Hybrid system based intelligent controlling and monitoring of green houses by zig-bee

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I.   Abstract: Green house are required by sensitive crops like any expensive flower, grapes as they required very fixed weather condition. In green house the weather condition is kept constant irrespective of outside weather but in current green house light conditions control via curtains. This paper discuss the system monitors the temperature , humidity, moisture, light intensity, CO2 level & water pump on/off control by sensing the water level in the well. This system introduces a new technology which moves the operation of green house towards the energy efficient system, by introducing hybrid network system. System collects the information from the different sensor from different green houses and control there parameter simultaneously. System introduce the PIC16F877A which is the heart of the system Communication link communicates over 2.4GHz ISM band using CC2500 Zig-Bee trans-receiver. Graphs give fixed crop weather conditions with outer greenhouse environment to make system versatile.

KEYWORDS: Hybrid System, Multiple Green Houses, Sensor, Water Pump Control, Zig-Bee, Master & slave

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II.   Introduction

THE history of agriculture has played a major role in human history as agriculture process has been a crucial factor in worldwide socio-economic change. Nowadays all the system can be control and operate automatically but there are still few important sectors like agriculture where automation has not been adopted, perhaps because of several reasons like Lack of Knowledge and trust on the newer technology. The concern of better quality agriculture product from consumer made the farmers adapt to latest agriculture techniques by implementing modern technologies for producing better agriculture products. The function of green house is to create comfortable growing condition for the full life cycle of the plant [3]. Green house automation system is the technical approach in which the farmer will be benefited by automatic monitoring and control of multiple green house environments together [1]. The system which we proposed, help us to control and monitor the micro-climate parameters of a green house environment automation is the process to control of industrial machinery and there by replacing human operator. For controlling and monitoring this system we are using wireless network. It has many advantages compare to traditional wired network. In order to satisfy low power dissipation and low speed among wireless network devices a new type of wireless technology Zig-Bee. This system introduced with hybrid network for overcome the power losses in rural areas. In this paper we are introducing green house control environment consist of two slave nodes and one master node, the communication between master and slave nodes done by using CAN Protocol . Communication between Master node and monitoring section through Zig-bee Wireless technology. If any abnormality occurs, the nodes will automatically controls the environment conditions by controlling various parameter control devices intelligently as required for the crops.

III.   Overview of system

The overview of this paper is to present monitoring and controlling of green house parameters by self-governing various sensors and using a Hybrid network for uninterrupted operation. In this section, we discuss several related work. We focus on Hybrid system, multiple sensor system and wireless network communication. The development of wireless sensor node for greenhouse monitoring system can be done by integrating three sensors platform, that is SHT75 to detect temperature and humidity[6], TAOS TSL262R to detect intensity of light[7], and Figaro's TGS4161 sensors to detect CO2[8]. The platform protocol use in this research is CAN protocol which has one part of a private network with a wireless pocket transmission. An attractive thing of our proposed system is that, it has extension in its concepts in successful way. Here we have combined our all previous concepts with newer technology for an effective and good productivity of plants both automatic controlling and manual controlling are takes place here with collaboration of microcontroller and zig-bee wireless network with continues supply.
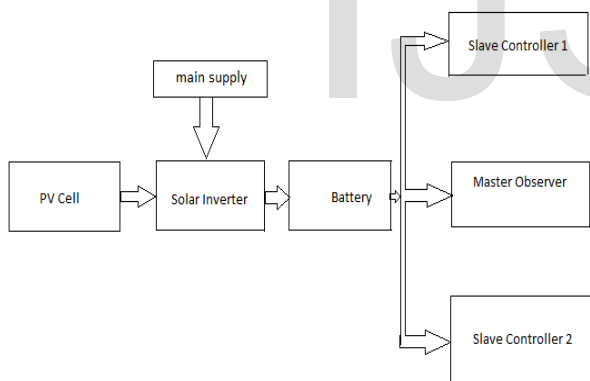
IV.   System Block Diagram

OVERALL SYSYTEM BLOCK DIAGRAM
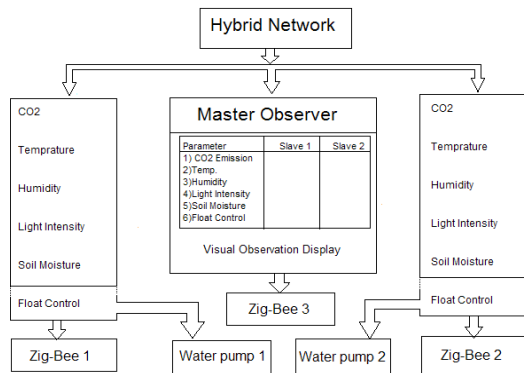
Fig. (A):   Overall system block diagram

IV.I.   Hybrid Power Network:

Hybrid Network System

Fig (B): Hybrid network system

This part is new in project. Hybrid network is new concept in which we combine two or more power supply to obtain the desired power for operation. Graph (A) shows the I-V characteristics for the power given by the solar cells here we using Solar cell and Main supply together for making a hybrid network for operation of green house continuously. This system works on the principle of photovoltaic cells in which the solar cell or photovoltaic cell converts the solar energy into DC supply and stored it in the batteries. Now for operation of green house we required AC supply hence we use the solar inverter for converting DC supply to AC

supply. This AC supply is itself get filtered in the inverter hence there is no need to use external stabilizer or filter for maintaining the voltage level constant. Generally solar cannot satisfy the power requirements of green house hence there is need to make it hybrid and for this we are using Main supply. Convention system takes the power from both as per requirement. But in this we are using Advance Inverting Circuitry. This System charges the battery from solar and also it carries a load at the same time. It will take the main supply only if the batteries we are using get completely discharge. At that time Solar only charges the battery and main supply fulfills the need of load.

V.   System Description

Solar Photovoltaic Modules A solar photovoltaic module is the basic element of each photovoltaic system. It consists of number of solar cells arranged and connected in a definite pattern. It converts solar energy into electrical energy when sunlight falls on its surface. Solar Inverter Cum Charge Controller with Intelligent Logic Control Solar Inverter converts DC (Direct current) power from the battery to AC (Alternating current) power compatible with the utility and AC loads. This unit consists of Solar Inverter cum Charge Controller with Intelligent Logic which controls the charging of battery from solar or mains with solar as priority. This system monitors the Battery charge status and accordingly decides to charge the battery either from solar or from mains. First priority of charging is from solar modules and only in the absence of solar power (no-sunshine time) and when battery voltage is low (a predetermined level), the mains charger is turned ON automatically. This maintains the battery on float. When battery bank reaches a preset low voltage, mains charger turns "ON" and charges the battery bank. Next day, when solar radiation is available, the cycle repeats. This ensures healthiness of battery and hence the life of the battery gets extended. Battery deep discharge, over charge protections are incorporated inside the Solar Inverter Battery a device that converts the chemical energy contained in its active materials directly into electrical energy by means of an electrochemical reaction. Low maintenance, tubular type batteries are provided with this system.

VI.   Conditioning and monitoring:

This is designed for controlling and observing green house parameter automatically with the help of PIC16F877A Micro-controller and Actuators'. In this design we control multiple green houses with one Master node and two Slave nodes. Each slave node control single green house. In which it controls six parameters which are Temperature,

Humidity, Soil Moisture, Light intensity, CO2 level and Water pump control with their respective Actuators and Sensors. SHT75 sensor is used to detect temperature and humidity [6], TAOS TSL262R to detect intensity of light [7], and Figaro's TGS4161 sensors to detect CO2 [8].SMES 300 Soil moisture sensors are used. LDR sensor is used for sensing light intensity. Float sensors controls the water pump. For stabilizing the ideal level of parameter operation actuators are used such as Fan, Bulb, Heater and Water Pump. Graph (B) shows the temperature variation result during day with outer greenhouse & inner greenhouse temperature

VII. Results
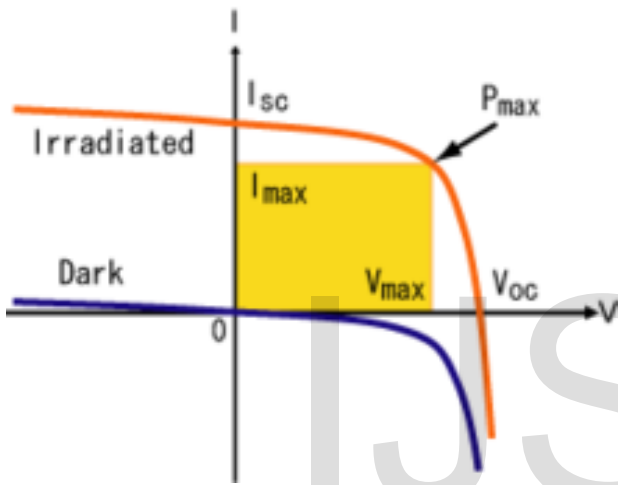
Graph (A): I-V curve for solar cell, showing maximum power point Pmax.

Maximum power point tracking is a technique that solar inverters use to get the maximum possible power from the PV array. Solar cells have a complex relationship between solar irradiation, temperature and total resistance that produces a non-linear output efficiency known as the I-V curve. It is the purpose of the MPPT system to sample the output of the cells and apply a resistance (load) to obtain maximum power for any given environmental conditions. Essentially, this defines the current that the inverter should draw from the PV in order to get the maximum possible power (since power equals voltage times current). The fill factor, more commonly known by its abbreviation FF, is a parameter which, in conjunction with the open circuit voltage and short circuit current of the panel, determines the maximum power from a solar cell. Fill factor is defined as the ratio of the maximum power from the solar cell to the product of Voc and Isc.
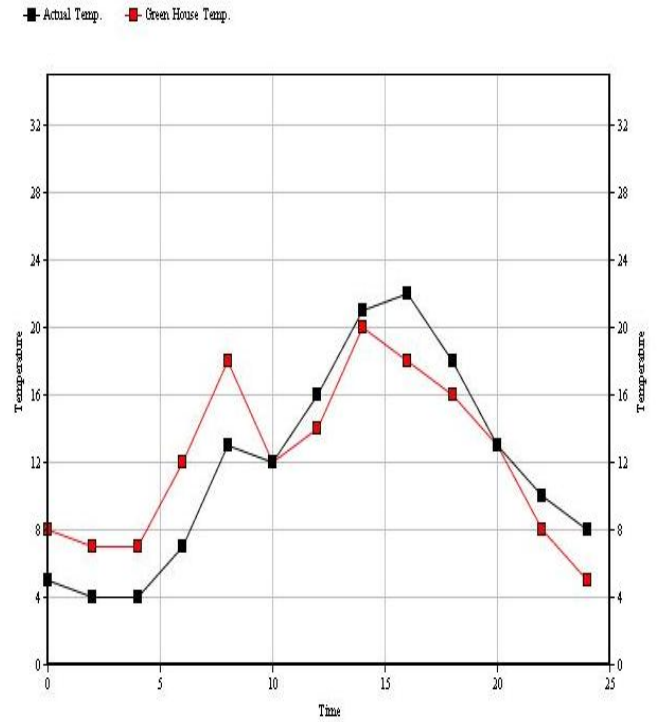
Graph (B): Temperature measurement Result
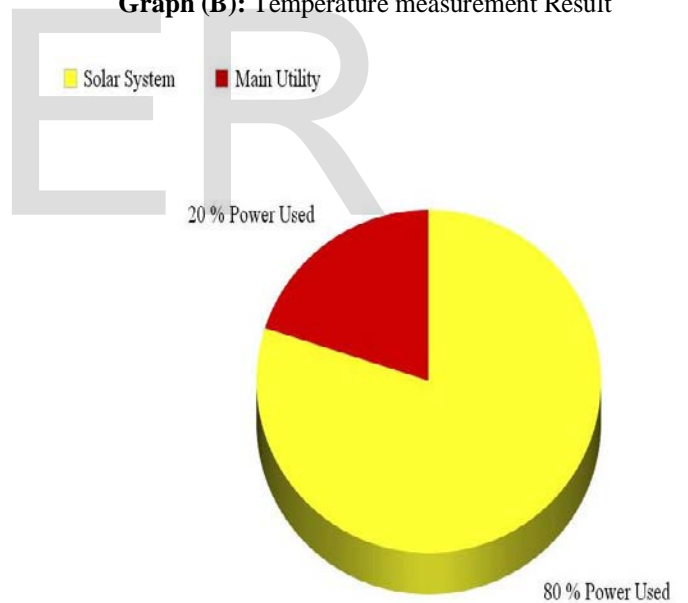
Graph (C): Power Used By System

VIII. Conclusion:

This system can give us opportunity to use six parameters energy efficiently for improving system efficiency, regulation and performance. Use of Hybrid system takes the burden on the main supply utility. This system can be more efficient if we use more non-conventional sources in it.

IX.   References

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