Solar operated hydraulic water pumping system using GSM

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□*Abstract*- In this project we fabricate solar operated reciprocating water pump, this is a new innovation concept reciprocating water pump is important in agricultural field. In this project electricity is produced through solar panel so this equipment compensates the electric power demands and very much helpful for agriculture. The main objective of this project is to pump the water with free source from nature ie., sunlight which can produce electricity through solar panel or with very less electricity.
The process is carried out with the hydraulic cylinder, the concept of pneumatic since it is easy to operate and very easy process. This concept can bring the drastic change in the field of mechanical especially for lubrication process in the machining area and agricultural field.
In this model we are using advanced technology using cell phone to SMS or call to ON and OFF the dc motor through GSM technology to microcontroller receives the signal from the GSM module to ON and OFF the relay ie., to control the motor anywhere in the agriculture field.

I. INTRODUCTION

Benefit of using solar energy to power agricultural water pump systems is that increased water requirements for livestock and irrigation tend to coincide with the seasonal increase of incoming solar energy. When properly designed, these PV systems can also result in significant long-term cost savings and a smaller environmental footprint compared to conventional power systems. The volume of water pumped by a solar powered system in a given interval depends on the total amount of solar energy available in that time period.

Specifically, the flow rate of the water pumped is determined by both the intensity of the solar energy available and the size of the PV array used to convert that solar energy into direct current (DC) electricity.

A solar powered pumping system methods needs to take account of the fact that demand for irrigation system water will vary throughout the year. Peak demand during the irrigation system seasons is often more than twice the average demand. This means that solar pumps for irrigation are underutilized for most of the year. Attention should be paid to the system of irrigation water distribution and application to the crops. The irrigation pump system should minimize water losses, without imposing significant additional head on the irrigation pumping system and be of low cost.

The aim of this project is to provide an efficient solution for automatic control of irrigation motor for illiterates. Now a day's technology is running with time, it completely occupied the life style of human beings. Even though there is such an importance for technology in our routine life there are even people whose life styles are very far to this well known term GSM technology. So it is our responsibility to design few reliable systems which can be even efficiently used by them.

II. BLOCK DIAGRAM

Solar panels are used to receive the sun light from the sun, and converts sun light to dc electric current. Battery is used to store the excess solar energy converted into electrical energy.

- Arduino is used to control the GSM (Global system for mobile) and moisture present in the land. It sends message to the mobile phones and it can be controlled. Motor is connected to the battery .It is used to run the cam operated pump which is connected to the HYDRAULIC double acting cylinder

- Crank and lever is a rotating element which is used to convert the rotary motion into a reciprocating motion. It is run by using the motor. Reciprocating pump is a positive displacement pump, which causes a Water to move by trapping a fixed amount of it then displacing that trapped volume into the discharge pipe. The fluid enters a Pumping chamber via an inlet valve and is pushed out via outlet valve by the action of the piston. They are either single acting; independent suction and discharge strokes or Double acting; suction and discharge in both directions.

- During the suction stroke the piston moves left thus creating vacuum in the Cylinder. This vacuum causes the suction valve to open and water enters the Cylinder. During the delivery stroke the piston moves towards right. This increasing pressure in the cylinder causes the suction valve to close and delivery to open and water is forced in the delivery pipe. The air vessel is used to get uniform discharge. Reciprocating pumps are self-priming and are suitable for very high heads at low flows.

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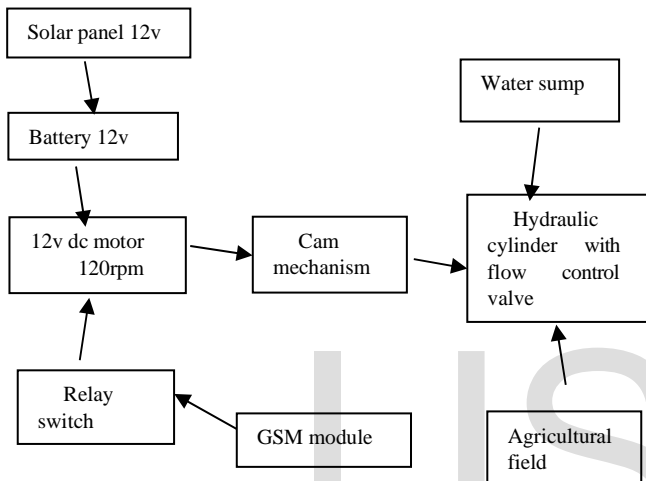

Fig3.Gsm SIM800A

Fig 1. Block diagram of present system

(1) Solar panel: A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications

Fig2.solar panel

(2) Gsm SIM800A : The SIM800A Quad-Band GSM/GPRS Module with RS232 Interface is a complete Quad-band GSM/GPRS solution in an LGA(Land grid array) type which can be embedded in the customer applications. SIM800A support Quad-band 850/900/1800/1900 MHz, it can transmit Voice, SMS and data information with low power consumption With a tiny size of 100 x 53 x 15 mm, it can fit into slim and compact demands of custom design. Featuring and Embedded AT, it allows total cost savings and fast time-to-market for customer applications. The SIM800A modem has a SIM800A GSM chip and RS232 interface while enables easy connection with the computer or laptop using the USB to the Serial connector or to the micro-controller using the RS232 to TTL converter. Once you connect the SIM800A modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manager of the USB to Serial Adapter.

Then you can open Putty or any other terminal software and open a connection to that COM port at 9600 baud rate, which is the default baud rate of this modem. Once a serial connection is open through the computer or your micro-controller you can start sending the AT commands. When you send AT commands for example "AT\r" you should receive

back a reply from the SIM800A modem saying "OK" or other response depending on the command sent.

(3) Relay: In shows are a relay is an electrically operated switch. Several relays use a magnet to automatically operate a switch, however alternative in operation principles are used, like solid state relays. Relays are used wherever it's necessary to regulate a circuit by a separate low-power signal, or wherever many circuits should be controlled by one signal.

A relay is basically a switch which is operated by an electromagnet. The electromagnet requires a small voltage to get activated which we will give from the Arduino and once it is activated, it will pull the contact to make the high voltage circuit. The relay module we are going to use is the 5v relay. It runs on 5V/12V and we can control it with any micro-controller but we are going to use Arduino.

Fig4.Relay switch

(4) Arduino Uno : Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.
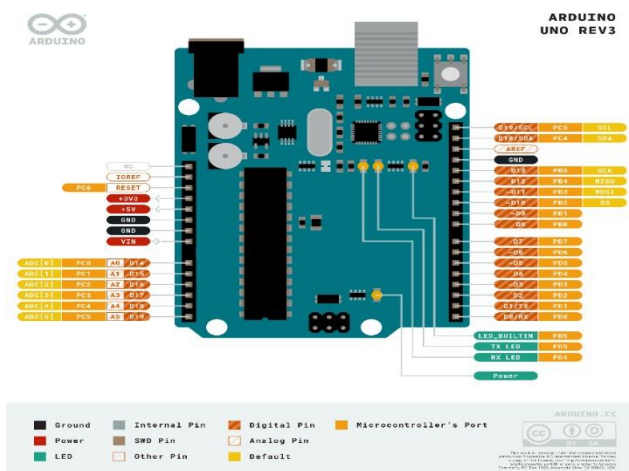

Fig5. Ardunio Uno

(5) DC Motor: This system uses the 12V DC permanent magnet motor.

Fig6. Dc motor

(6) Battery: We use 12V lead acid battery for storing the electrical energy from the solar panel

Fig7.battery

III. ADVANTAGES

- Solar panel creates absolutely no pollution. This is perhaps the most important advantage that makes solar energy
- Solar powered panels and products are typically extremely easy to install. Wires, cords and power sources are not needed at all, making this an easy prospect to employ.
- Manpower requirements are minimized.
- Has better efficiency.
- Makes the maximum utilization of solar energy.
- motor works on constant speed and consumes less energy.
- Solar-powered water systems take very little maintenance because they only have a few moving parts.

IV. RESULT

In this model we are using advanced technology using cell phone to SMS or a call to ON and OFF the dc motor which intense to operate the hydraulic reciprocating water pump to suck from the tank and through to the agriculture field. this system is mainly used for drip irrigation where there is no need of continuous flow of water.

Solar panel which is very much necessary in agriculture field, which gains the solar power to run this system.

V. CONCLUSION

We can say our project can be a success considering that will be effective in providing mobility for persons who have disabilities. One of the major lessons we have learned is that designing an appropriate technology is a huge challenge.

While concluding this part, We Feel quite contented in having completing the project assignment the project assignment well on time. The selection of choice of row materials helped us in machining of the various components to very close tolerances and there by minimizing the level of wear and tear We believe that we have system that will be effective in providing mobility for persons who have disabilities one of the major lesson we have learned is that designing an appropriate technology is a huge challenge appropriate is more than just availability for replication it considers reliability and efficiency.

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