POWER PLANT PARAMETER MONITORING ANDCONTROLLING SYSTEM BASED ON WIRELESS TECHNOLOGY

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ABSTRACT

Due to harmful working environment and remote location of Thermal power plant sites, it is dangerous and time expensive to operate and maintenance. The demand for power increases, increasing safety and reducing operating and maintenance cost plays a vital role in increasing the reliability of the power plant. As the Thermal power plant has to work for 24 hours and 365 days, it is not possible to monitor the parameters in site at each and every moment. As there is regular change in shift of workers, hence it is important to check out all the parameters related with thermal power plant. So remote monitoring is also needed. This project develops a sensor network based control and remote monitoring system. In the proposed system microcontroller is used that controls all sub devices connected across to monitor and control the power plant parameters such as Temperature, Pressure, Gas, Level , Flame is measured by using temperature sensor, pressure sensor, gas sensor, level sensor, flame sensor[1]. All the sensors data is processed using microcontroller. Using this system we can control the operation of Thermal power plant in auto mode and monitor & control parameters in work place. Also we can communicate data to other PCs in remote locations using ZigBee technology. In order to avoid the complexity of wiring in wired network ZigBee wireless technology is used.

Keyword:- *ZigBee technology, Wireless network, Monitoring system, Controlling system, Thermal power plant.*

1.INTRODUCTION

At present, industries are increasingly shifting towards automation. In Thermal power plant, Combustion of coal in the boiler converts the water into steam. This steam with high pressure and temperature is given to Turbine which rotates Turbine shaft. This Turbine shaft is connected to the Generator shaft. By rotating Turbine Shaft, Generator shaft also rotates and Power will be generated. Temperature, Pressure and Flow are the three main parameters to be controlled in steam. Boiler tubes will be puncture if temperature of steam increases. So, temperature of steam should be monitored and controlled.

The boiler tank level must be controlled to the limits specified by the boiler manufacturer. If the boiler tank level goes beyond these limits, boiler water carryover causes the turbine damage resulting in extensive maintenance costs or outages of either the turbine or the boiler.

If the level is low, overheating of the water wall tubes may cause tube puncture and serious accidents, resulting in expensive repairs and injury or death to personnel. A puncture most commonly occurs where the tubes

connect to the drum. In the existing system the boiler parameters are monitored by using MATLAB and it can be controlled by manual only.

Wiring network is used in the classical power plant control system which has the drawback of complex wiring and it's maintenance cost is very high. To overcome these drawbacks, the wireless technology called ZigBee is used.

1.1 INTRODUCTION TO ZIGBEE

ZigBee is a specification for high level communication protocols using small, low-power digital radios based on an IEEE 802.15.4 standard for personal area networks. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices.

ZigBee is used in the applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 Kbit/s, best suited for periodic or a single signal transmission from a sensor or input device. The Applications of ZigBee are home entertainment and control, wireless sensor and networks, industrial control, embedded sensing, medical data collection, building automation, etc. The ZigBee technology is suited for the devices having very simple in design, low cost, low power and having low duty cycle.

The ZigBee technology is widely used because it has low cost. ZigBee technology has not only high reliability but also having more extensive range. The range of ZigBee can be increased by using the mesh network. If the communication is line of sight then the data can be transmitted over long distance. The range can be variable depending upon the environmental conditions.

ZigBee chip vendors typically sell integrated radios and microcontrollers with between 60 KB and 256 KB flash memory. ZigBee is operated in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide. Data transmission rate is in the range from 20 to 900 kilobits/second. The physical range of ZigBee is 10 to 20 meters.

2. SYSTEM DESIGN

The system consist of microcontroller, Zigbee and parameter of thermal power plant. Microcontroller is the key element of the proposed system which keeps on monitors the power plant parameter. The block diagram of the transmission section of the system is shown in fig 1. For every particular amount of time the microcontroller preprocesses the data and sends it to the control unit via wireless Zigbee module. Monitoring the parameter of power plant are most important in analysis. Receiver section of the system is shown in fig 2.

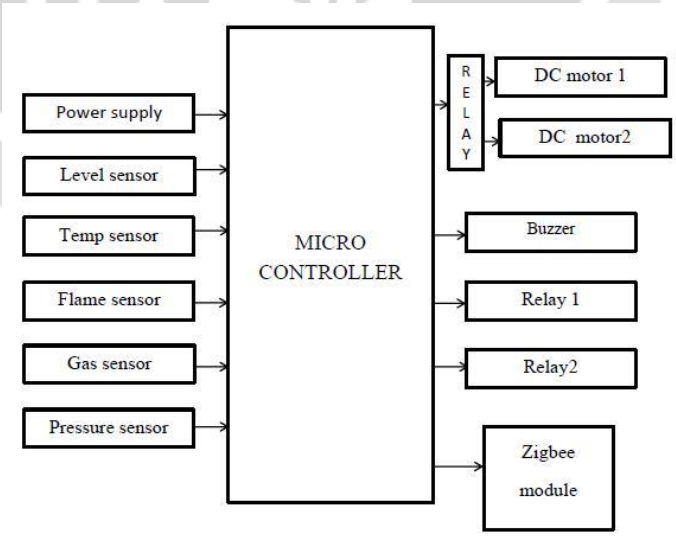

Fig 1. Block Diagram of Transmitter Section of the system

Fig 2. Block Diagram of Receiver Section of the system

3. METHODOLOGY

In proposed system we use the different sensors and microcontroller for monitoring and graphical user interface for controlling the parameters of power plant. After sensing the data, it is given as input for microcontroller .By acquiring the data from the sensors, the microcontroller monitors it. In order to communicate between these two units wireless Zigbee module is used.

The system structure mainly consists of Transmitter Section and Receiver Section which are shown in figure 1and figure 2 respectively. Transmitter section mainly consists of five sensor networks in this system which senses various parameters in Thermal Power plant. Various sensors used here are Temperature, Pressure, Level, Gas and Flame Sensors. As the output through these sensors is a physical quantity, they are connected to ADC (Analog to Digital Converter) to convert this analog information to digital format and then this digital information is processed using microcontroller.

The controlling section [3] of this system is of great interest. The entire sensor's data are stored in the microcontroller memory and continuously monitored. If any of the sensors data exceeds or below its threshold level, it indicates the workers through a display device like PC in work place and through a GSM receiver in remote place which have connections to the microcontroller. Also we can automatically control the environment of Thermal Power plant if any sensor level is high or low.

The level sensor is used to detect the level of water in the water tank. The level of water can be monitored by using microcontroller by sending the command to start motor 1. The levels of water are specified as low, mid, high.

The temperature sensor is used to calculate the temp (T) inside the boiler. In order to monitor that temperature, the command is send to the motor 2 through microcontroller.

Microcontroller is the important and central part of this project. The gas sensor is used to detect the presence of LPG gas[2] and when the gas is absent then buzzer will emit the beep sound.

The pressure sensor is used for the analysis of pressure of the steam inside the boiler. When the pressure goes to high level then relay 1 is in OFF state and relay 2 is in the ON state. For low pressure, exactly opposite condition occurs.

In any unavoidable circumstances, if fire occurs in the room where the boiler plant is situated then by using the flame sensor and buzzer we can identify that situation. To minimize the loss due to fire, we use the buzzer that to notify us earlier.

In receiver section, the Zigbee module is serially interfaced to the PC (Personal Computer). By using this PC the user can see the various sensed parameters of the power plant by using graphical user interface.

A Zigbee is connected to the data processing unit so the information from the transmitter section is transferred to a remote location so the technical person can be available in time to troubleshoot the issue in power plant.

4. CONCLUSION

In this paper, monitoring and control system has been implemented for thermal power plant. By using this system, monitoring and controlling of different parameters at the input side of power plant is possible. ZigBee technology is used for sending the information to the remote location.

5. REFERENCES

[1] Wang Jing, Hou Jie, "*Research on Flue Gas On-line Monitoring System for Thermal Power Plant* ",Proceedings of the 30th Chinese Control Conference,2012.

[2] MQ-7 Semiconductor Sensor for Carbon Monoxide, Henan Hanwei Electronics Co., Ltd, www.hwsensor.com.

[3] C.Rojiha, "Sensor Network Based Automatic Control System for Oil Pumping Unit Management", International Journal of Scientific and Research Publications, Volume 3, Issue 3, March 2013

[4] Ganesh V. Padole, Sandip N. Kamble, "Embedded Wireless based Communication in Oilfield and Providing Security Syatem", International Journal Communication and Network Security (IJCNS), vol I, Issue II, 2011.

[5] Sudararajan, V.; A. Redfern; M. Schneider; and P. Wright (2005). "Wireless Sensor Networks for Machinery Monitoring," ASME International Mechanical Engineering Congress and Exposition.

[6] Wright, P.; D. Dornfeld; R. Hillaire; and N. Ota (2006). "Tool Temperature Measurement and its Integration within a Manufacturing System." Transactions of NAMRI/SME, Vol. 34, pp. 63-70.

[7]Jagannath, V.M.D and B.Raman (2007). " WiBeam: Wireless Bearing Monitoring System" communication systems software and Middleware, COMSWARE 2007, 2nd International conference.

[8]Environmental standards for Gas/Naphtha based Thermal Power Plants, EPA Notification [GSR 7, 1998].

[9]Hong min Wang dan Li,Ping Xue,Jie Zhu and Hai bo Li,"*LabVIEW- based data acquisition system design*", 2012.

[10]Daniel Alexandru Visan, Ioan Lita, Mariana Jurian and Ion Bogdan Cioc*," Wireless Measurement System based on Zigbee Transmission Technology*", 33rd International Spring Seminar on Electronics Technology,IEEE 978-1-4244-7850-7,2010.

[11]National Instruments [EB/OL]. ActiveX and LabVIEW (www.ni.com)

[12]www.microchip.com/downloads/en/DeviceDoc/39582b.pdf