

FABRICATION OF SOLAR IRRIGATION SYSTEM

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Abstract - Cost effective solar power production is important for the development of agriculture in India. The power consumption of any equipment is an important to reduce the cost of production. In this project, the overall power consumption rate will be reduced by using the components such as moisture sensor, water pump which is solar powered, float switch controlled water tank, and an automatic water flow control system. Thus, the implementation of the system reducing the usage of grid power and conserves electricity and reducing water losses and conserves water. [1]

Key Words: Cost Effective, Solar Power Production, Moisture Sensor, Float Switch, Conserves Electricity.

1. INTRODUCTION

Sun a huge star which generates energy by nuclear fission of hydrogen nuclei into helium as a by product of this released energy in the sun solar radiations are emitted. This solar radiation strike the earth surface the amount of solar radiation received by the earth surface is around 1367 watt per square meter. These solar radiation can be used for several purposes like heating, power production solar heating can be by using flat plate collectors which absorbs and transfers heat to a fluid (water or air). solar power production involves the use of photovoltaic cells to convert solar radiation into electricity for further utilization. Solar energy is also a renewable source of energy which is cost free and excessively available in nature and most importantly it is eco-friendly. Our system makes uses of this solar radiation to produce power which runs a agricultural water pump. Thus the power required to run the pump is eliminated which removes the dependency of farmers on grid power.

1.1 Literature review

Concept of conventional irrigation: The conventional irrigation methods are controlling the flow direction of water by using paths and sand barriers manually by farmers. By using these method a larger amount of water is needed for irrigation and also wastage of water is also high and a lot of manual work is to be done by the farmers.

Concept of sprinkler irrigation: Sprinkler irrigation involves the use sprinklers which is placed at various places of the agricultural field. Water pump delivers pressurized water to the sprinkler. Water is sprayed into the air through sprinklers so that it breaks into small water drops that falls down on the agricultural field. The total energy consumption

of agricultural sector 132.1 billion Kwh which is 19.4% of total energy consumption. There are around 18 million agricultural water pump sets in India along with 0.5 million new pump connections every year. by implementation of the proposed solution energy consumed by agricultural pump sets can be reduced. [2]

2. Methodology

This irrigation system has two main modules- Solar pumping module and automatic irrigation module.

Solar pumping module: Solar pumping module has the following components solar panel, control circuit, battery and a water pump powered by solar energy. solar panels of required capacity is used to generate electrical energy that is used to drive the water pump. convertor circuit is used to convert the direct current produced from the solar panel into alternating current. battery is used to store the direct current produced from the solar panel. Automatic irrigation module: An automatic irrigation module has the following components stepper motor, moisture sensor and a control circuit for stepper motor. stepper motor controls the outlet of the water tank. stepper motor is driven by the control circuit which gets signal form the moisture sensor according to the moisture level in the field. if moisture level is low on the field the signal received by the control circuit actuates the stepper motor to open outlet of the water tank. If the moisture level in the field is sufficient by using the signal from the moisture sensor the driver circuit controls the stepper motor to close the outlet of the water tank.

Components Used:

- Solar Panel
- Battery
- Convertor Circuit
- Water Tank with float switch
- Moisture Sensor
- Automatic valve regulation

A. Solar panel:

Solar panel is a electrical device that generates electrical energy when exposed to solar radiation. The amount of solar power produced depends upon the intensity of solar radiation, size of the solar panel and the efficiency of the solar panel. The most commonly used material for

manufacturing of solar panel are amorphous silicon (a-Si), cadmium telluride (CdTe), and copper indium gallium selenide (CIS/CIGS).

B. Battery:

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices. generally positive terminal of the battery is the cathode and its negative terminal is the anode. when connected to an external circuit terminal marked as negative is the source of electrons that will flow and deliver energy to an external device. The electrical energy produced by the solar panel is stored in the battery and can be used as per need.

C. Convertor Circuit:

A convertor circuit is used to convert the direct current (dc) produced by solar panel into alternating current (ac) that can be used to run the water pump. Convertor circuit is placed after the battery so the from the battery is converted into ac before it is used.

D. Water tank with float switch:

A tank is where the water is pumped and stored this tank is controlled by using a float switch. the water level in the tank and the pump operation are simultaneously controlled by this float switch. This float switch power off the pump when the water level in the tank goes over limit.

E. Moisture sensor:

A moisture sensor is used to detect moisture content in the agricultural field. Moisture sensor measures the moisture level in the soil and creates a voltage with respect to a preset reference value. This created voltage is a output signal from the sensor to the automatic value regulation circuit.

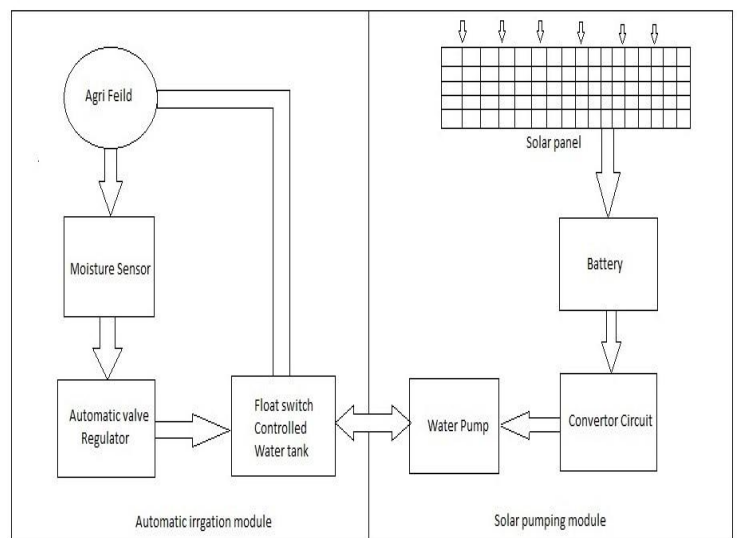
F. Automatic valve regulation:

The outlet of the water tank is automatically regulated by using a stepper motor which controls the flow area of the outlet valve. as said earlier a moisture sensor placed in the field is used to detect the moisture level in the agricultural field and create a output signal. This output signal from the sensor is sent to the driver circuit that controls the stepper motor the stepper motor opens or closes the outlet of the water tank according to the moisture level in the field. when the moisture level goes beyond a fixed level the signal form the driver circuit (via moisture sensor) controls the stepper motor and closes the outlet valve completely. When the moisture level goes below a fixed level the signal form driver circuit controls the stepper motor and opens the outlet of the water tank.

Table -1: Bill of Materials

SR. No	Component	Description
1	Electric motor	0.25HP
2	Centrifugal pump	Maximum discharge = 150Lph
3	Moisture sensor	Type-VG400
4	Stepper Motor	Step Angle:1.8 full Step
5	Solar Panel	Solar panel PVI-68

Fig -1: Block Diagram of Solar irrigation System



3.ADVANTAGES AND APPLICATIONS:

3.1 Advantages:

- Wastage of water is prevented.
- Requires no grid power.
- Uses renewable source of energy.
- This does not need attention of people.

3.2 Application:

- Can be used in Agricultural fields.
- Used to maintain experimental plants.

4. CONCLUSION:

The Proposed solution solves the energy crisis of the farmers as well as the government. by implementation of this project water wastage is reduced and prevents scarcity of water. Eliminates the dependence of farmers on grid power for irrigation. also human intervention in irrigation is reduced.

this project uses renewable source of energy and it is ecofriendly and cost effective.

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