of the accumulator is to isolate the compressor from any damaging liquid refrigerant.

Accumulators, like receiver-driers, also remove debris and moisture from a system. It is a good idea to replace the accumulator each time the system is opened up for major repair and anytime moisture and/or debris is of concern. Moisture is enemy number one for your A/C system. Moisture in a system mixes with refrigerant and forms a corrosive acid. When in doubt, it may be to your advantage to change the Accumulator or receiver in your system. While this may be a temporary discomfort for your wallet, it is of long term benefit to your air conditioning system.

2.3 Heat Place

I need to have a lot of information that is almost similar approach to achieve my target. It is good to start with gathering information about current solution which introduce by K.D Huang et al proposed using solar panel to drive the exhaust fan for

green house ventilating system. But the cost to have the ventilating system is much affected the car price. The solution seems not too practical in term of financial.

Another approach of protecting the passenger compartment is to block the UV light by installing tinted film on the windscreen and car window. The main obstacle of this tint film is the regulation. In addition, the tinted film may block the front view of other's car driver. This may lead to accident.

The need of this research becomes vital to solve the problem smartly with low cost, safe and effective. So, I would like introduce reverse blowing method to improve the heat ventilation system onside the passenger compartment.

2.4 Solar Powered

The use of solar as a power source is using the weaknesses as strength to drive the system. M.Y.H Othman et al found that Malaysia temperature distribution during day light as below:-

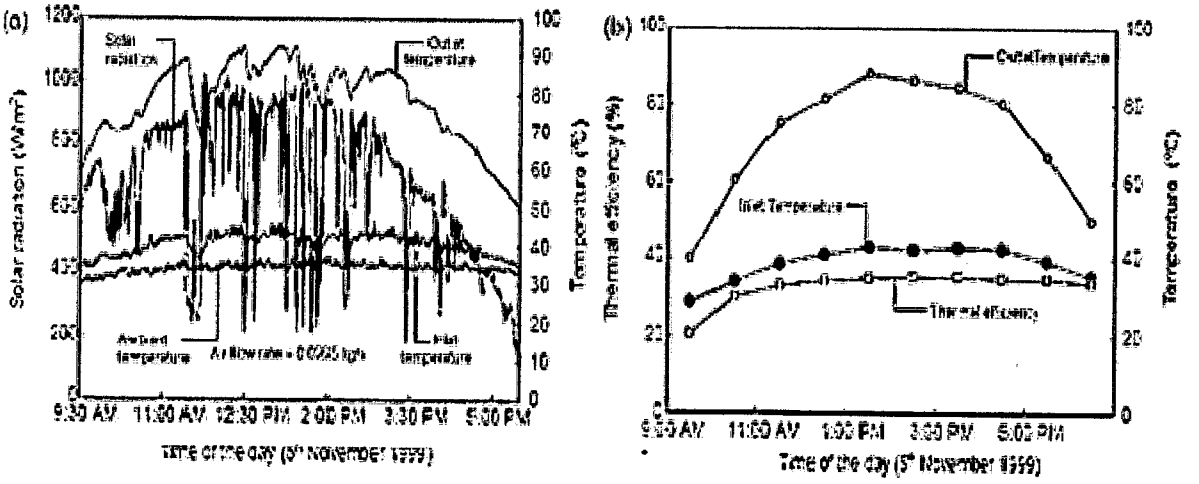

Figure 2.2 : Temperature graph

2.5 Simulation and Experiment

This study seeks to determine the numerical simulation using finite volume method. The SIMPLE method is applied to correlate the pressure and velocity solution during the iteration process.

K.D Huang et al then found that airflow could be effectively occur if the air inlet located at nearly the heat source such as front windscreen as shown below:-

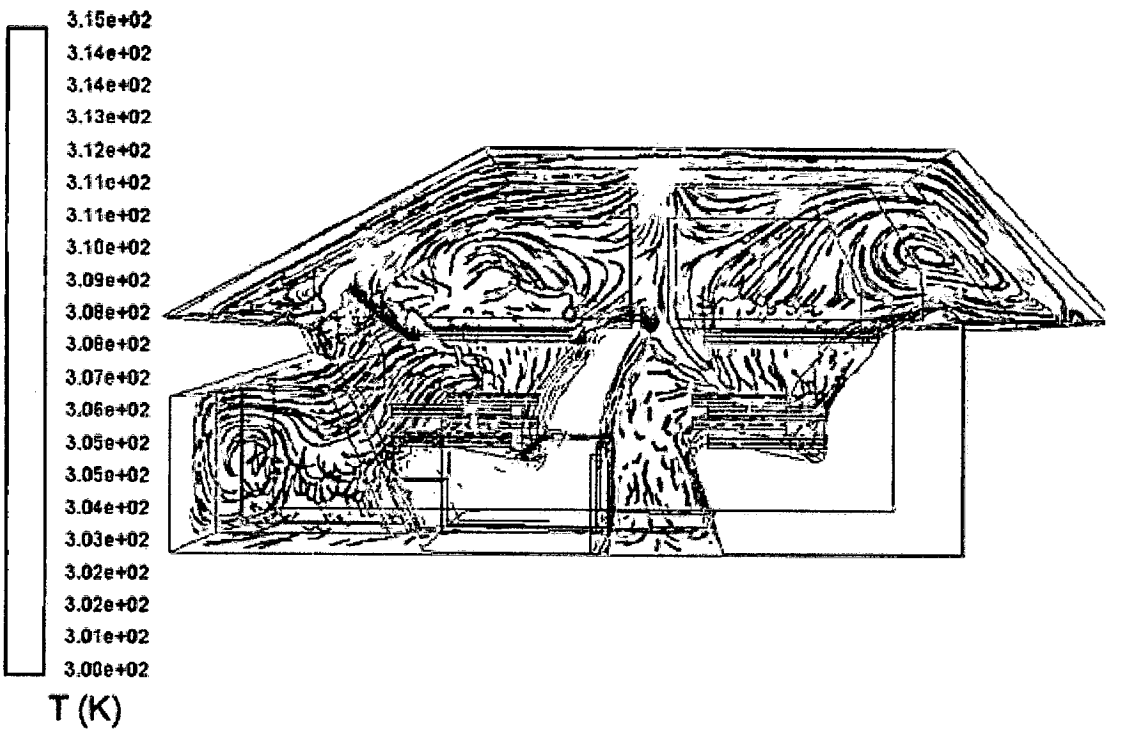

Figure 2.3 : Air flow and heat source simulation

E.Mehzab et al have described the theoretical support of a code developed to study the thermal comfort in a compartment. Results of some simulations carried out, on a car in summer conditions, have been presented. It was shown that:

i) For a car parked facing the sun, the air and the materials reach considerable temperatures, such as about 100 _C for the dashboard.

ii) A considerable reduction of the temperature inside the compartment is caused by the use of a reflecting glazing and a white colour of the bodywork of the car.

iii) When the car runs with the air-conditioning on, the temperatures of solid nodes directly exposed to the cold blasts from the aerator decrease significantly.

2.6 Thermometer

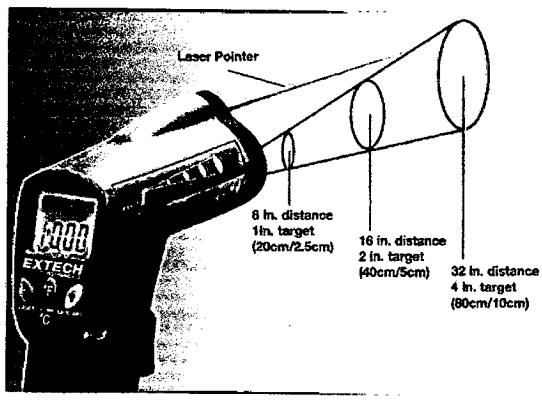

Figure 2.4 : Distance to spot ratio

2.6.1 Special Features

i) Large LCD display with backlighting.

ii) Fixed emissivity (0.95) covers 90% of surface application.

iii) 8:1 field of view.

iv) Audible and visible over range indicators.