PORTABLE CAR COOLING SYSTEM

Gaurav Sharma 1
Assistant Professor Department of Mechanical Engineering
BBDIT Group of Institutions, Ghaziabad, India

Yogesh Kumar Sharma 2
Assistant Professor, Department of Mechanical Engineering
Advanced Institute of technology & Management,
Auragabad, Haryana India.

Abstract
Todays car is the important transportation for individual than another transport. Statistic shows that, approximate 12.2 million registered private vehicles in Delhi NCR region. The demand of the private transportation caused so many problems. Because the needs of parking space. So another choice for the people who don’t have parking. It develops another problem, that the temperature will increase approximate 56 degree centigrade. Which will be very uncomfortable at the time of entry in the car. While, the car can also have depreciation problem and which deteriorate the perishable items in the car. So, the need of this type of car cooling system is really necessary to maintain the temperature.

Keywords: Portable; Parking; Temperature; Hot conditions; Uncomfortable

Introduction
This project study is based on the problems faced by people, when, park their car under the hot sunny day. As the number of vehicles increased day by day, people is having difficulty to get roof parking space during peak hour. So, they face the problem to leave their car in parking which is in open condition. Then, temperature of the car effected by outside conditions. The problem started if the car parked in without shade parking that direct face the high intensity of sun rays.
The car to heating up and introduces an very hot temperature in the car when people get enters inside the car later on. the atmosphere inside the car is very hot, which increase the discomfort in the car, and increase the time of the car owner to wait, till it cooled by the help of surrounding air.

So for solve this problem “Portable car cooling system” is invented. The main object of this system is to cool the car which parked in open space. The main aim of this research is directly related to the temperature which is maintained in the cabin. of car cabin, without the using of car engine. For economic point of view the materials which used in this system also have low cost. This system is used. This system is used to maintain the temperature inside the car at the level of human comfort even atmosphere is a very hot When the driver starts the vehicle the air conditioner don’t required the more power to reduce the temperature at optimum level, which decrease the fuel energy This process reduces the total running cost of the car. While this cooling system is more durable than the solar car ventilation fan or other alternative means.

The peltier cell are used in this cooling system. which works with the principle of the conversion of the difference of og temperature to electric voltage. It works on see back effect. This thermoelectric device generates the voltage when there is temperature difference.
Peltier cell is a device working on the Peltier phenomenon. It is used for the cooling since the cell allows us transfer of heat from the colder place the warmer one. Peltier cells are constructed by the large amount of semiconductor elements, connected in series from the electrical point of view and in parallel from the point of view of the heat transfer. These semiconductors consist of n-p and p-n junctions, as the heat is supply at one end and one end remains cold the kinetic energy of charge carrier become increase. This may led the flow of charge carrier, as load is applied then the circuit may get completed.

PRIMARY & SECONDARY FAN 12V DC-No. Of Fan-02
Heat Sink

The construction of system is very simple as the working of system is quite similar to domestic room air cooler. The basic concept of system is conversion of heat energy into electricity by thermoelectric effect as discussed earlier. The portable car cooling system is consist a water tank, a heat sink, a duct assembly, a roller connecting one end with stepper motor and other end with bearing, sponge with irregular shape at circumference, two fans known as primary and secondary fan and dry battery. These are the basic component of system whose specification will discuss later. The working whole system is very simple as it plays an important role in reducing car cabin temperature.

WATER TANK WITH ON/OFF SWITCH

Now the hot air passes through duct and reaches to upper portion of water tank where the roller with sponge is connected to gear motor is assembled. The sponge is rotated by the gear motor at a specific speed and after each revolution of sponge it absorbs water from water tank and become wet.

Tank cover made up of galvanized iron-

The hot air from duct is imposed to wet sponge due to which it become cold. This cold air is then released out by secondary fan which works as exhauster to the system. In this way the circulation of air in system is continually occurs and each time hot air get converted into the cold air, in this way car cabin temperature may get reduced.

AIR DUCT-

The mechanism starts from the intake of air through primary fan, as it works as intake manifold. The working of primary fan is to suck the hot air of car cabin into the system and this hot air first collects to sink area where it imposed to the heat sink. Heat sink consists of combination of assembly of Peltier cell and aluminum fins structure with thermoelectric paste

Gear motor 12 volt DC

This will create a temperature difference to Pettier cell as one end of Peltier imposed to hot air and other end to cold water tank; due to which thermoelectric effect is occur and current will be produced which is used to charge the battery.

Battery
Implementation
Due to change in atmospheric condition the temperature of the earth is increasing day by day. It's done because pollution of the earth increases at tremendous level, which is very harmful for the human being as well as different species lives on earth. The power generation is also responsible for pollutant which always stays in the earth atmosphere. Now the unconventional energies are the second choice to decrease the pollutant. I.e. use of solar power, wind and hydro.

For this product, it uses a Peltier cell as an alternative source of electrical energy.

In order to obtain the optimum performance of the product, the design of the product is the most important. This system operates using 12Vdc battery power type dry where it is rechargeable. The battery can be charged either using a charger or more attractive using the Peltier cell. There are several Peltier cells used in this system. Peltier cell will produce electricity when one of the surfaces is imposed with hot air and other surface with cold air. The greater the temperature difference felt by the Peltier cell, the more electricity is produced. Arguably, it does not work as expected because the current produced is as low as milliampere (mA). However, it is believed that it can be a source of alternative energy that can be considered.

Based on the results from the conducted experiment, the portable car’s cooling system is able to reduce the temperature inside the car. The functionality testing activities was conducted at an open place under a hot and sunny condition. It concluded that the temperature in the car approach to 62°C at 12:30 pm. The temperature in the car with and without the proposed system taken from 8:30 am in the morning until 3:30 pm in the evening. It is observed that the temperature inside the car cabin is maximum between the hours of 1 o'clock and 2 o'clock in the afternoon. While, readings taken from 9.00 am slightly increase until 12.00 pm in the afternoon.

After some time, an hour later, the temperature readings obtained is rapidly increased. Unfortunately, after 2:00 pm until 3:00 pm in the afternoon, the temperature readings decreased at a slower rate.

According to the research experimental works, it is proven that the portable car cooling system is capable to maintain the temperature inside the car in the range of 25°C to 30°C as shown in. As a result, this product also improved the quality of air and moisture inside the car's cabin significantly.

Calculation-
Here we calculate the capacity of tank, power capacity system and mass flow rate air.

Tank capacity: - here we use the tank of following specification.
Depth = 13.5 cm
Length = 20.2 cm
Width = 14.1 cm
Total volume of tank = length X height X width
Total volume = (20.2 X 13.5 X 14.1) cm³ = 3845.07 cm³ = 3.845 litres

Clearance volume = clearance height X length X width
= (1.5 X 14.1 X 20.2) cm³
= 427.23 cm³ = 0.427 litres

Actual capacity tank = (3.845 - .427) litres = 3.417 litres

Power = \( m_a \cdot c_p \cdot dT \)
\( dT \) = desire temperature change = Temperature at inlet – Temperature at outlet = 30°C c \( c_p \) = heat capacity = 1.005 kJ/kg.K
\( M_a \) = mass flow rate (kg/s)
Mass flow rate of air \( (M_a) \)

\( M_a \) = density of air X cross sectional area of fan X velocity
= 1.225 X 22/7* (.10)²/4 X 3.1 = 0.02984 kg/s = 1.79 kg/min
Power developed = 0.02984 X 1.005 X 30 = 0.8996 KW

Conclusion
As a conclusion, the working model of this type of (PCCS) cooling system was successfully developed and it is performing very well.

The main objective of the research is to propose a cooling system that able to maintain temperature conditions inside the car at the range of 25 to 30 degree centigrade. When car is parked under very hot condition. The results of different tests shows that the vehicle's owner whom using this product capable to maintain the cabin car temperature approaching to room temperature. Although, the developed portable car cooling system is in a medium size and the design is suitable for all type of vehicles in India. It was proved that this system has good features, high performance with simple and effective way in reducing the car's cabin temperature.

Limitation
There are some limitations of this project due to which it does not preferred most in India. These are:-

1. The Peltier cell. Generally at low temperature difference it will produce mille ampere of current.
2. The proposed system is only responsible for temperature reduction; it does not concern about the humidity reduction in car cabin.
3. The cost of Peltier cell is very measure issue for manufacturer.
4. There are some other alternatives of this system. For example we use solar panel to produce electricity or we reduce car cabin temperature by using car ventilation system.

References -

2. International journal innovative technology and exploring engineering (IJITEE)
3. Research paper “alternative way to reduce car cabin temperature powered by Peltier cell” by M.F.Baser and their groups. 1995