© 2018 IJSRSET | Volume 4 | Issue 4 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Real-Time Analysis of Parameters of Solar Panel

Anu. G. Pillai
Assistant Professor, Department of Electrical Engg SSGI(SSTC) Bhilai, Durg, Chhattisgarh, India

ABSTRACT

This project propose a method for monitoring the performances of the PV (photovoltaic) systems. With the system of collecting, archiving and analyzing the data measured, we can monitor, define and subsequently interpret all positive and more significantly the negative external effects on the efficiency of the device. When planning the application of renewable energy sources , it is necessary to take decisions not only on the basis of more general and more profound knowledge than is currently available. In this system an X-Bee series 1 module has been used as trans-receiving system, which is then interfaced with Aurdino board. Here a CT is connected in the series with the line whose parameters is to be measured, since the precision circuit reads only voltage upto 5V, a burden is connected across CT to convert the value into equivalent voltage. Then the value is passed over to the precision circuit and then to Aurdino board. It is then passed over to the X-Bee module for transmission and an another module receives the signal that is being transmitted by the configured device. The receiving module is connected to a PC to decode the data to the end user.

I. INTRODUCTION

Our current industrial society works only with conventional energy sources like coal, oil, natural gases or uranium. Meanwhile, we will have two big problems with them. They produce several kinds of pollutions. If we do not care, atmospheric pollution, climate change or nuclear waste can endanger our living condition on the earth.

After several years the limited energy source will become exhausted, which will not guarantee our energy supply in the future. On the opposite side, the renewable energy sources use natural flows. These renewable energy sources only use a small part of the flow that is why they cannot damage natural surroundings. One of these natural resources is solar power and there are several ways to use it. One of them is to produce electricity. Firstly, we will explain how the photovoltaic technologies work, and then we will show implementation of buildings and commercial buildings and end up with solar towers.

The solar power pack is trouble free, long lasting and cost effective power solution. Non-availability of grid power, unpredictable power cuts, rising power bills and maintenance worries are history. As a result of proven technology, they are highly efficient and maintenance free. With just one time investment, solar power packs send your non-availability of grid power , unpredictable power cuts & rising electricity bills worries packing. What's more, they are eco-friendly too.

The term "Photovoltaic" or abbreviated "PV" is a combination of two words - "photo", meaning light, and "voltaic", meaning electricity. Thus, photovoltaic technology, the scientific term used to describe solar energy, involves the generation of electricity from light. More precisely, solar cells or solar photovoltaic arrays convert light from the sun directly into electricity. Solar photovoltaic (PV) systems are like any other power generating systems. In solar PV systems, just the equipment used is different than that used for conventional electromechanical power

generating systems. However, the principles of operation and interfacing with other electrical systems remain the same. Although a solar PV array produces power when exposed to sunlight, a number of other components are required to properly conduct, control, convert, distribute and store the energy produced by the array

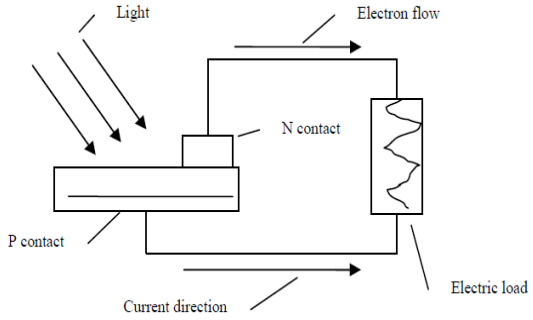

Figure 1. Diagram representing working of PV cell

PV cells convert sunlight directly into electricity without creating any air or water pollution. PV cells are made of at least two layers of semiconductor material. One layer has a positive charge, the other negative. When light enters the cell, some of the photons from the light are absorbed by the semiconductor atoms, freeing electrons from the cell's negative layer to flow through an external circuit and back into the positive layer. This flow of electrons produces electric current. Form the figure 2, it can be found that the physics of the PV cell is similar to that of the classical diode with a pn junction. The energy form the light is absorbed by the junction. The absorbed photons are transferred to the electron-proton by the silicon system. And then it comes to electron flow in the circuit which could be used in electric load.

Figure 2. Overview of solar panels

Sun intensity: Under a full bright sun, the magnitude of the photocurrent is reach to maximum. At a lower sun intensity, the power shifts downward as follow

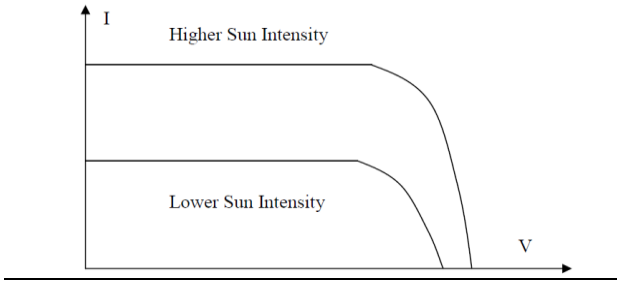

Figure 3. Graphical representation of sun intensity

On a lower sun intensity day, the short-circuit current decreases a lot, but the open-circuit voltage changed is small. Although the power we get is changed by the different sun intensity, the efficiency is the same. Because of the lower solar energy impinging on the module, we get a lower power output

II. METHOD ADAPTED

This project propose a method for the monitoring the performances of the PV (photovoltaic) systems. With the system of collecting, archiving, and analyzing the data measured we can monitor, define, and subsequently interpret all positive and more significantly the negative external effects on the efficiency of the device. When planning the application of renewable energy sources it is necessary to take decisions not only on the basis of elementary information about these energy sources but also on the basis of more general and more profound knowledge than is currently available. While planning this there was three possibilities that I underwent.

1. By directly connecting the LAN through the port of the inverter unit and remotely monitoring the data by using the unique web address.
2. By using MODEMS; one at the sending end and the other at receiving end and synchronizing both for receiving the data remotely.

3. By installing a mother PC (with LAN connected) in the panel room and permanently connecting the inverter to the PC via USB and remotely monitoring the panel by tracking the IP address of the mother PC.

When planning the application of renewable energy sources it is necessary to take decisions not only on the basis of elementary information about these energy sources but also on the basis of more general and more profound knowledge than is currently available. Complex and additional information about the intended application can be obtained from measuring, collecting and analyzing relevant data.

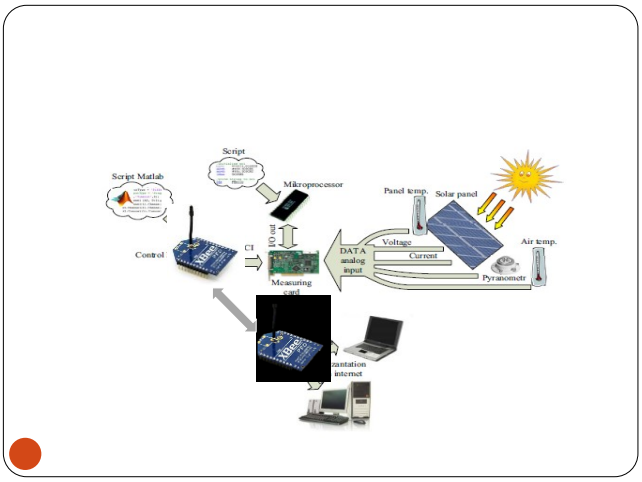

Figure 4. Overview of circuit

While undergoing these possibilities, various problems were encountered with each one of them, therefore I planned a different technique for extracting the data from inverter end to the monitoring end PC.

Studies gave me the idea of a component that can be used as a trans-receiving system with low capital and more advanced techniques. The system is XBEE series 1, which work as a transmitter and receiver system when interfaced with Arduino board. Here the techniques I used to transmit the data is as follows.

Firstly a CT has been connected to the line at the inverter end and then a burden is been connected for reading the voltage across the line. Then the equivalent voltage has been provided at the transmitting end in the converter station and then the receiving side is interfaced with the PC in which monitoring is done.

III. HARDWARE MODEL AND DESCRIPTION

3.1current Transformer

Figure 5. Current Transformer

A current transformer (**CT**) is used for measurement of alternating electric currents. When current in a circuit is too high to apply directly to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. A current transformer isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry

Burden:

The secondary load of a current transformer is usually called the "burden" to distinguish it from the load of the circuit whose current is being measured. The burden, in a CT metering circuit is the (largely resistive) impedance presented to its secondary winding. Typical burden ratings for IEC CTs are 1.5 VA, 3 VA, 5 VA, 10 VA, 15 VA, 20 VA, 30 VA, 45 VA and 60 VA

3.2: Precision Circuit:

A precision rectifier is built around an op amp, two diodes, and two resistors. Using this circuit instead of the diode bridge solved the forward voltage drop problem, because the op amp corrects the output for

any voltage loss over the two diodes. AC ripple was allowed to reach the analog pin and dealt within software

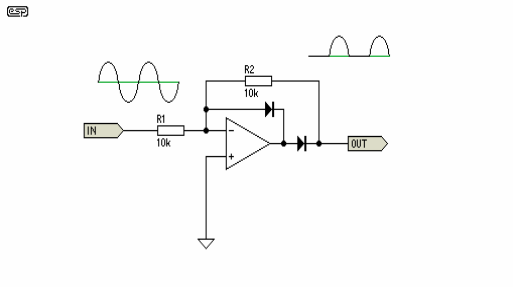

Figure 6. Precision Circuit

3.3: Aurdino:

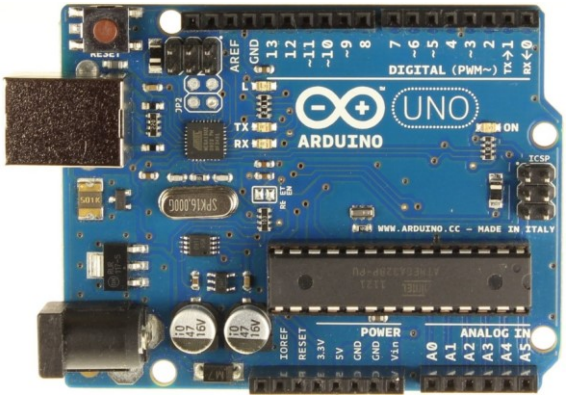

Figure 7. Aurdino Board

Aurdino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

Aurdino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Aurdino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free. The Aurdino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

3.4:Xbee WIRELESS MODULE:

Figure 8. XBee wireless module

This is our most popular XBee wireless module: the series 1 802.15.4 protocol 1mW with wire antenna. Its good for point-to-point, multipoint and convertible to a mesh network point. We suggest this module for those starting out as it is the easiest to get going: if there are two XBees in the same area they will automatically 'sync' and pass serial data back and forth without any additional work or configuration

What we like about the Series 1 modules is that they are so easy to get set up. If you have two in range, they will automatically form a serial link with no configuration, so you can send TTL serial data back and forth. You can also configure the baudrate, as well as sleep modes, power modes and tons more stuff using the Digi XBee tool.

The pins on an XBee are 2mm spacing, not 0.1" so they will not fit into a breadboard. For that reason, they work best in our XBee adapter module kit (which has a 250mA 3.3V regulator) or with the USB XBee adapter.

This module comes with a wire antenna, its the same price as a chip antenna but 50% more range because of the improved antenna, awesome!

3.5: Conclusion

The project is highly useful for remote data monitoring thereby decreasing the manual work and the errors in reading. Since the project used X-Bee module as trans- receiving system, the distance of transmission is about 300fts/ 100mts.

For a relatively larger distance transmission , a more powerful trans-receiving a system must be introduced so as to increase the reach of the system.

For our future, it is now essential to diversify our energy sources. If we do not react now and stop or decrease our dependency on fossil fuels, the future is in danger. When oil and coal resources will be exhausted, there will probably have tensions between the countries, maybe war or economic crisis will increase.

Physically, solar energy constitutes the most abundant renewable energy resource available and in most regions of the world, its theoretical potential is far in excess of the current total primary energy supply in those regions. Solar energy technologies could help address energy access to rural and remote communities help improve long-term energy security and help greenhouse gas mitigation.

The main problem with solar panel is that it can't be used in night and in the rainy season, the intensity of the sun rays are not uniform, so its efficiency is lesser than any other season of the year. Also the cost of generation of 1 unit of electricity is high. The solar panels are very costly and it requires large area for large scale generation.

A lot of improvements have been done in this field even though it is not as efficient as other conventional energy sources. We have seen many methods to improve the efficiency for instance solar tracking system etc. The different kind of solar panels with some arrangement is being used in now a days. The solar energy power system is the future for our energy requirement. Many countries are focusing on this field of energy generation because our fossil fuel will no longer exist so this kind of non conventional energy sources are need of hour.

The further developments are to be done in solar energy power system. Different researches are being done to make it more efficient and countries like China, Japan, and America are developing different technique to overcome the problem regarding the solar cell.

The system can be further developed for controlling the parameters along with monitoring for remote operation; at the same time it can be further implemented for solar tracking also.