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Real Time Monitoring & Controlling System for Food Grain Storage

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ABSTRACT— Purpose of this study is to develop real-time monitoring and controlling system for food grain storage. In agriculture field the next basic objective is to provide an effective, safe viable storage in unpredictable weather conditions. In the process of grain storage, temperature and humidity are two factors that can affect the grain quality. The overall structure of the proposed grain storage system consists of two components, one is the host computer located in control room for information processing and prediction of grain situation, the other is the lower computer terminal in the granary with grain data acquisition. The main purpose of the system is to acquire data from different sensors and transmit this data over Ethernet. If wired network crashes then we will implement wireless connectivity to access the status of granary. The proposed system has good reliability, maintainability and cost effectiveness.

KEYWORDS— Controlling System, Monitoring System, Grain Storage, Sensor, Data Acquisition

I. INTRODUCTION

Grains are the most important staple foods in most country. Grain storage is a vital component in the economy and the society. Maintaining quality and safety of grain storage are related to the hundreds of millions of people in India. Grain storage therefore occupies a vital place in the economies of developed and developing countries. The purpose of any grain storage facility is toprovide safe storage conditions for the grain in order to prevent grain loss caused by adverse weather, moisture, odents, birds, insects and micro-organisms like fungi. The traditional grain storage suffered through several drawbacks such as large cable coverage, more interference and lighting strike, high maintenance cost. By monitoring and controlling grain storage more relevant real time information can be obtained. And after analyzing the data of rice, millet, wheat, jawar under different stress conditions, combining this result with temperature & humidity parameters and gas, more comprehensive analysis about the activities of pests and mildews in the granary will be submitted to the admin members. Then, the administrators can perform different controlling actions for ventilation or cooling by granary operating devices according to the analysis. Due to low cost sensor and effectiveness communication, several problems in traditional monitor system are solved

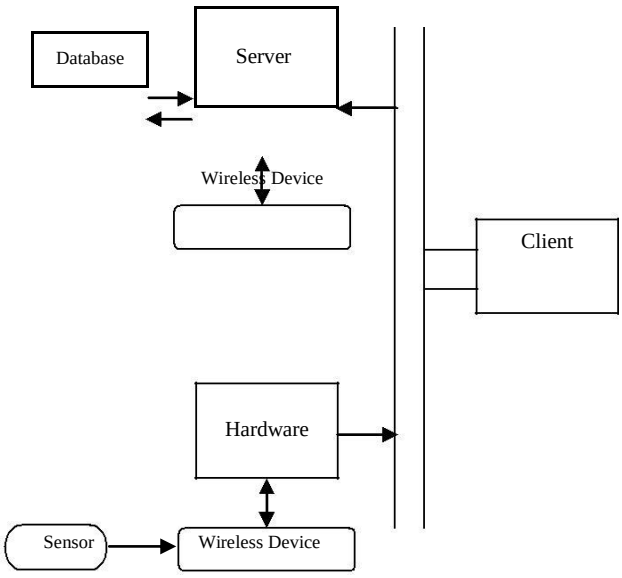

Fig. 1 Overview of grain system

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II. System Architecture And Working Principle

The proposed architecture for monitoring and controlling of the grain storage divided into two parts

(1) Hardware component &

(2) Software component.

The hardware pat placed in granary with data acquisition models and software part located in control room from where administrator can generate controlling action.

The hardware part consists of LM 35 temperature sensor and SY-HS-220 humidity sensor model. The hardware placed around PIC18F452.The data acquisition model process the output of various sensor, amplify the signal and done A/D conversion. It Acquire the real time data from granary process the signal and then given to the PIC controller in digital form.

The software part consists of host commuter which is located in control room. It consists of database which created in VB.NET, printer, client and Ethernet model. The PIC controller sends the data acquired from grainy over the Ethernet model to host computer. The main objective is to collect data from different sensor and transmit over the Ethernet.

efficiency, ROM & RAM, hardware and software tool PIC 18F452 controller is selected. It has 2GB memory which is available for grain data measurement.

The exponential growth of computer technology and widespread use of embedded system have promoted the development of distributed monitoring systems for grain storage. The aim of the work is to design and implement monitoring & controlling system for grain storage, which can be useful & necessary in large granaries. This device should be low cost, low power consumption, reliable and suitable of supporting the above mentioned applications.

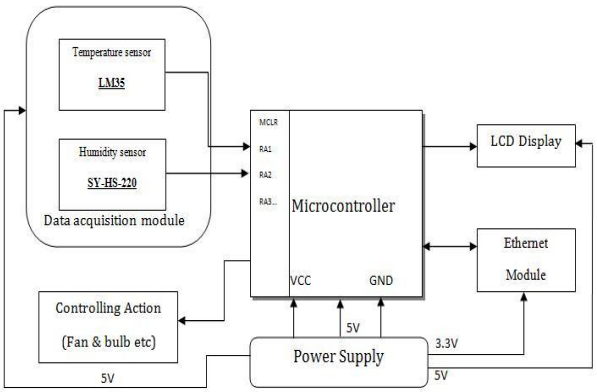

Fig. 2 Architecture of grain storage system

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The hardware also consists of DC fan and DC bulb for controlling temperature and moisture content in grain depots. When moisture and temperature in grainy increases beyond the certain level administrator can generates controlling action bulb and fan respectively according with situation.

In this real time monitoring & controlling system for grain storage PIC controller acquires the data from granary and transmits that data to host computer here, after taking the information from lower terminal about temperature, humidity in accurate and real-time monitoring by supervisory systems in granaries. Then administrators can take actions for cooling and heat generation by granary operating devices according the analysis.

Ethernet module describes in this paper, the PIC microcontroller and host computer communicate with Ethernet with SPI protocol. If weird system fails then we can use wireless modules to access data from grainy. In order to find out real time changes which is occurred in grainy due to change in moisture and temperature we developed real time monitoring and controlling with Ethernet module. The GUI is used in lower terminal through which administrator can read the data from granary.

III. Implementation Strategy

Current design for grain storage consist PIC microcontroller, sensors, Ethernet module, and controlling part. Lower computer terminal is heart of this grain storage system. By considering lower power consumption, cost,

IV. Software Realization

Communication protocol are implemented through software running on PIC 18F452. Controller and Ethernet module interfaced with SPI protocol. SPI is high level standard data protocol with 10 mbps speed. Here wheat as grain is to be taken to test, proposed grain system. According to demand from administrator temperature and humidity reading acquired from grainy,

A. Temperature Sensor

The LM-35 is used as temperature sensor which is a precision integrated circuit temperature sensor, calibrated directly in° Celsius (Centigrade).Temperature sensor is connected to "channel 0" of port A of PIC microcontroller. This sensor gives a variable output voltage with respect to the temperature variations in granary LM 35 operated in range between -55° to+150°C +150°C range. [7]

B. Humidity Sensor

To sense the humidity, SY-HS-220 humidity module is used. This model converts relative humidity into output voltage. Humidity sensor is connected to "channel 1" of port A of PIC microcontroller. The sensor output is a variable voltage with respect to humidity level and expressed in terms of %. In normal condition the humidity will be around 50% to 70%. Here, we have to set the minimum humidity and maximum humidity values. [7]

C. Data communication

The data communication is done through Ethernet module. Ethernet controller is chip which can be used to transfer data between two components. Data acquired from grainy is passing over the TCP/VDD link to host computer through Ethernet. The SPI protocol implemented between PIC controller and Ethernet module.

after amplifying the output of sensors and converting the analog output with A/D converter, it is given to PIC controller. PIC controllers store this data as temporary data and fetch it to the host computer. Available data from granary is combined into TCP / IP packet, finally Ethernet module send this data to host computer. Host computer will save the data in data base. Data base is developed in VB.Net.

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A. Flow Chart

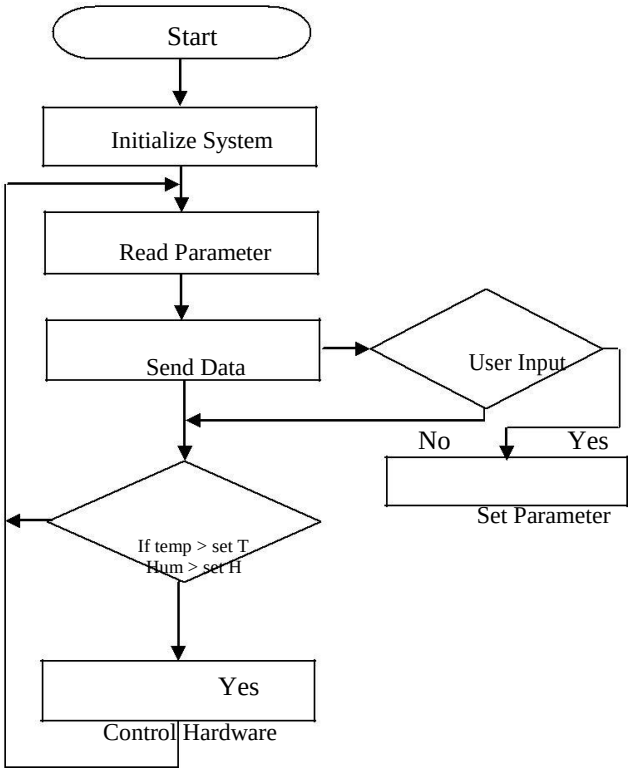


Fig. 3 Flow chart for transmitting station of grain storage system

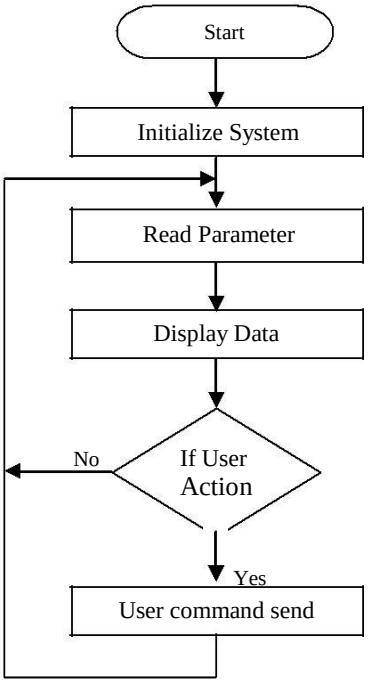
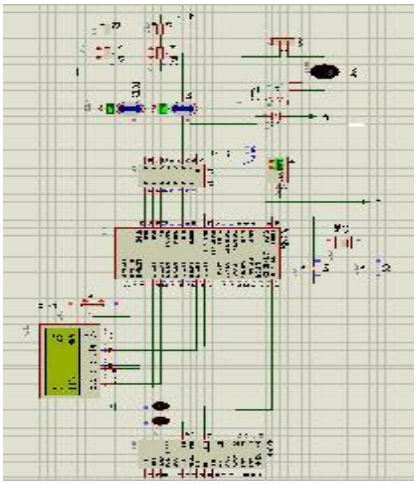


Fig. 4 Flow chart for receiving station of grain storage system

B. Software Simulation



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V. Experimental Result And Analysis

Here we have taken wheat as grain to test the system. The two types of wheat sample are taken one is good quality of wheat and another is decomposed type of wheat. Also we test the system at morning and evening.

Table 1 shows the result of humidity & temperature on two different types of wheat.

TABLE I

TEST 1	Grain initial humidity content % 46	Grain Temperature (0C) 28	Test conducted on good quality of grain
TEST 2	Grain initial humidity content % 72	Grain Temperature (0C) 39	Test conducted on decomposed quality of grain

VI. Conclusion

In this paper we discussed and developed real time monitoring and controlling system for grain depots to ensure the food grain security based on PIC microcontroller and Ethernet module. This system overcomes drawbacks of traditional approach of grain storage and provides flexibility and reliability to access status grain data, where controlling action minimizes grain wastage as well as grain loss. With real time development we can store grain in different climate and atmosphere. The total system has low cost and takes accurate measurement.

During this experiment temperature and humidity conditions are monitored and controlled under different condition. Also we can use this system for fruits.

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