A Review Paper on Automated Irrigation Using Solar Power

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Abstract-*Solar energy is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic's, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.*

It is an important source of renewable energy and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.

Keywords: Renewable energy, photovoltaic system, solar energy, irrigation

I. INTRODUCTION

The energy issue is a global concern, given the recurrent crises in the electricity sector. Over the past decade, the energy sectors of many countries endured intense changes with stimulus to the decentralization of power generation; giving the distribution network a central role in this new model .Energy generation plays a key role in human life, along with means of transportation, telecommunications, water and sanitation. However, both the generation and use of energy should be handled in a harmonious way and appropriate to the environment, so that natural resources can be used rationally and sustainably. From the point of view of supply, the oil crisis and precariousness in the availability of such source resulted in rise in the price of fossil fuels, thus increasing the operating costs of the electrical sector Companies operating power plants fed by these inputs. However, new environmental requirements have forced companies in the sector to include environmental costs in their activities due to several inherent problems, such as expropriation, areas of flooding for hydroelectric reservoirs, acid rain caused by the emission of carbon dioxide from thermal power plants and radiation by accidents in nuclear power plants. Therefore, we need to use renewable energy sources, which are clean and less aggressive to nature and to humanity. This demands a technological domain in the exploitation of these new energy sources, reducing costs of manufacturing, installation and maintenance of related equipment. One of the most promising renewable energies being exploited by man is the photovoltaic energy, both in electricity production in isolated systems and in systems connected to the power grid. The distributed generation with systems connected to the power grid differs from the centralized generation once it delivers energy directly to the distribution grid or where the consumer is located, even in an industrial area, in an office building or in remote regions. Moreover, this type of generation does not imply maximum or minimum volume generation, and can be formed by high-low power unit. Such impact will bring both positive and negative points, depending on the configration of photovoltaic systems. However, the injected power can support the voltage profile and system stability. Even though photovoltaic systems applied in distributed generation are less used than other generation technologies, they are gaining ground globally due to incentive programs and regulations, obtaining strong growth in the market. This type of energy generation from the sun presents itself as one of the most rational forms of electricity generation. Once static and silent, it is a promising technology for electricity generation, providing the possibility of installing photovoltaic systems near houses. Residents of rural areas sometimes have no access to electricity because of distance from the distribution power grid. In this case, they can choose to install photovoltaic panels with an integrated battery system which, during the night, can also make use of electricity. In turn, residents who already have access to electricity in their homes could install photovoltaic panels. Those who do not have a place available for installation of photovoltaic panels can install them on the roof of their homes.

FigA. Mobile solar panel

II. PROPOSED MODEL

A complete block diagram of proposed automated irrigation system is illustrated in Fig. 1. The area of paddy field usually may cover up several hundreds of hectares; to cover the whole area we need to place different sensors in the paddy field. The sensors will always sense the water level of the field and will send a message to the user's cell phone to inform the condition of irrigation through the DTMF (Dual Tone Multi Frequency) signaling. Farmer will control the motor sending assigned code to the microcontroller.

A Photo Voltaic (PV) cell is the only source of energy to drive this proposed system. The energy will be stored in the DC Battery through power supply. The sensors, microcontroller and cell phone interface are driven by DC power. However, pump is driven by AC power; inverter is used to convert DC to AC power, and AC power interface ensures the proper AC power supply to the pump

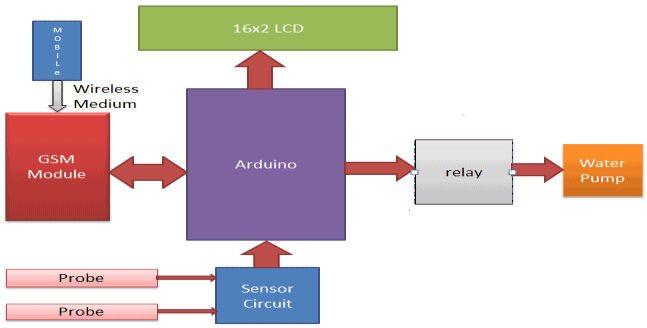


Fig1 block diagram of proposed circuit

III. DESCRIPTION OF PROPOSED MODEL

A Circuit detail of Proposed Model In this section, different circuit components of our proposed model are illustrated in Fig. 2- Normally, sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer/ instrument. Two metal plates such as A and B are used to form a sensor; at where 5V DC power is attached with plate A, and plate B is connected with a microcontroller. Normally plate A and plate B are isolated from each other and no voltage signal passes to the microcontroller. When the water fills the gap, the metal plates A and B gets connection and voltage signal passes to the microcontroller.Fig.2 Sensor connections to microcontroller According to our design model, if the water level reaches to 0cm, the microcontroller will automatically start the pump through AC interface According to the command of the pin RA4 .The farmer will be confirmed by a message; for example, PUMP STARTED. AC interface usually consists of a relay which is operated by the microcontroller and used to control the pump. The pump will remain switched ON until the water level reaches to the secured level 10cm. When the sensors sense the water level is above 10cm, microcontroller will make the pump to be switched OFF; as it is receiving the status of water level from the sensors. At the secure level (10cm) the microcontroller will not operate. However, if water level goes down to mid level (3cm) the sensors will send a signal to the microcontroller through the pin 12 (RB6) After receiving the signal the microcontroller will send a message (for example, WATER LEVEL LOW) to the user's cell phone through the cell phone interface. The cell phone interface usually consists of an opt coupler which is connected with the keypad of the cell phone as depicted in Fig. 5. The microcontroller will seek the decision from the farmer through a message; whether he wants to start the pump or not. In our propose model, an individual code is assigned for each user. If the farmer wants to start the pump, he will send a message with the assigned code to the microcontroller through the DTMF decoder. The circuit detail of a balanced-line mode DTMF To reject the common-mode noise signals, a balanced differential amplifier input is used. The circuit also provides an excellent bridging interface across a properly terminated telephone line. Whenever the farmer presses any key on his mobile phone keypad, the delayed steering (Std) output of the IC (Integrated Circuit) goes high on receiving the tone-pair, and glow the LED15 (connect with pin15 of IC via resistor R15) for a duration depending on the value of capacitor and resistor connected with pins 16 and 17. The LEDs connected with resistors R11-R14 at pins 11-14, indicate the output of the IC. The tone pair of DTMF generated by pressing the telephone button is converted into binary values internally in the IC. AC Interface A B MCU +5v Pump Cell Phone Interface PV Cell Power Supply Battery Inverter AC power Interface Sensor Micro Controller Cell Phone 229 Cell phone interface Dual Tone Multi Frequency Decoder The binary values are indicated by glowing LEDs at the output pins of the IC. For example, if the farmer dials a number 5, LED12 and LED14 will glow as corresponding binary value is 0101. Similarly, for any other number, the corresponding LEDs will glow. Thus, a non-defective IC should indicate the proper binary values corresponding to the decimal numbers pressed on the telephone key-pad. The microcontroller will start the pump if it gets the correct code. However, the microcontroller will automatically switch ON the pump if water level reaches to the danger level even if the farmer does not send the code. Solar energy supply system A small PV (Photo Voltaic) cell (6V) is connected with a battery through the charge controller. the charge controller will limit the rate of current is added to or drawn from the battery to prevent the overcharging of battery. The voltage regulator will always maintain a constant 5V supply to the module.

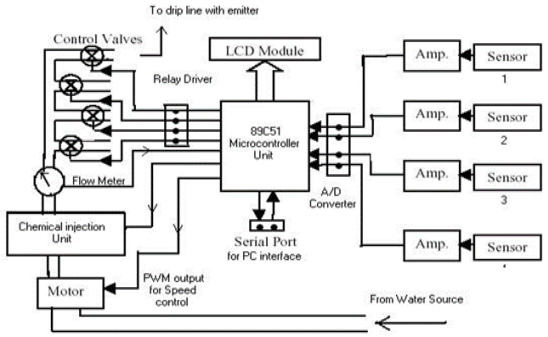
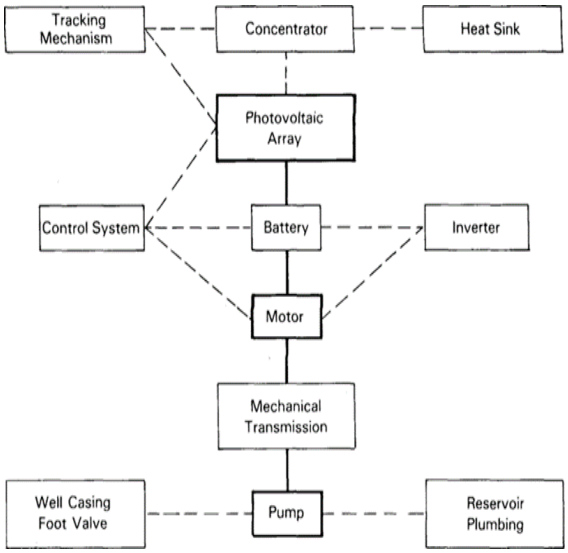


Fig2. Circuit diagram

IV. FLOW DIAGRAM OF PROPOSED MODEL

Figure 11 illustrates a flow diagram of propose automated irrigation model. Where, T and F stand for True (desired level of water exist) and False (desired level of water does not exist), respectively. At first the microcontroller will check the status of mid sensor (3cm). If mid sensor senses the water level that means sufficient level of water exists in the paddy site, the microcontroller will not initiate any decision. However, if the water level reaches below the mid sensor it will send a message seeking decision from the farmer.



If the farmer sends a message with his assigned code, the pump will start and will run till reaches to the high sensor (10cm). Conversely, if the farmer does not send a message, then the microcontroller will wait for the command until the water reaches to the low sensor (0cm). If the water falls down to low sensor the pump will automatically start and continue till water level reaches to high sensor. In this way the loop will be continuously followed by the microcontroller.

V. CONCLUSION

The automated irrigation model and implementation has been explained in detail in this paper. Since model is solar powered it is efficient and cost effective. Also it is a model inspired by technological advancement therefore it also comes with password protection to ensure security.

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