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Milk Dairy Automation Using 'CAN Protocol'

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Abstract— Now a day's automation in industry increases rapidly. There are main two purposes behind the use of automation in industry first is to reduce the man power and second is for safety purpose. We can use automation in two ways the first one is fully automatic automation and another is controlled by human. Automation can be done by using different electronics components like microcontroller, sensors, etc. In milk dairy, chemical factory, sugar industries automation technique is used. In automation various sensors are used which produces data, is collected by vehicle data acquisition by inter communication through an intelligent communication network called controller area network (CAN). In our project we are going to use CAN protocol because it gives better results for shorter distance. In this project weare using CAN transceiver MCP2551 and PIC18F458 which is application specific Microcontroller. We are referring here PIC microcontroller it has variable bit rate like 8 bit, 16 bit, 32 bit so this is advantages.[4]Also this system prevent milk from spoiling.Today, CAN is widely recognized for its high performance and reliability, and is used in a broad range of fields from FA devices and ships to medical and industrial equipment. CAN is a serial bus protocol to connect control system to sensors as optional system which reduce wired connections. In milk industry currently PLC based system is used for automation which is costly and noisy. There is large distance between work area and user control room. In flushing process of milk containers they operate on man power which is time consuming. This paper gives an overview of control system and its benefits using CAN protocol.

Index Terms— Automation, CAN bus, CAN protocol, Data acquisition and control system.

I. INTRODUCTION

CAN is the solution developed by Robert Bosch GmbH, Germany in 1986 for the development of a communication system between three ECU's (electronic control units) in vehicles being designed by Mercedes.CAN is a very reliable and message related serial network that was actually designed for the automotive industry, but has become a sought after bus in industrial automation also used in other applications. The protocol used in various fields such as production machinery, fire automation, home appliances automation and wheel chairs.[1]

A. Controller Area Network

CAN is two wire, half duplex, high speed network system mainly used for high speed application using short message. It have communication rate up to 1Mbits/sec thus used in real time control. It has unique error detection and error correction features makes it more trustworthy and adaptable to noise critical environment. .CAN uses carrier sense multiple access protocol with overlap detection and judgment on message priority as its communication protocol.[3] Every node in CAN allows the communication protocol to monitor the bus network in advance before transmitted message is reached. If no activity occurs in network, then each node has the equalopportunity to transmit a message. Bit-wise arbitration is used by communication protocol to solve collision problem. For successful process of arbitration, the logical states need to be explained as dominant (logic 0) or recessive (logic 1).[2]

SOF	11 Bit Identif	RTR	IDE	R0	DLC	DATA Up to 8 bits	CRC	ACK	EOF	IFC

Fig. 1 Standard CAN frame format

SOF	11 Bit Identif	SRR	IDE	18 Bit Identif	RTR	R1	R0	DLC	0...8 bytes DATA	CRC	ACK	EOF	IFC

Fig. 2 Extended CAN frame format

Figure 1) shows the standard CAN frame format which has 11-bit identifiers. It has 125kbps to 1mbps signaling rates. The improved version extended CAN frame format is shown in figure 2) having 29-bit identifiers. Messages are transmitted to all nodes in the network by using CAN protocol which is considered as a message based protocol, hence each node is able to decide either message is delivered or rejected from the receiving messages. On the basis of network configuration transmitted message send to one or many other nodes. This has many applicable consequences such as multicast, message routing and filtering, system flexibility, together with data consistency.[5]

B. Control System Using Controller Area Network

In the control system for the automation of cleaning system we use the controller area network (CAN). Our system is made up of two nodes. The first node is introduced for the decision making, it takes decision about which process is to be select, real time signals, and finally it transmit the signal to the another node it acts as receiving node. the main purpose of second node is used for correct decision making and it also be used for observe the signal

received from the first node. The relay used in the system is drives by the second node. The relay introduced to drive the valve and pumps. As mentioned earlier this working process is better than existing working process because of cost of system is much less as compared to PLC based system. And other benefit is that this system will minimize the noise to great extend as compare to the PLC based system. The advantage of this system over currently used system is that this process required less man power. Also the automation is provided for the washing process of milkcontainers too.[7] After flushing process milk container is fill with milk for analysing the weight of milk the weight sensor is included in this system.

C. Literature Survey

1) "Research paper on dairy automation using CAN protocol".IJSEAT Volume2 Issue12,Dec2014:This system proposed by Mr.B.Praveen Kumar, S.Rajagopal Sri AdityaEngg.College,Surampalem. In that they explain the brief overview of CAN protocol n/w. They used ARM 7 LPC 2129 microcontroller.
2) "A framework of milk dairy automation using CAN protocol".Volume2 Issue7,Mar2015:This system proposed by SarodeTushar B. is the milk dairy automation using PIC microcontroller 16F877A. They use IR transceiver as a level sensor and it is built around TSOP 1738 module.
3) "Milk dairy automation using CAN protocol''. Volume 3 Issue 9,sep2013: This system proposed by Mr. Abhijit K Chougule and Prof. R.J.Vaidya B.V.U.C.O.E Pune in this system they explain milk dairy automation using ARM controller LPC2129.
4) "Milk process automation in dairy system using PLC SCADA": This system proposed by Linda senior lecturer in UK in this system digital controller and mechanical devices used.

D. *Proposed System*

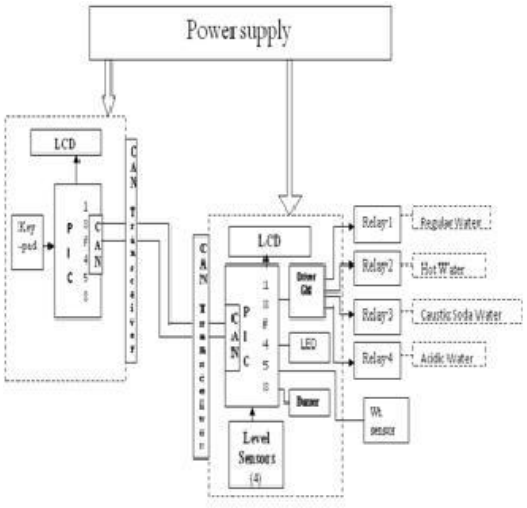

Fig. 3 Block diagram of milk dairy automation using CAN protocol

D. Real time clock

Real time clock gives delay of few seconds for all types of tanks so due to that sequentially system follow the command given by control room.[6]

The two processes for flushing are :

i. Caustic soda method:
   a. 10 Sec regular water
   b. 5 Sec hot water
   c. 25 Sec caustic soda
   d. 5 Sec regular water
   e. 25 Sec hot water

ii. Acidic flushing method:
   a. 15 Sec caustic soda
   b. 10 Sec acidic flush
   c. 5 Sec regular water
   d. 10 Sec caustic soda
   e. 5 Sec regular water
   f. 10 Sec hot water

II. HARDWARE REQUIREMENT

1) PIC Microcontroller: PIC18F458
2) CAN transceiver: MCP2551
3) Sensors: level sensors & weight sensor
4) Power supply: +5v
5) LCD display
6) Keypad
7) Relay
8) LED
9) Buzzer

III. CONCLUSIONS

This system is useful to overcome the limitations of currently used system because CAN protocol required less wiring and it has capacity to extend the network for modification. It has greater flexibility and it has data rate upto 1Mbps. CAN protocol is multi-master device and it has ability to transmit data between different nodes upto 112 nodes. It gives better result for shorter distances so it is useful for milk dairy automation.

IV. REFERENCES

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[5] Prodanov, W., M. Valle, and R. Buzas, A controller area network bus transceiver behavioral model for network design and simulation. IEEE Transactions on Industrial Electronics, 2009. 56(9): p. 3762-3771
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