

SOLAR TRACKING AND MONITORING SYSTEM FOR SOLAR WATER HEATER

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Abstract – These system is ARDUINO based water level and temperature detector with indications on LCD. This will be achieved using ARDUINO and some additional components, including a pumping machine. The LCD displays that if the Tank is full or empty. The system is applicable in industry and for residential use to avoid spillage of liquid to the environment. There is use of temperature sensor to detect the temperature and then if the temperature rises above the 50degree then solenoid valve become ON automatically and water flows for the use. Solar tracking system is used as a renewable energy source and it is efficient than the conventional solar systems. Solar tracking system gives more efficiency as compare to without tracking system. The power comes from solar tracking is stored in battery. And this power also used in home-applications.

Key Words: Ardiuno [unoR3], Sensors-level, light, temperature, solenoid Valve, stepper motor, Re-lay, RTC, Pump, solar panel.

1. INTRODUCTION

Water is commonly used for agriculture, industry, and home appliance etc. Therefore, water controlling system implementation makes potential significance in home applications. This is represent the design and construction of ARDUINO based water level detector with graphical output. This is achieved using a programmable ARDUINO and some additional components including sensor, RTC, LCD and Solenoid valve. The demand for trackers has expanded significantly in recent years as more reliable and cost effective solutions come to market. Solar tracking system is used as a renewable energy source and it is efficient than the conventional solar systems. Industrial and domestic reliance on the use of fossil fuel is today facing challenges in demand and environmental consideration. Faced with a possibility of scarce oil resources and increasing concern about its harmful

byproducts, such as toxic pollution, global climate change and acid rain, awareness of using renewable energy is growing. So the green energy also called the renewable energy, has gained much attention nowadays.

1.1 Objective

The system being developed will focus an automating solar tracking. Solar heater is a device which is used for heating the water, for producing the steam for domestic and industrial purposes by utilizing the solar energy. Solar energy is the energy which is coming from sun in the form of solar radiations in infinite amount, when these solar radiations falls on absorbing surface, then they gets converted into the heat, this heat is used for heating the water. This type of thermal collector suffers from heat losses due to radiation and convection. Such losses increase rapidly as the temperature of the working fluid increases.

1.2 Scope

All the resources are basically dependent on solar energy. Wood, coal, gas and oil resources were created using solar energy while even hydro and wind power are essentially derived from solar energy. There have been significant efforts to find new ways of improving solar energy (technological and commercial) and making it more efficient and cost-effective. Some examples include improving the efficiency of the solar cell, finding new materials, such as Cd-Te, mounting and using Azimuth angle while installing, utilizing government and private incentives and rebate programs, implementing smart metering, smart grid, hybrid solar, etc.

2. BLOCK DIAGRAM

The implementation of proposed system mainly involves three sensors, which are temperature sensor, level sensor and LDR sensor using ARDUINO microcontroller based. The block diagram of the system is shown in Figure.

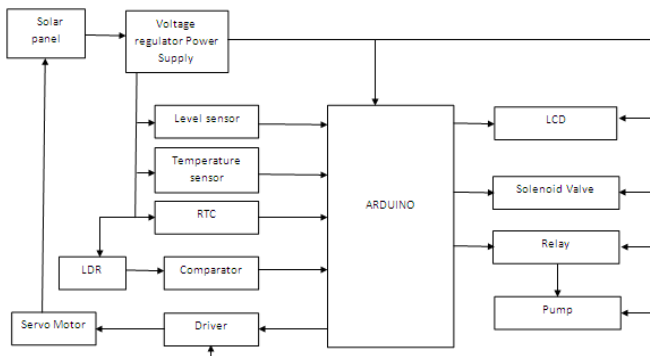


Fig -1: Block Diagram

2.1 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.



Fig 2: Arduino Board

2.2 Solar Tracking System

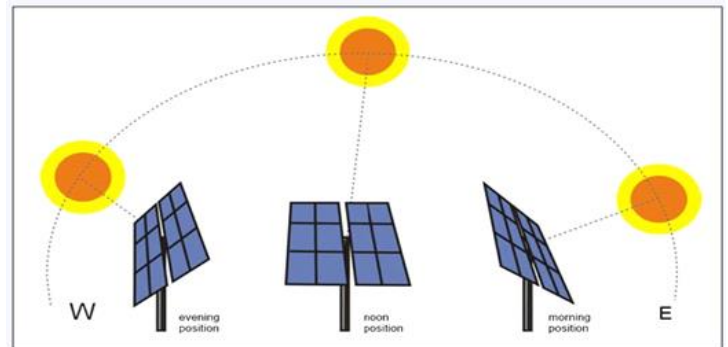


Fig 3: Solar Tracking System

The maximum solar energy through solar panel. For this a digital based automatic sun tracking system is proposed. This project helps the solar power generating equipment to get the maximum sunlight automatically thereby increasing the efficiency of the system. The solar panel tracks the sun from east to west automatically for maximum intensity of light.

2.3 WORKING

Solar panel is used to give DC voltage. This DC voltage is regulated by regulator IC. Power supply is given to required components. Level sensor and temperature sensor is used to detect level and temperature of water respectively. This particular analog output is converted into digital signal using ARM7 ADC. Another input to the ADC is output from LDR through comparator. This Comparator is used compare outputs of LDR. If $LDR1 > LDR2$ then ARM7 will moves the panel using servo motor at angle 45 degree. If $LDR1 = LDR2$ then panel will be at 90 degree. And finally if $LDR1 < LDR2$ then panel will be at 45degree. At night time when there is no light, panel will move to its initial position. Solenoid valve will be open only when it satisfies two conditions which are, when temperature of water reaches 50 degree and time matches to the particular RTC time.

3. RESULT

Specially it works for maximizing solar cell output by positioning a solar panel at the point of maximum light intensity. This solar output can be use to control water level as well as its temperature. According to the measured readings the efficiency of the single axis tracker is only 32.17% higher than that of fixed panel.

Hours	Static Panel			Solar Tracking		
	V	mA	mW	V	mA	mW
08.00am	8.4	0.6	5.04	9.15	1.17	15.8
09.00am	8.5	1.17	9.94	9.45	1.78	16.86
10.00am	8.6	1.25	10.75	9.7	1.99	19.3
11.00am	9.7	1.82	17.65	9.85	2.38	23.44
12.00pm	9.9	2.22	21.97	10.2	2.7	27.54
01.00pm	10.3	2.56	26.36	10.8	3.2	34.29
02.00pm	10.5	2.97	31.18	10.7	3.05	32.64
03.00pm	9.7	2.17	26.28	10.25	2.93	30.8
04.00pm	8.6	2.5	21.5	9.08	2.63	25.77
05.00pm	8.3	2.14	17.76	9.25	2.43	22.47
06.00pm	8.1	1.43	11.58	8.75	1.87	16.8
Average power		18.18				24.03

Table No -1: Comparison between static panel and solar tracking panel.

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4. Architectural model

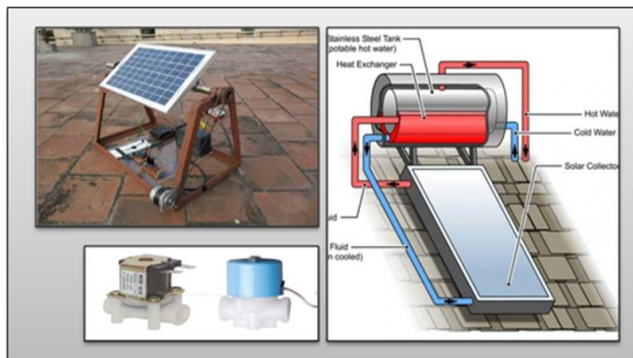


Fig -4: Architectural model

5. CONCLUSIONS

This project will present a mean of tracking the sun position with the help of ARM controller. specially it works for maximizing solar cell output by positioning a solar panel at the point of maximum light intensity. This solar output can be use to control water level as well as its temperature.

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