

# DESIGN AND IMPLEMENTATION OF AUTOMATED CAR VENTILATION SYSTEM BY SOLAR ENERGY

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**Abstract.** Sunlight of summer can kill human not only destroy a car. The sun heat is able to dissolve the plastic inside the car or even the furniture especially if the car furniture is made of leather.

Even children are not safe. During the year 2013 in U.S only it was found that at least 43 deaths of children in cars or buses due to heat stroke, after accessing to hot car or being left in the closed car for long time. With an average of 38 death per year since 1989 to 2013.

Based on this, many ventilation systems have been developed during the last 10 years. But this project provides ventilation system with different methods. It is environmental friendly, by solar energy power source and fuel consumption reduction, with higher efficient of ventilating.

This project is expected to reduce the temperature inside a BMW 735i using the new ventilation system which based on certain sensing methods. It will ventilate, change the entire air of the parked fully stop engine car by adding ventilation components to the car compartment.

**Keyword.** Ventilation; PIC Microcontroller.

## INTRODUCTION

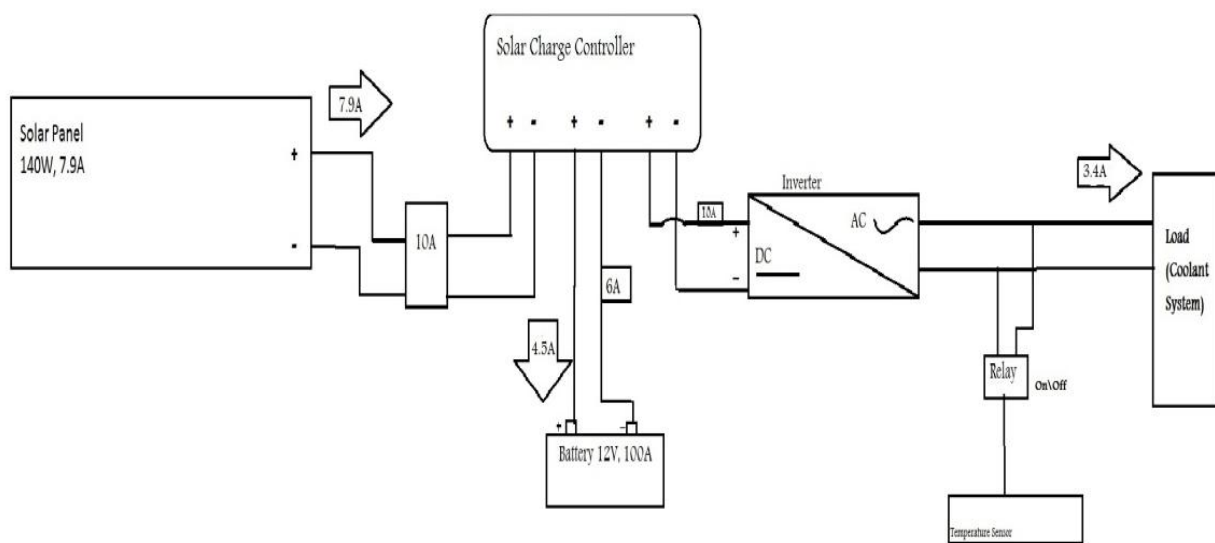
In summer days most of the drivers hates to drive their cars after long time parking at the morning. Of course each driver was in the condition of being late for any event or appointment because of trying to find an appropriate parking away from the sun light and heat.

When coming to the car after three or four hours at the morning time, the normally condition is entering a natural oven with stinky smell and no oxygen for breathing. These bad conditions lead to deaths. In U.S only it was found that at least 43 deaths of children per year in cars or buses due to heat stroke, which also called hyperthermia, after accessing to hot car or being left in the closed car for long time.

The system which is provided by this project is a ventilation system using a motor with blower fan which automatically works when the car compartment temperature increases above a threshold temperature. This automatic operation is done by a sensor with a switch to turn on and off the system. The power source is the heat source, which is the solar energy.

## METHODOLOGY

To complete the project it needed to collect theoretical information and mathematical calculations to get the accurate components measures and the perfect system performance. The library college books were good enough to collect information about solar cells and ventilating systems. The design needed to be tested and simulated using software programs before implementing the hardware design. For that purpose the Proteus Program were used to design the circuits and to program it the MIKROBASIC were used. The ventilation design will be completed in the college workshop using the car parking to park the car and fix the system.



**Figure 1 Block Diagram of the Full System**

- i) Photovoltaic. The solar panel converts the light into a DC (Direct Current). The used panel is 140 W power, which can supply 7.9A current. It charges a battery, which is a back up for the system, of 12V, 100A.
- ii) Circuit Breaker: Is an electrical switch which can be operated manually or automatically. It is used to protect the circuit from damage due to the overload or shorted circuit. Here the 10A, 6A are used.
- iii) Solar Charge Controller: The solar power controller is used to control and prevent overload charging on the battery. It protects the battery damaging by regulating the voltage and current that comes from solar panel. It also controls the solar panel current to the load.
- iv) Inverter: It is used to convert the Solar panel output “DC” into “AC” (Alternative Current) which suits the single phase motor in the ventilation system which is AC motor.
- v) Relay: is a switch which works electrically depending on the electromagnet. It is used to control the circuit. Relays are used to connect two separate circuits; one circuit with a high voltage depends on the other with a lower voltage.

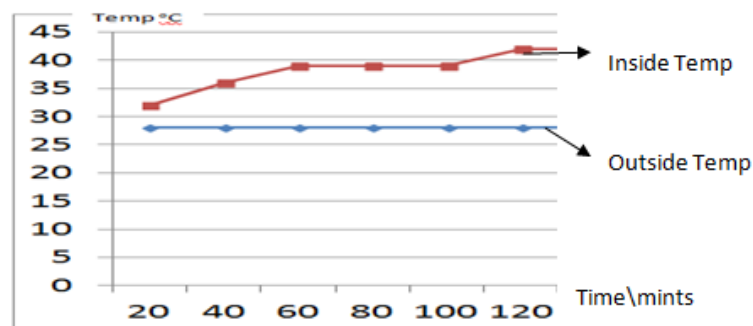
- vi) Temperature Sensor: The temperature sensor circuit used the following components:
- LM35: in an integrated circuit used to sense the temperature in ° Kelvin.
  - PIC16f887: is a CMOS 8-bit microcontroller with 40 pins. Contains a 256 byte of EEPROM, 10-bit ADC (Analog to Digital Converter). It is controlling the system based on the temperature measured by the LM35.
  - LCD (LM016L): is used to display the temperature.
- vii) Ventilation System: it consists of → Blower Fan, Filter, Recirculating Pump, and Blower Motor which is a single phase motor.

## RESULTS AND DISCUSSION

When measuring the temperature inside the car compartment comparing with the surrounding outside temperature of the car, it was found that after two hours of parking the car directed to the sun; the car compartment temperature is 14° more than the outside temp. Table 1 shows the measurements of car cabin temp without ventilation system.

**Table 1 Observation Table of Temperature without Ventilation System**

Time	Inside car Temp	Outside Temp
1 hr	39°C	28°C
2 hr	42°C	28°C
3 hr	43°C	28°C



**Figure 2 Observation Plot of Temperature without Ventilation System**

Figure 2 shows the plot diagram of the comparison between the outside temperature and inside the car cabin temperature. Temp increased when the time increases per minute, more time of parking directed to the sun, more increasing of temperature.

**Table 2 Observation of Temperature with/without Ventilation System**

Time	Inside Temp °C\ without ventilation system	Outside Temp	Duration of work	Inside Temp °C\ with ventilation system
1 hr	41°C	28°C	10 mints	34°C
2 hr	44°C	29°C	19 mints	31°C

During the first hour the ventilation system works for 10 minutes and decreases the cabin temperature by seven degrees.

Then after two hours the system works for 19 minutes it could decrease the temperature by 13 degrees.

## CONCLUSION

Design and implementation of ventilation system is the aim of this report project. Implementation of this project was done by many procedures. Starting with the software implementation which is focused on the temperature sensor designing. Finalizing with the ventilation system hardware implementing.

The project idea was emerged due to the increasing of riskiness of the car compartment which is directed to the sun heat. Almost 40 children died every year due to heatstroke after entering a heated car or being left for long time in the car. The solution of this problem is by adding a ventilation system for the car which works when the car compartment starts heating. The idea was tested by many students and researchers; each developed different system and got different results.

The automobile companies also developed different solutions, such as the panoramic roof, but it was not efficient enough.

The implemented ventilation system used the temperature sensor as a basic controller for the whole system. The sensor is controlled by a microcontroller which turns on the ventilation when the car compartment temperature increases, then switch it off when it is reduced. The temperature sensor is the basic new idea of the system compared with the existed ventilation systems.

In addition, this system is developed using a single phase motor which operates with AC, which adds more quality and life duration of the system, and rotates a blower fan of an air cooler with high speed ability of changing the surrounding temperature for the car cabin.

In conclusion, the automated ventilation system by solar energy, was successful and the obtained results meets the predicted ones. The system could decrease the entire temperature of the BMW car compartment by 12 degrees after working for 23 minutes of 120 minutes.

In addition, using the ventilation system will reduce the temperature of the car compartment which will decrease the probability of switching on the car air condition immediately after entering the car, as a result the fuel consumption will be reduced. Because the AC consume more fuel of the car engine when it is switched on while the car is heated.

The system can be a solution of decreasing the average number of deaths due to heat stroke caused by parking cars directed to sun for long time.

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