Wireless Industrial Power Management

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Abstract— The world passing the biggest problem of power. Because the production of power is less than the demand power of consumer side. In many countries the increase in demand is growing at a faster rate than transmission capacity and also the cost of providing power is also increasing due to the higher coal prices and deficiency of fuel. Also the reason of not getting the full power to consumers side is that the growing population of countries. To overcome the problem of power distribution this paper provides an overview of wireless sensor network by managing the equal power distribution by using zigbee network sensor. The abnormal deviation in the values of any of these parameters from their set point values will be immediately sensed and further controlling action of devices will be carried out. It is a bi directional communication system in which, at any time we can know the present parameter status. We are using wireless telemetry systems for electrical applications. The researchers have suggested the use of this ZIGBEE technology for monitoring the electrical parameters of devices from remote terminal. The aim of the proposed work is to sense the temperature and light intensity values and send it to PC using Zigbee for controlling devices. The design of hardware and software for a compact, good and low cost system to achieve remote monitoring is studied [1]

Key words: Zigbee, Microcontroller, Analog to Digital Converter

I. INTRODUCTION

Power management is a crucial issue nowadays as power requirements are increasing and the generation is not able to supply the demand from the market and falls into the frequent power cuts[2]. Energy management and understanding energy costs are a major focus today in the manufacturing industry. The world today's facing the most critical problem of not getting the regular power. The idea behind project is to introduce a embedded, Microcontroller based system which will monitor the various power consuming devices[1]. And the controlling action of the devices will be there without affecting the required work criteria. Here we use wireless telemetry system. Again as in order to calculate and find the final cost of any manufactured product, it's required to check the power consumed during production. So by using the energy meter we receive electrical units consumed. In case of over-voltage the system protects the plant from damage and it auto shutdown the production machinery[3]. In nearly every country, researchers expect existing energy production capabilities will fail to meet future demand without new sources of energy, including new power plant construction. However, these supply side solutions ignore another attractive alternative which is to slow down or decrease energy consumption through the use of technology to dramatically increase energy efficiency [3].

II. HARDWARE OF THE PROPOSED SYSTEM

The block diagram mainly consists of toll unit & server unit as shown in Fig.1.1& Fig.2.2 Transmitter unit consist of PC, MAX-232, Zigbee transmitter. In server unit PC is use to control all appliances connected at the relay circuitry. We can see the map of all premises on PC, by the symbol of each devices like tube, fan etc. PC is connected to Zigbee module by serial communication cable [4]. Compared temperature values and light intensity values are given to PC through microcontroller. All controlling action on the PC is done using VISUAL BASIC SOFTWARE. [2].

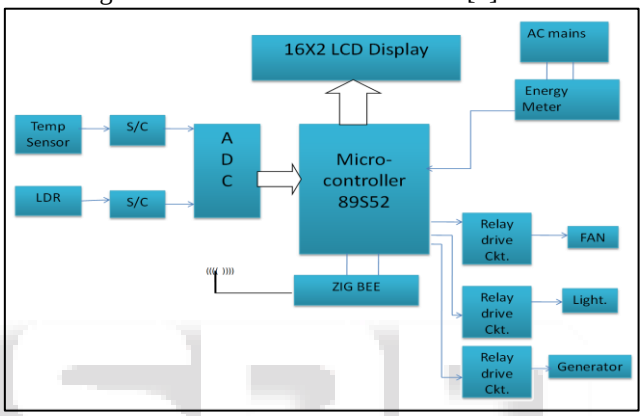

Fig. 1: The Toll Unit

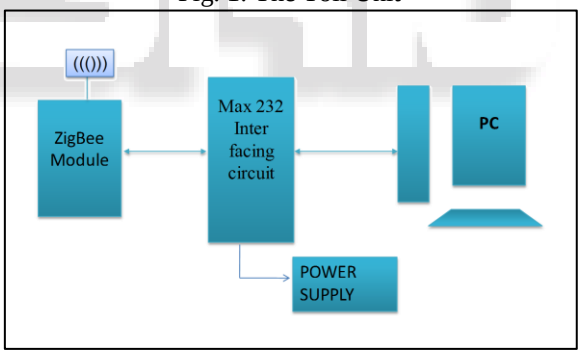

Fig. 2: Server Side

A. *Microcontroller 89c52:*

The Microcontroller IC 89C52 has 256x8 bit internal RAM which is most important feature for this application. The AT89C52 provides the following standard features: 8Kbytes of Flash, 256 bytes of RAM, 32 I/O lines, three 16-bittimer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry[5].

B. *Analog to Digital Converter:*

Input analog channels. Three address lines are used for selecting input which is to be converted into digital form. The Vref+ and Vref- pins are used to set reference voltage. Based on set reference value, the step size is decided. The default step size is 19.53mV. ADC0808 needs an external clock to operate.

C. LCD Display Unit:

LCD indicates different mode settings & set point adjustment. Also 16 char are divided to indicate speed output. The LCD Display used here is 16 characters by 2 line display. The 16 characters in both lines are equally divided to indicate commands and speed. In our project LCD is interfaced with the port-0 (D0-D7) i.e. from pin number 32 to pin number 39. The LCD interfacing is done here for indicating various display messages for the user [6].

D. Relay:

Relays are switches that open and close circuits electro-mechanically. Relays control one electrical circuit by opening and closing contacts in another circuit. When a relay contact is normally open (NO), there is an open contact and when a relay contact is normally closed (NC), there is a closed contact when the relay is not energized. Relays are used to switch smaller currents in a control circuit. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts [7].

E. Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors. The output voltage is directly proportional to the Celsius temperature. It has an advantage over linear temperature sensors calibrated in ° Kelvin. The user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. It does not require any external calibration The external calibration is used to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full -55 to +150°C temperature range. [8].

F. Max232:

The MAX232 is an IC that converts signals from RS- 232 serial port to signals suitable for use in TTL compatible digital logic circuits. Through a single on chip charge pump and external capacitor from a 5V supply, the driver provides RS232 voltage level outputs (approx.±7.5V.The typical threshold and hysteresis values of receivers are 1.3 V and 0.5V respectively [9].

G. ZIGBEE:

ZigBee is a protocol which uses the 802.15.4 standard as a baseline. ZigBee is designed for low power applications. It fits well into embedded systems. Zigbee is a communication IC.Zigbee is used for communication between toll unit and server unit. It is bidirectional device which perform transmission & reception simultaneously. ZigBee has a defined rate of 250 kbit/s[10].

III. WORKING

The industrial power management system consists of a microcontroller to which a display is interfaced. With the help of the Temperature Sensor, the temperature will be received and the same is compared with set point which is already set and depending upon the same the Fans are controlled. Again the sensor LDR which will check the light conditions and accordingly the Lighting system will be controlled. Depending upon the values received by ADC, in form of logic 0 and logic 1, microcontroller will control turning ON and OFF of relay. When relay will receive logic 0 from microcontroller the relay will be in OFF position and when it will receive logic 1 it will be in ON position. Depending upon temperature and light intensity values, fans and lights are controlled. The Data Communication is wireless communication using Zigbee. Again as in order to calculate the find the final cost of any manufactured product its required to check the power consumed during production. As we know that, industries are given specific power units depending upon electrical devices used, and if they cross that power unit level, then they have to pay penalties. So incase when industrial process crosses that level, due to auto-switching system generator will be turned ON. In case where the A.C. mains are not available our system automatically switches to the generator. For the case of the over voltage the system protects the plant from damage and it auto shutdown the production machinery.

IV. EXPERIMENTAL SETUP & RESULT

Fig. 3: Main Setup

When light intensity falls below 100,light is turned ON. When temperature rises above 40˚C then Fan is turned ON.When mains supply gets off generator is automatically turned ON.This setup can be controlled both manually or automatically.

V. FUTURE SCOPE

Later by modifying the project this system can be controlled without human presence. Automatic control of manufacturing devices in industries. It can be applicable for security and alarm, window control, door control, automatic notification etc. On-demand meter reading and remote troubleshooting allow utilities to provide better and more timely consumer support. Utilities have more at hand about outages and restorations, and are able to provide consumers with good information about when power will be restored. During emergencies, utilities can create “partial outages” in non-exempt buildings to ensure the power remains available where it is most needed. Power demand and usage, allowing utilities and consumers alike to do their part to ensure continued and affordable supply of essential services into the future [11].

VI. CONCLUSION

In this paper, the design of Industrial Power Management Using PC based on Zigbee for monitoring and controlling the power and various electrical devices has been proposed. The device analyzes the temperature and light intensity status for turning ON and OFF of fan and light. Also when mains get OFF generator is automatically turned ON. Also it keeps the record of power supply consumed during production. For the case of the over voltage the system protects the plant from damage and it auto shutdown the production machinery. .In this way we can control various industrial equipments.

The most challenges and "green" legislation that utilities are facing today, combined with increased demand from consumers for more flexible offerings and cost savings, make a solution like smart meters both timely and inevitable. ZigBee's wireless open standard technology is being selected around the world as the energy management and efficiency technology of choice. Implementing smart meters with an open standard such as ZigBee helps to keep costs down, ensure interoperability, and future-proof investments made by both utilities and consumers. Consumers and businesses will see changes they never dreamed possible. [12]

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