

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

All buildings ventilated by exhaust fans operate on the principle that fans create a partial vacuum within the building as they expel air outside. This vacuum causes fresh air to be drawn into the building. The pressure difference between the inside and the outside of the building is called *static pressure*. Static pressure indicates the resistance that fans must overcome to actually move air through the building. If too little outdoor air enters a home, pollutants can sometimes accumulate to levels that can pose health and comfort problems. Likewise, one approach to lowering the concentrations of indoor air pollutants in a home is to increase the amount of outdoor air coming in.

Outdoor air enters and leaves a house by infiltration, natural ventilation and mechanical ventilation. In a process known as infiltration, outdoor air flows into the house through openings, joints and cracks in walls, floors also ceilings. In natural ventilation, air moves through opened windows and doors.

Air movement associated with infiltration and natural ventilation is caused by air temperature differences between indoors and outdoors. By mechanical ventilation, air moves through exhaust fan that intermittently works according to wind blowing.

This means that typical exhaust fan that use wind to operate will stop functioning when slow wind blowing. The rate at which outdoor air replaces indoor air is described as the air exchange rate. When there is little infiltration, natural

ventilation or mechanical ventilation, the air exchange rate is low and the home temperature will be increased.

Most home cooling systems do not mechanically bring fresh air into the house. This scenario occurred either due to the nature or the system itself that not really perform excellently. Ideally, a home has mechanical ventilation to remove pollutants and hot air that generated in the home and provides outdoor air in a controlled manner.

Solar Ventilation Fan provides many benefits for instances, cooler home because a hot attic often heats the rest of home. A cooler attic will prevent this. Moreover, it will lower utility bills by keeping attic cooler using solar power thus will save on the costs of running the AC off the electrical grid.

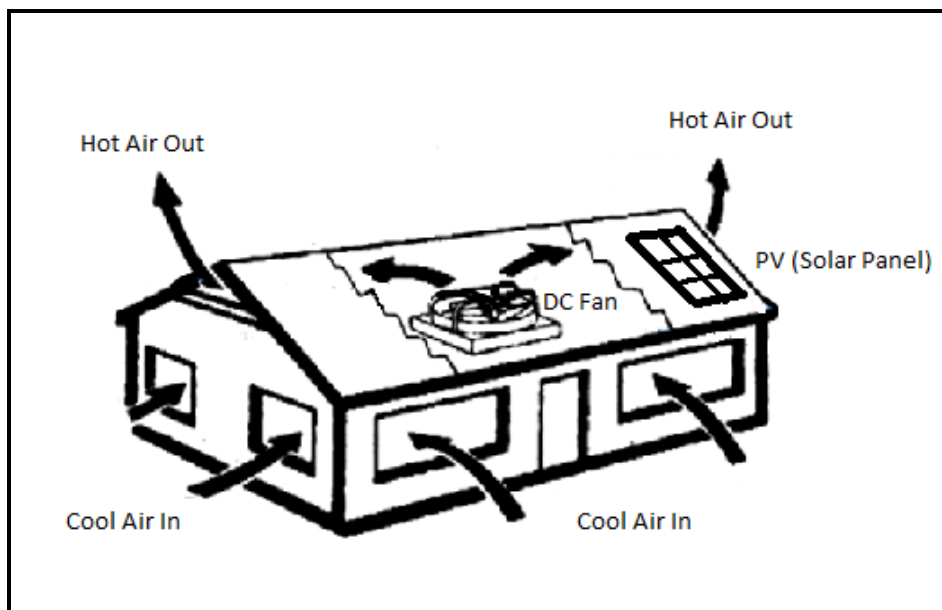


Figure 1.1: Attic Fan Concept.

Figure 1.1 shows the attic fan ventilation concept in a house. Air that flowing in and out through the windows and joints called the natural ventilation. The mechanical ventilation will be done by the DC fan that will be installed at the attic area. It only operates with the help of the solar module. The solar module should be installed on the roof top which facing the optimum solar radiation. Usually, the best angle for placing a solar module is 20 degrees therefore the solar module will gives

the best performance and the maximum life span [9]. Moreover with these reason, the maintenance cost could be decreased.

The idea of installing an exhaust fan at the attic area is because hot air that trapped in the attic penetrates at the living area if not been removed during the daytime. The hot air trapped in the attic area usually around 130° F where in Celsius is 54 degrees. Sometimes, the temperature may be increasing till 150° F during hot summer which equivalent to 65 degrees Celsius [8].

This scenario will increase the temperature inside the house for the whole night. The same phenomenon wills occurred repeatedly unless mechanical ventilation been installed. So expelling hot air in a house will be more efficient with both natural and mechanical ventilations system.

## **1.2 Objectives**

There are several objectives that have been recognized for this project. The project objectives are as listed below:

- a) To develop a ventilation fan for houses using solar module that operated when the temperature sensor was triggered.
- b) To expel hot air especially for houses located at slow wind blowing area when typical ventilation fan cannot function.

## **1.3 Scope**

The scope of this project is the ventilation fan will be a prototype model where it can be used to cool the attic area by expelling the hot air out using a DC fan. The main targets are consumer's house in Malaysia which located at slow wind