ENERGY MANAGEMENT IN AC APPLIANCES USING AUTOMATED POWER SUPPLY

Divyangi Patil., Abhijeet Gupte., Parikshit Bhujade and Viral Patel

RESEARCH ARTICLE

ENERGY MANAGEMENT IN AC APPLIANCES USING AUTOMATED POWER SUPPLY

Divyangi Patil*., Abhijeet Gupte., Parikshit Bhujade and Viral Patel

Department of Electronic and Communication Engineering, SIE, Vadodara, Gujarat, India

ARTICLE INFO	ABSTRACT
	Nowadays the wastage on electricity and natural source are the major concern. Rigorous attempts have been made in order to transform our abiding energy conservation system into smart energy system. The current energy conservation system provide only one power source i.e. "Non Renewable source of energy". So these paper introduces a new smart energy management system which has two power sources "Non Renewable source of energy" and "Renewable source of energy" for the AC appliances .Keeping under consideration of the user requirement the coin operated timer controlled device allow them to use the electricity for required period of time as per needs.

INTRODUCTION

From 10 to 15 years there is a tremendous increase in electricity consumption and wastage .Due to this wastage many areas are not getting sufficient electricity and are facing energy crises.Generally when we go out of house we switch off all appliances to prevent accidents like as short circuit, firing but sometime we forgot to switch off them which results in wastage of energy and money. In order to avoid this type of wastage many energy conservation system have been developed. With help of this energy conservation system we are capable of reducing wastage but not to large extent.

The major disadvantage of enduring energy conservation system is that they depend only on one power source and if electricity is not available then the appliances cannot be operated. So, in order to overcome all the disadvantages of lasting energy conservation system. We have designed "smart energy management system" which provides two power sources for AC appliances operation. The first power source is the "renewable energy source (solar & wind)" and second power source is "electricity". The appliances will continuously operate on AC supply. But if AC supply is OFF then at that time, appliance will get AC power from battery bank in the form AC supply with the help of inverter. Nowadays many advance technologies are available, it has become necessary to use renewable energy source such as solar or wind because

both these energy source are have extreme power and are available of free cost. We know that solar and wind energy is not continuously available and depends on environment conditions, so it is necessary to store the energy in battery back to make use in future. This system operation is based on a unique feature of coin operate timer controlled power supply by having an auto switching between two supply continuous power to AC Appliances. It has keypad based locking system to protect the coins which are collected in safe.

MATERIALS AND METHODS

Solar Panel

Solar panel is an electrical device which absorbs the solar energy and generate electric energy by the photovoltaic effect. The process of converting sunlight to electricity is called as photovoltaic effect. A photovoltaic module is packaged such a way that it is assembled of solar cells. When this panel is exposed to daylight, electrons in the semiconducting material absorbs the photons, leads to highly energised. These movement of electrons in semiconducting material. Each cells is having DC output power and its range is from 100 to 365 watts. These solar panel absorbs the sun rays and convert it into electric energy these energy is stored in power bank and then energy is converted into AC power through inverter .The solar module uses wafer based crystalline silicon cells .the efficiency

Corresponding author: **Divyangi Patil**
Department of Electronic and Communication Engineering, SIE, Vadodara, Gujarat, India

of the solar cell is 40% as per new record. The efficiency can be reduced by the dirt, grime, pollen on the solar panel.

Fig 1. Solar Panel

There are two main types of solar panel currently in commercial are

1. ***Monocrystalline solar cells:*** This type of solar cells are created from thin wafers of silicon from single crystals.
2. ***Polycrystalline solar cells:*** This type of solar cell is made from thin wafers of silicon cut from multiple interlocking silicon crystals grown together, hence they are cheaper to produce, but their efficiency is lower than the monocrystalline solar cells

GSM MODULE

A GSM modem is a specialized type of wireless module which accepts a SIM card and is built with Dual Band GSM engine SIM 900A, works on 900/1800Mhz.it operates like a mobile phone. The modem is connected with RS2332 interface which allows to connect with computer as well as microcontroller to communicate over mobile network. GSM modem provides mobile internet connectivity, which are used for sending receiving SMS and audio calls through AT commands. The power supply is allowed to connect through unregulated power supply. The GSM modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. GSM modem is a modem device which is connected with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. When modem is powered "on", the network Led will light up for every second at slow rate. At this stage we can start using Modem for our application, it states that modem is registered with the network.

Fig 2.GSM SIM 900A module

ARDUNIO

The Arduinouno board is an open-source prototyping platform based on easy-to-use hardware and software. Arduino consists of both a physical programmable circuit board and a software, IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. Itis a microcontroller board based on the ATmega328 which has 14 digital input as well as output pins & 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It connect it to a computer with a USB cable or power it with a AC-to-DC adaptor or battery. It can be powered via the USB connection or with an external power supply. The power source can be provided by Vin,5V,3V,GND which are selected automatically.
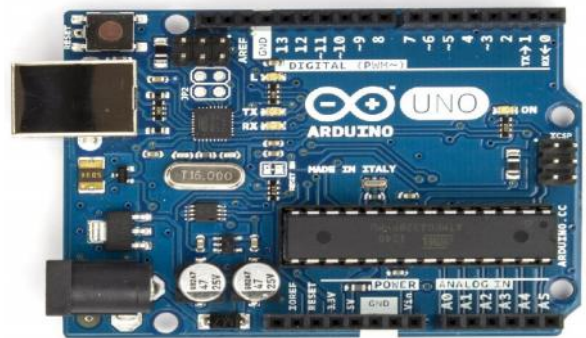

Fig 3. Arduino Uno board with Atmega 328 controller

The Arduino Software (IDE) runs on Windows, Mac OS X, and Linux. The environment is written in Java,C and C++ programming that allows to make computer to drive both functional and creative projects. The ATMEGA 328 on the arduinouno comes with the boot loader that allows you to upload new code without the use of the external hardware programming. It communicates using the original STK500 protocol.
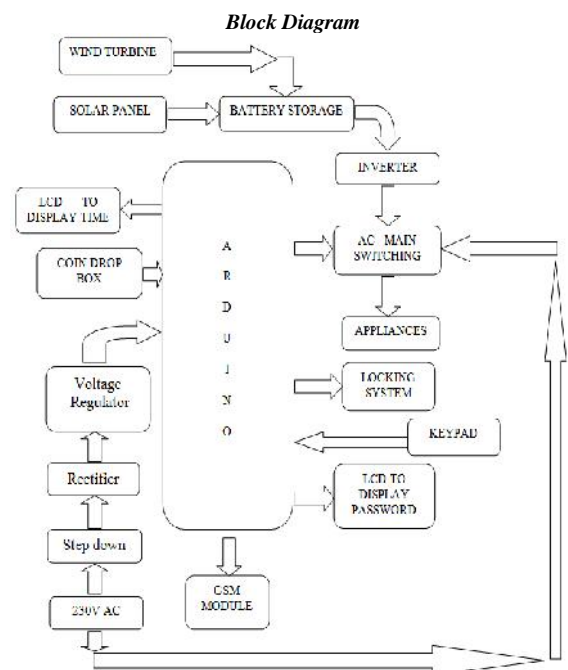
Block Diagram

Fig 4. Block diagram of Energy Management in an AC appliances using automated power supply

Arduino interacts with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, smart-phone, TV. This flexibility combined with the fact that the Arduino software is free, the hardware boards are pretty cheap, and both the software and hardware are easy to learn.

DIGITAL LOCKING

The lock is designed in order to protect coins. The lock will work in such a way that we have to enter the password through keypad which will be displayed on LCD. The LCD will display unlock as soon as we entered a right password and lock when wrong password is entered. The lock is made of CD-drive. Initially the CD- drive is open .Whenever the LCD displays unlock at that time the drive move inside. It will in that position for 20sec and after that it will move in its original position. And when the LCD display lock at that time the drive will not change its initial stage.
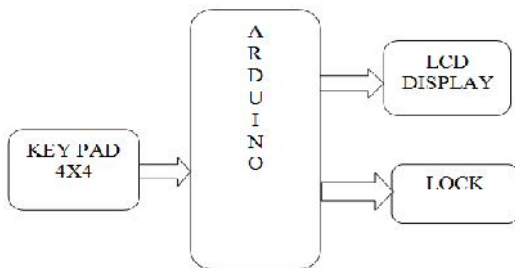

Fig 5. Block diagram of digital locking system with keypad matrix

Fig 6. Digital locking system with keypad matrix and real time operation of digital locking system

POWER SUPPLY

Non-renewable

The input supply is 230V AC which is continuous time and amplitude varying signal come from the main supply. It is then stepped down to 12V AC with help of step down transformer. Then step down voltage is applied to rectifier. The rectifier at output provide pulsating 12V DC. The output of voltage regulator will be pure DC voltage which is continuous time and amplitude varying signal.
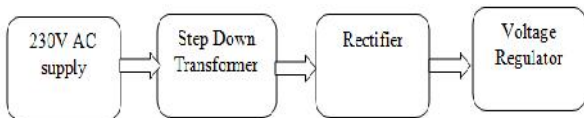

Fig 7 Block diagram of Power supply

RENEWABLE

First renewable energy is solar. The solar energy in form of photons is incident on the solar panel. The solar panel is formed by combination on large no of photovoltaic cell. This photovoltaic cell is excited by incident photons on it. The excited cell will start vibrating and will produce electron and hole pair. At a time large no of photons are observed by photovoltaic cell which will produce large no of electron-hole pairs. Large no of electron-hole pairs will constitute a large amount of electric current to flow. This will charge the battery and store.
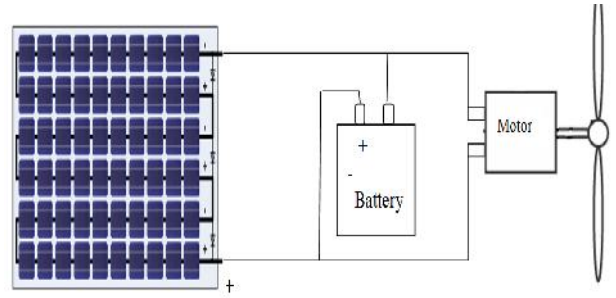

Fig 8 Structure of energy storage in battery with help of the solar panel and windmill

Second renewable energy is wind. The wind has large amount of kinetic energy. This kinetic energy of wind can be converted into electricity with help of motor. The fast moving wind strike the blade of windmill which will rotate the shaft of motor which generate electricity.

INPUT STAGE

The input to system is provided with the help of coin drop box. The coin drop box has 3 IR sensors. All the three ir sensor provides different acknowledge to arduino. When coin is inserted is 1 ir sensor the ac appliances will get power supply i.e. turn on time of appliances will be "1min",if 2 ir sensor then "2min" and if 3 ir sensor then "4min".
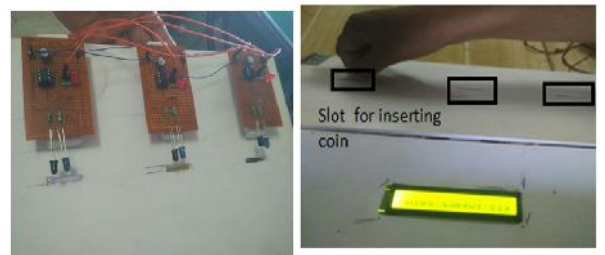

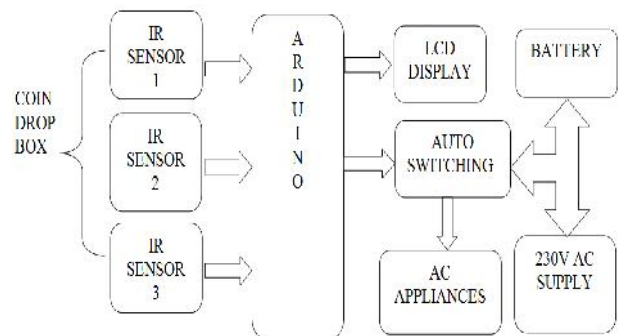**Fig 9.**Working of input stage with coin drop box

Fig 10 Block diagram of main operation of prototype

OUTPUT STAGE

The output stage has AC appliances, LCD display and auto switching. The LCD display will provide us the information about the turn on time of AC appliances. According to the acknowledgement provide to arduino by input stage the arduino provide acknowledgement to auto switching. The auto switching will turn on power supply according to input stage and provide it to AC appliances. The auto switching will decided which of the power to AC appliances according to availability of power supply.
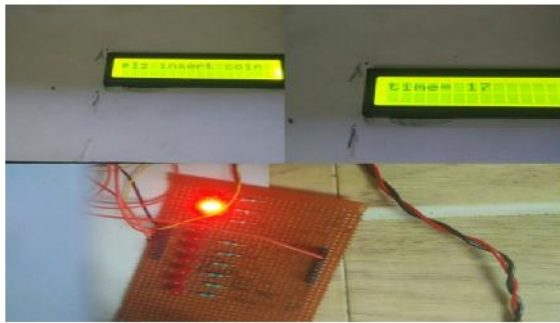

Fig 10 Real time operation of output

OVERVIEW OF BLOCK DIAGRAM

As our project depends on renewable and non-renewable resources of energy and energy can operate at limit interval of time as per our requirement .When sun rays strike the solar panel, PV cells absorbs it and convert it into dc energy whereas same as in wind with it strike with blade of wind mill it generates dc energy. To use this source in applicances, we need to convert this dc source to ac energy, which is done through inverter. we have specially desgined inverter so that it is stored in power banks. To operate the appliances the power is supplied by power banks. In coin drop box as per the requirement of time coin is inserted and according to time setted the appliances starts working and the power is supplied. In certain condition if solar and wind falls to give sufficient energy then auto-switching is available which will automatically switch to ac grid power supply .In these way we can save our power as well as nation's revenue.

OPERATION

In this prototype, when we need to turn ON the appliances we insert coin according to our requirement of energy usage. After coin is insert the appliance starts operating for that a specific interval of time which is assigned to one coin detection. Mostly we use renewable energy .i.e. solar and wind energy. Solar rays are absorbed by solar panel which is attached to battery bank where it stores power in DC energy same as in wind energy produced by windmill. Through inverter designed it converts DC to AC energy. This AC energy is supplied to appliances when coin is inserted. When renewable sources is not available sufficient then auto switching is present which automatically switches to nonrenewable sources .i.e. AC grid supply.

When the turn ON time of appliances is about to finish before few interval GSM module sends a message to user that "System is about to finish to start the system again insert a coin". Digital locking is present to safeguard the coin inserted.

CONCLUSION

As we all know that solar power conversion to electricity is somehow a expensive process. The cost for overall power generation can be reduced by using wind turbine. So it is less dependent on AC power.
In this paper we have implemented a methodology of storing the excessive power generated by renewable energy power in battery banks for future use and simultaneously discharging the stored energy during peak hour to fulfill our power requirement.

We have placed a unique feature in this paper of auto-switching between two power sources to reduce our electricity bills.

Keeping in mind the future vision to implement this project to public places and from business point of view, we have placed a digital locking system.

REFERENCES

1. B L Theraja and A.K Theraja Electrical Technology By S.C and. Simon Monk Programming, Arduino Getting Started With SketchesMcGraw-Hill Education *Beginning Arduino** - Michael McRoberts Apress; 2nd ed. 2013 edition.
2. Ch. Srisailam, R. Sudhir Kumar, M.Venkatesh, N. Jagapath: A module integrated solar isolated solar micro inverter", *International journal of electrical and electronic research*, ISSN 2348-6988, volume 3, April - June 2015.
3. L. Chandrashekar, A.Shravan Kumar**: "**Hybrid powered energy management system using wireless sensor network", *International Journal & Magazine of Engineering, Technology, Management and Research.* ISSN 2348-4845, volume 3, March 2015.
4. Ashish S. Ingole*, Prof. Bhushan S. Rakhonde**, Hybrid Power Generation System Using Wind Energy and Solar Energy, *International Journal of Scientific and Research Publications*, Volume 5, Issue 3, March 2015.
5. Abhay Kumar1, NehaTiwari: "Energy Efficient Smart Home Automation System", *International Journal of Scientific Engineering and Research*, ISSN: 2347-3878, Volume 3 Issue 1, January 2015.
6. M. F. Almi, M. Arrouf, H.Belmili, S. Boulouma, B. Bendib: "Energy *management of wind/PV and battery hybrid system", International* *Journal of New Computer Architectures and their Applications*, ISSN: 2220-9085, Volume 2, December 2014.
7. Sethuraman M, S. Jayanthi : "Low cost and high efficiency Smart HEMS by using Zigbee with MPPT techniques", *International Journal of Advanced Research in Computer Science and Software Engineering* ISSN 2277- 128X, Volume 4, Issue 11, November 2014.
8. R. Sureshkumar1, Remya. K. R: An Efficient Energy Management and Household Appliances Scheduling for

Residential Customers using Embedded System *International Journal of Emerging Technology and Advanced Engineering Website* Volume 4, Issue 1, January 2014

9. S.B.Shridevi, A. SaiSuneel, K.Nalini: **"**Coin based mobile charger using Solar tracking system", *International Journal of Advanced Research in Electronics and Communication Engineering*, ISSN: 2278 – 909X, Volume 2, Issue 9, and September 2013.

10. SandeepKumar1, Vijay Kumar Garg: A Hybrid Model Of Solar-Wind Power Generation SYSTEM *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering* Vol. 2, Issue 8, August 2013.

11. YuanxiongGuo, Miao Pian, and Yuguang Fang: Optimal Power Management Of Residential Customers in the Smart Grid, IEEE Trans. Parallel and Distributed Systems, vol. 23, no. 9, Sep 2012.

12. Roberts and C. Sandberg: The Role of Energy Storage in Development of Smart Grids, Proc. IEEE, vol. 99, no. 6, pp. 1139-1144, June 2011

****

How to cite this article:

Divyangi Patil *et al.*2016, Energy Management In Ac Appliances Using Automated Power Supply. *Int J Recent Sci Res.* 7(2), pp. 8694-8698.