CHAPTER 1

INTRODUCTION

1.1   BACKGROUND OF STUDY

This chapter explains the overview on solar desalination. Solar desalination is one of the methods to solve the current water crisis. This method had been employed by humankind for thousands of years. From early Greek mariners to Persian alchemists, the basic technology has been utilized to produce freshwater. Solar desalination processes the contaminated water and converts it to a potable form. It is also a process of removing salts from sea water with the help of solar energy to yield pure water. The benefits of solar desalination are it uses free solar energy for operation, inexpensive, light in weight, low maintenance costs and environment friendly. Besides that, this chapter also explains on solar tracker and the significance of solar tracker. It explains how the solar tracker works and what the significance of solar tracker for the user and why the solar tracker is invented.This project discusses the design and construction of a prototype for solar tracking system that has a single axis of freedom.The control circuit is based on an ATMega328P microcontroller. It was programmed to detect sunlight via the LDRs before actuating the motor to position the solar panel. Lastly, this chapter also cover about control the flow of salt water into absorber tube. The basic mechanisms of measure level sensor are ATMega328P microcontroller which is Arduino, solenoid valve, ultrasonic sensor and water pump. The control circuit is based on an Arduino microcontroller. It was programmed to control the water flow into absorber tube. When the water reach at maximum point, the ultrasonic sensor will send the signal to solenoid valve to stop the water from flow into absorber tube.

1.2   OVERVIEW ON ELECTRICAL SYSTEM

Due to the complex design and high costs of production, solar thermal systems have fallen behind in the world of alternative energy systems. Different mechanisms are applied to increase the efficiency of the solar collectors and to reduce the cost. Solar tracking system is the most appropriate technology to increase the efficiency of solar collectors as well as solar power plants by tracking the sun timely (akram et al., 2012). The main mechanism of the solar tracking system consists of the tracking device, tracking algorithm, control unit, positioning system, driving mechanism and sensing devices. The tracking algorithm determines the angles which are used to determine the position of solar tracker (Rajan et al., 2017). The advantage of solar tracker is can generates more electricity because the system follow the sun timely. Besides that, this system also need to control the salt water that flow in absorber tube. Due to that problem, the solenoid valve is used to control that water flow. A solenoid valve is operated using an electromagnetic solenoid coil to change the state of a valve from open to close or vice-versa (Forum, P. I., 2013). When the coil is energized the solenoid valve is 'normally closed' and the valve gets lifted open by the electromagnetic force produced by the coil.

1.3   PROBLEM STATEMENT

Water covers 71% of the Earth's surface and vital for all forms of life. On Earth, 96.5% of the planet's crust water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of ice and liquid water suspended in air), and precipitation. Only 2.5% of this water is freshwater, and 98.8% of that water is in ice (excepting ice in clouds) and groundwater. The growing scarcity of fresh water is driving the implementation of desalination on an increasingly large scale.

Around 700 million people in 43 countries suffer today from water scarcity. By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world's population could be living under water stressed conditions. With the existing climate change scenario, almost half the world's population will be living in areas of high water stress by 2030, including between 75 million and 250 million

people in Africa. Thus, solar desalination technology is created to solve the water crisis. Solar desalination technology is prefer as it is cost free and clean energy, low operating cost, little maintenance, and no moving parts involved in this systems. The solar desalination uses sunlight to purify the water. The direct sunlight will help to separate the salt from water through vaporization and condensation processes using solar stills.

Thus, we designed a parabolic trough collector which can absorb and reflect the sunlight efficiently. Thus, there is maximum sunlight for the parabolic trough collectors. Besides, the designs will increase the rate of evaporation and condensation of the salt into water by using vacuum tube. In addition, we also use solar tracking to trap more sunlight. We also adding the LCDs at tracking system to display the value of light dependent resistor. The designs will be compact and lightweight so that users can carry it everywhere. We also install the solar panel at solar desalination to charge the battery in the system.

1.4 OBJECTIVES

Below are the main objectives of the projects.

1. To design and construct the circuit that can detect the water level by using ultrasonic sensor.

2. To design and construct a single axis solar tracking system for moving the parabolic trough collector.

1.5 PROJECT SCOPE

This project is focused in designing and building the prototype of solar tracking system that would be a starting point to build the realistic solar tracking system. This prototype will use the microcontroller ATmega328P and use four sensor photoresistor or other name is light dependent resistor as sensors. Besides that, this project also focuses on developing a working prototype of the parabolic trough collector type of solar desalination process. This prototype will purify the salt water contained in absorber tube using sunlight for the purpose of desalination. Lastly, this project also focuses on the installation of solenoid valve that will control the salt water flow in absorber tube.