DESIGN OF MODERN INDUSTRY AUTOMATION USING PIC AND CAN PROTOCOL

Vijay.s[1], Kesavan.S.P[2]

[1] UG Scholar, ECE, Nandha college of Technology, Tamilnadu, India
[2] Associate Professor, ECE, Nandha college of Technology, Tamilnadu, India

ABSTRACT

Let us consider an industry very large area of monitoring and controlling of each equipment is a big task. Large amount of man power and time consumption is required. To resolve this problem we proposed this design model to make single person for monitoring and controlling the whole industry. It can be achieved by CAN (Control Area Network) bus network i.e. wired technology, PIC microcontroller and GSM module which are the main objective. The reason for use these CAN protocol and PIC microcontroller because of its cost effective and the CAN protocol is very easy to implement in various industries, auto motives and home. The software process is done in MP LAB to compile the program.

Keyword : - *CAN, PIC Micro controller, GSM, and PIR sensor etc….*

1. INTRODUCTION

Industry automation systems have become popular in the world wide. There are many different parameters are need to be monitored and control the industrial equipment. So that need to separate circuit system to measure different parameter. It is complex to implement these circuit due to need of large area and complexity. So there is a need arise to reduce this high complexity. To resolve this technical issue we go for Industrial Automation. Industrial automation is defined as a set of technologies that results in operations of industrial machines and systems without significant human intervention and achieve performance superior to manual operation. This is achieved by use of CAN (Controller Area Network) protocol to process multichannel in a single window. To provides an ideal platform for interconnecting modules and allows each module to communicate with any other module we use CAN bus. It provide fast and robust communication and where data should maintain high integrity, CAN can be used. Using CAN protocol we can send data from one node to other node. The main objective of this paper is to design a industrial automation and control system with low cost based on multiprocessor communication using CAN protocol and PIC microcontroller [1].

The rest of the paper is organized as follows:

Proposed system is given in section III, detailed view of hardware components is given in section IV, monitoring and controlling system design is given in section V, experimental and simulation results are given in section VI, conclusion and future development are discussed in sections VII.

2. EXISTING SYSTEM

In recent days the available system in industries is only monitoring the various equipment, If there is any fault occur in the equipment it indicate to the authority person as problem is occurred in the Industry. Then the authority person make manual step to control the accident that is the authority person must present in the Industry. Thus the function will resume when all the errors are cleared. Fig.1. shows the detailed block diagram of existing system.

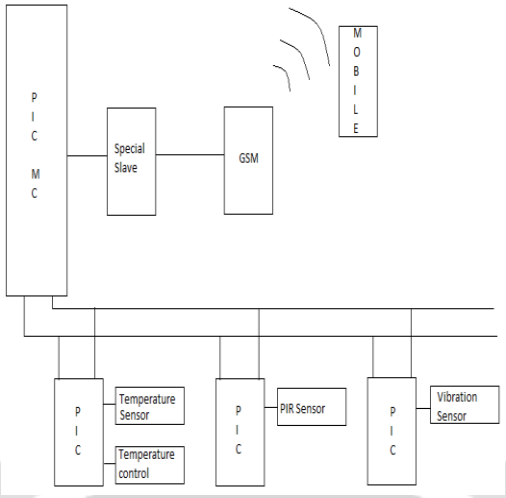


Fig -1: Block diagram of Existing System

3. PROPOSED SYSTEM DESIGN

The block diagram of proposed system is shown in Fig.2. Three slave modules and one master module along with one special slave are present. In this proposed system control devices is added to control the equipment without the presence of human interaction that is the main advantages of than existing system.

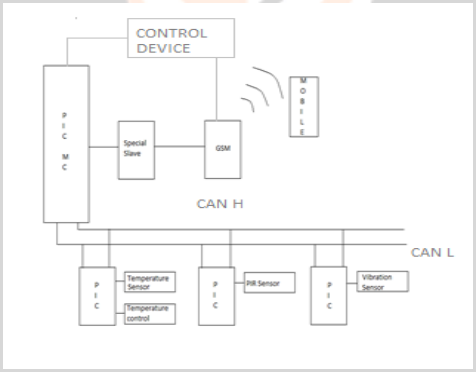


Fig -2: Block diagram of Proposed System

3.1 Process

This process initiated by the master. Whenever the master asks for the temperature, the slave 1 measures temperature level value of the boiler and senses the those values to the master module via CAN protocol after converting values into digital values via AID converter. Similarly the slave 2 is used to measure the smoke/gas level of the boiler and senses those values to the master module after converting those valves into digital values. The master module displays both temperature and gas/smoke values on the LCD.

If the temperature level of the boiler is higher than a threshold value, the cooling fan is automatically turned ON and the relay is made to tum off the boiler, and simultaneously the message will be sent to a higher authority or supervisor regarding the abnormal situation via GSM (global system for mobile communication). If the temperature value is lower than the threshold value, the relay is turned to ON in order to heat the boiler. Similarly if smoke/gas

level of the boiler is higher than the threshold value, the buzzer is turned ON to indicate the abnormal condition and DC motors connected to window opening mechanism are rotated for fire and gas leakage control.

If there is any malfunction occur in the industry the user make free decision to make turn ON or OFF the industry through mobile phone.

4. HARDWARE DESIGN

There are many slave that are used to take measurement and one master micro controller for control the all slaves according to their function. One special slave for send update information to the authority person. . These parameter processing modules, relay modules and special module are connected to the master module which controlling all the modules.

4.1 PIC Microcontroller

PIC is a Harvard architecture microcontrollers made by Microchip Technology. PIC referred to *Peripheral Interface Controller*. The hardware have capabilities range from 8-pin DIP chips up to 100-pin SMD chips, with discrete I/O pins, DAC and ADC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types.

The manufacturer supplies computer software for development known as MPLAB, assemblers and C/C++ compilers, and programmer/debugger hardware under the MPLAB and PICK it series. Third party and some open-source tools are also available. Some parts have in-circuit programming capability; low-cost development programmers are available as well has high-production programmers.

PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, extensive collection of application notes, and availability of low cost or free development tools, serial programming, and re-programmable Flash-memory capability.

4.2 Temperature sensor LM-35

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in QC). The sensor circuitry is sealed and note 1 230 V 7805 AC IN

4.3 Buzzer

If the DC motors start rotate continuously, the buzzer will turn on to indicate the abnormal condition. As the concentration of gas decreases the sensor output decreases and when it becomes less than the limit the motors will stop automatically.

4.4 Liquid crystal display

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly.

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

4.5 PIR sensor

The PIR (Passive Infra-Red) Sensor is a pyro electric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.

All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation is invisible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

5. DESIGN OF MONITORING AND CONTROLLING SYSTEM

CAN bus which belongs to the category of field bus is a kind of serial communication network which supports distributed control or real-time control effectively. Currently, many existing auto network standards have different emphasis about their functions. The CAN 2.0B is a network protocol that was specially developed for connecting the sensors and actuators. CAN 2.0B supports data rates from 8kbps to 1 Mbps, which allows the CAN network to be used to share status information and real time control. It can transfer up to 8 data bytes within a single message. Values are transferred to microcontrollers from ADC via CAN Protocol at an interval of 10 seconds and is displayed in the LCD. The flowchart for CAN based monitoring in master side is shown in fig.3.

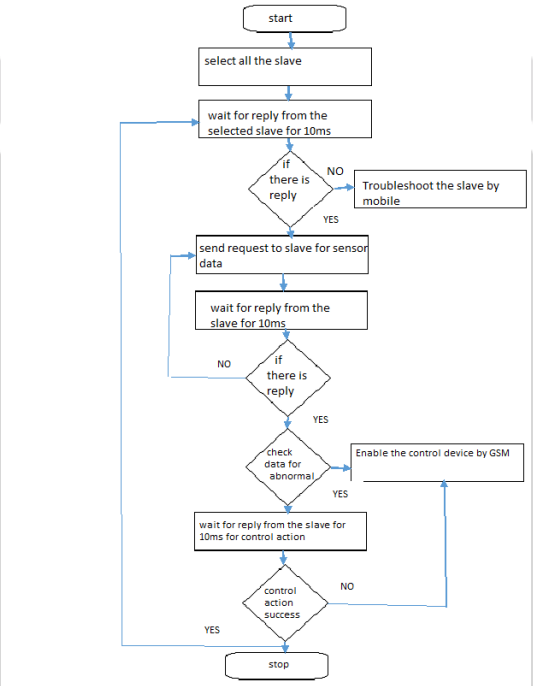
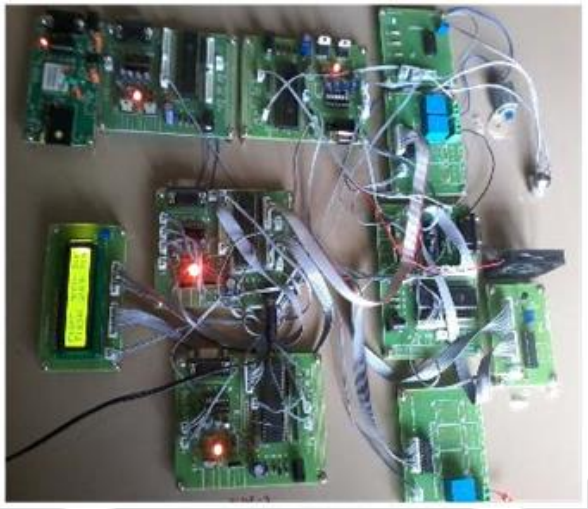


Fig -3: Flow chart

6. EXPRIMENT AL AND SIMULATION RESULTS

The whole automation is split into two stages. The initial stage is parameter monitoring stage that is to measure the all parameters in the industry. Then the second stage is industry automation and controlling. The overall hardware setup of industrial automation and controlling system. In the first stage, temperature sensor and PIR sensor and vibration sensor are connected to microcontrollers. The LCD is connected to port 0 of the microcontroller in the master order to display the instantaneous values of parameters. Control signals for LCD are obtained from PORT 2. The master is interfaced with special slave for interrupt purpose.



7. CONCLUSION

This paper is concerned with the implementation of low cost effective control of industry with less man power. This is very useful in chemical industry to avoid any malfunction and monitoring the temperature, PH values and human interactions in the factory. Transmission of process information from plant to control room is made in fail safe and efficient manner by CAN serial communication protocol. Instantaneous values of process parameter are send to the authority person. Normal and abnormal conditions are viewed in the LCD. Control elements are activated and deactivated as per the program logic.

8. REFERENCES

[1]. Shaohua Lu And Farid Boussaid,"Microcontroller Based Industrial Automation And Control System Using Can Protocol"IEEE Transactions on Power Electronics, Vol 30 No 10, Octomber.
[2]. Presi.T.P, "P IC Microcontroller Based Vehicle Monitoring System Using Controller Area Network (CAN) Protocol",IEEE international conference 2012.
[3]. Kumar, M. A.Verma, and A Srividya, Response-Time "Modeling of Controller Area Network (CAN). Distributed Computing and Networking, Lecture Notes in Computer Science Volume 5408, p63-174,2009.
[4]. Tindell, K., A Burns, and AJ. Wellings, "Calculating controller area network (CAN) message response times", Control engineering Practice, 3(8): p. 1163-1169,2005 .
[5]. John Rinaldi and Vince Leslie, 'The Fast Guide to Controller Area Network (CAN) Application Layers", Real Time Automation, pp. 1-8, December 2003