Elimination of Mediators between Farmers and Consumers in Warehousing by Implementing Cold Storage

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ABSTRACT

Agriculture plays a very important role in Indian economy. The modern agricultural practices increase the production. Although there is an increase in the production, the lack of proper cold storage facility is becoming the major hurdles. So, this can be overcome by implementing an advanced cold storage system. For this the network with sensors placed within the cold storage chamber will be sufficient. The sensors should have the ability of monitoring all the required environmental parameters and also process the information for further control. Different environmental parameters like temperature, humidity etc., are to be monitored in the cold storages for maintaining the quality of the commodities in the storage. Apart from this, marketing and sales of the agricultural products is also one of the biggest problem faced due to involvement of the mediators. Along with the advanced cold storage, this system also aims at providing the marketing of agricultural products by direct involvement of government organization with the farmers avoiding the mediators.

Keywords- cold storage; mediators; monitoring; wireless sensor network.

1. INTRODUCTION

Agriculture is the one of the important occupations in India. It not only provides food and food products for human and animal life but also provides raw materials like cotton, rubber etc., to the industries. It is the largest provider of livelihood in India and provides employment for more than fifty percent (50%) of the population. It contributes around sixteen percent (16%) of the total GDP and ten percent (10%) of the country's total exports. Thereby agriculture contributes greatly to the country's economy and this structures the main source of income.

Many problems faced by the Indian agriculture in the past few decades include dependency on rain, low yield, unawareness about modern methods, transport and marketing facilities, storage facilities etc. Even though the developing technologies have proposed the solution for many of these problems, storage and marketing problems are not provided with satisfactory solutions.

As a result, post harvesting food losses could not be reduced successfully. Post-harvest loss may include loss due to improper storage, transportation, due to involvement of mediators etc. Storage is an important link in ensuring continuous supply of food and other agricultural produce for the consumers. Improper storage refers to

lack of storage or storing in conditions unsuitable for the product. Loss due to improper storage can be seen in the fig.1.

	Weight loss range
Harvesting/field drying	4-8%
Transport to homestead	2-4%
Drying	1-2%
Threshing/shelling	1-3%
Winnowing	1-3%
Farm storage	2-5%
Transport to market	1-2%
Market storage	2-4%

Fig.1. Reasons for loss in agricultural produce

Further the recent marketing system has created several layers of inter mediators, lengthening the supply chain, which results in prices down for farmers and up for consumers. The middlemen purchase the agricultural products from the farmers at a lower price. They also get the commission from the farmers for the transactions made. Goods purchased at lower price from the farmers are sold out to retail businessmen at higher price and the retail businessmen sell those products further at higher price to the consumers. As a result, the farmers get only the lower price for their produce whereas the consumers have to pay higher price for the same produce.

Due to these problems famers loose interest in agriculture and tend to take up other occupations. As a result there will be decrease in production. These problems have a great effect on agriculture which in turn affects the national economy. To overcome these problems the proposed cold storage system can be used.

2. EXISTING SYSTEM

Global food losses have recently been documented to be in the order of 25% to 50% of the total production volumes, caloric content or market values depending on the commodity [1].According to the recent census India holds the first place in the world in production of fruits and second place in the production of vegetable accounting roughly to 10% and 15% respectively of the total global production. Nearly, one third of the fruits and vegetables produced are wasted mainly due to poor cold storage estimated to cost up to Rs.500 billion annually [2]. Much of the developing world in general lacks access to affordable refrigeration systems for pre-cooling, refrigerated transport, cold storage, or freezing during postharvest handling and distribution of perishable foods. The food losses occur mainly during the period from harvest to retail marketing and are due to changes in physical volume or economic value and often result in loss of nutritional value. Hence to avoid such losses, technology plays a very important role in the preservation of agricultural products.

Wireless Sensor Network (WSN) generally refers to a group of spatially separated sensors for effective recording and monitoring of the physical conditions of a particular environment and further organizing the collected data at a desired location. These sensors measure environmental conditions like temperature, humidity, weight, sound, wind and so on. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Wireless Sensors has many

applications such as in smart cities, industrial automation and control, home automation, defence, smart agriculture etc., [3]-[7].

A system for remote monitoring of conditions in a cold storage was developed. But this system aims only at monitoring the temperature and not other parameters [8]. Further in the next proposed system monitoring of the CO_2 was also possible in addition to the monitoring of temperature [9]. The monitoring of fruit in cold storage, using a wireless sensor network based on ZigBee protocol was proposed. This design gives a new way to collect the data of environment instead of the traditional way using wires or manually [10].Energy consumption was the major problem faced for the advanced implementation of wireless sensor network (WSN) technology. To overcome that a system design was proposed and an energy-aware sensor node was implemented, which aimed at constructing a energy-efficient Wireless Sensor Network [11]. To increase crop yield, controlled environment must be provided. Humidity is one of the parameter, which plays an important role. Therefore, a Wireless Sensors Network (WSN) is designed and implemented for monitoring of humidity of poly house [12].

3. PROPOSED SYSTEM

Effective monitoring of temperature, humidity and other environmental conditions simultaneously within a cold storage in a warehouse has become one of the important field in research and development. In this project, we demonstrate how technology can be utilized in a warehouse for preventing loss of food grains and food products by implementing a cold storage and also provide a solution to the farmers from being deceived by the middle men. The block diagram of the proposed system is as shown in fig.2.
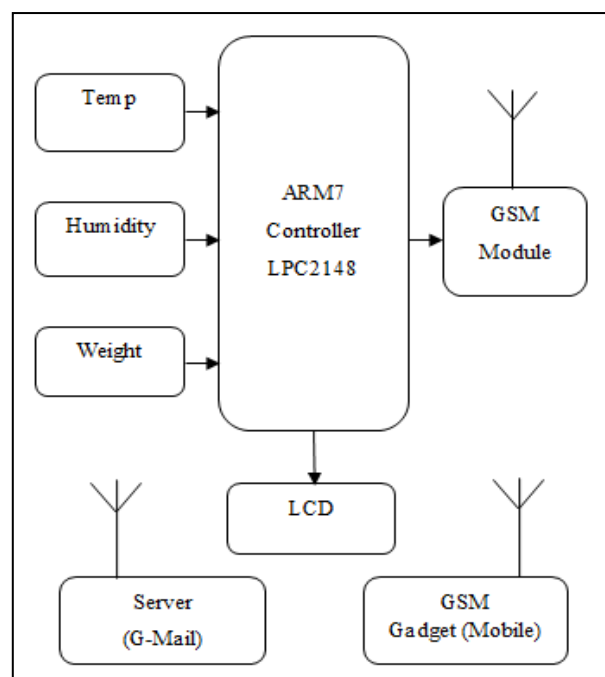

Fig.2.Block diagram of the proposed system

The proposed system consists of sensors and controller placed within the cold storage chamber. These wireless sensors generate an output voltage with the change in their surrounding environment and are fed to the pins of controller which are used for monitoring the conditions like temperature, humidity, etc. within the cold storage and collect the information. The parameters that are sensed are displayed on LCD. The farmers contacting the mediators for selling their agricultural products will be deceived of the actual market price what they were supposed to get. As a result the farmers end up in loss. The proposed system avoids this problem of mediators by establishing direct contact linking the farmers and the government organization which gives the details to the farmers regarding the market value of a particular agricultural product on a periodic basis.

4. METHODOLOGY

The system mainly consists of monitoring nodes, router nodes, the control centre node and the Management Centre (PC), web service.The warehouses or cold storage areas generally are divided into several small sale units, which are close to each other. Monitoring nodes consisting of sensors mainly responsible to collect data such as temperature, humidity and other environmental factors that help prevent food and food grains from perishing or decaying.All these nodes pass vital environmental information obtained from different sensors to a Central node Via GSM module.

In addition to this, the materials the farmers store is entered in to respective panchayat database which will be collectively connected to the nearby taluk database which consists of information of different panchayats. These taluk databases are monitored by the district administrators of agriculture department of the government.By implementing this technology, a farmer will be getting periodic notification in the form of message. This enables a farmer to directly sell his material via government, to the market price on that particular day and can make profit.In this way, we will be able to eliminate the middle men who make farmers suffer loss.

5. COMPONENTS DESCRIPTION

5.1 Power supply unit

This section needs two voltages +12V and +5V, as working voltages. Hence specially designed power supply is constructed to get regulated powersupplies.


5.2 Buffers and Drivers

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Buffer is used to isolate the input from the output, providing either no voltage or a voltage that is same as the input voltage. It draws very little current and will not disturb the original circuit.Driver circuits are most commonly used to amplify signals from controllers to control power switches.

5.3 Monostable Multivibrator

It is a multivibrator in which one of the states is stable. This circuit is also called as "ONE SHOT". This is designed using 555 timer circuit.
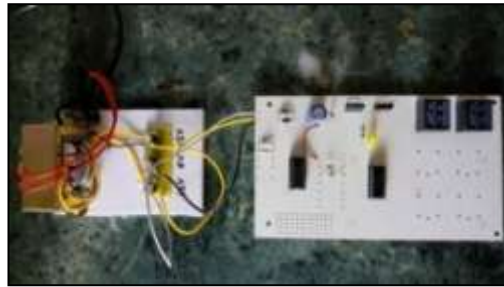
5.4 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 2x16 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.


5.5 ARM Processor

ARM is computer processor based RISC architecture. A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces costs, heat and power use. The low power consumption of ARM processors has made them very popular: The ARM architecture (32-bit) is the most widely used architecture in mobile devices, and most popular 32-bit one in embedded systems.

5.6 GSM

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.
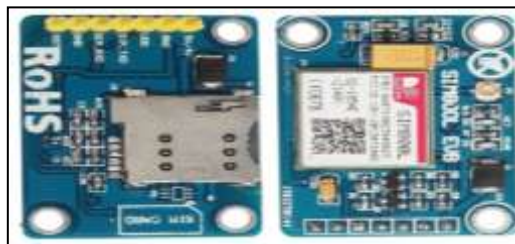

5.7 Temperature sensor

LM35 is the digital temperature sensor used. The temperature ranges from -55°C to 150°C. The voltage range is 5V. It has a low self heating point of 0.08^{o}C.
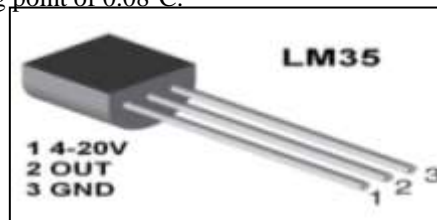
5.8 Humidity Sensor

DHT11 is the digital humidity sensor used. The supply voltage ranges from 3 to 5V and current range is around 2.5mA. The humidity detection capacity ranges from 20% to 80% and has a good accuracy.
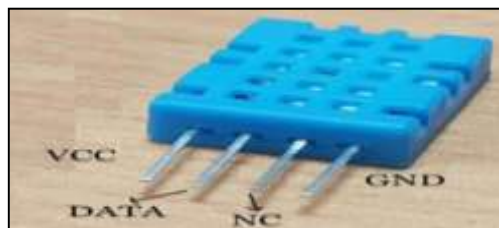
5.9 Weight Sensor

Load cell is the weight sensor used. A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured.

5.10 Heat sink with fan

A heat sink is a passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of temperature at optimal levels.A heat sink is usually made out of copper or aluminium. Aluminium heat sinks are preferred because of low cost and low thermal conductivity than copper.

5.11 Peltier Cooler

A Peltier cooler is a solid-state active heat pump which transfers heat from one side of the device to the other, with consumption of electrical energy. Such an instrument is alsocalled a Peltier device. Peltier Module (TEC1-12706)is used for thermal cooling. It has dimensions of 40mm x 40mm x 3.6mm. It requires a 12V DC power supply and has current range of 4.3A to 4.6A. It has operating temperature range from -30℃ to 70℃.

6. EXPERIMENTAL RESULTS

The hardware implementation is as shown in the fig.3. The purpose of this project is to effectively monitor the environmental conditions such as temperature, humidity and weight. These results are being displayed on the LCDand are sent to user's GSM gadget as well as to the g-mail server. The below figures show the experimental results.
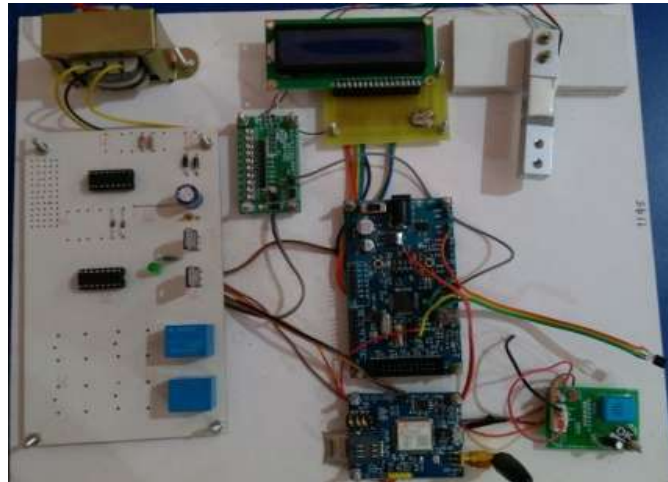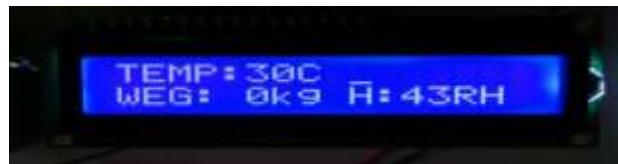
Fig.3. Hardware design

Fig.4. Initial Output showing the values of parameters

Fig.5. Output showing the variation in weight

Fig.6. Output showing the variation in temperature

The messages that will be sent periodically to the users' GMS gadget (mobile) show the details regarding the parameters inside the cold storage as shown in the fig.7. These messages enables the user to have the continuous information about the condition within the cold storage.
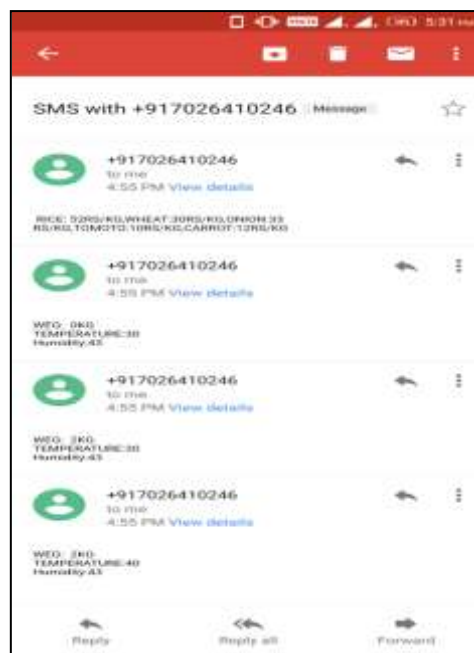
Fig.7. Message delivered to the users' GSM gadget

Fig.8. Notification sent to the g-mail server

7. CONCLUSION

The proposed method can effectively monitor the environmental conditions like temperature, humidity within the warehouse where the agricultural products are stored. This ensures maintaining the quality of the products within the warehouse and thereby preventing their perishability. As there is a direct link established between the farmers and government organisation we can prevent the losses to the farmers due to the involvement of the mediators.

REFERENCES

[1]. www.wikipedia.com

[2]. Shobhit Kumar Nagpal and S. Sudha., 'Design and Development of a Sensor Node to Monitor and Detect Change in Internal Parameters of a Cold Storage System', Global Conference on Communication Technologies (GCCT) 2015, pp. 745-748.

[3]. Basu D., Moretti G, Gupta G.S., Marsland S. 'Wireless Sensor Network Based Smart Home: Sensor Selection, Deployment and Monitoring', Sensors Applications Symposium, 2013, pp. 49-54.

[4]. Chung W.Y., Yau C.L., Shin K.S. Myllyla R, 'A Cell Phone Based Health Monitoring System with Self Analysis Processor using Wireless Sensor Network Technology', 29thAnnual International Conference of the IEEE, EMBS,2007, pp. 3705-3708.

[5]. N. Sakthipriya 'An Effective Method for Crop Monitoring Using Wireless Sensor Network', Middle-East Journal of Scientific Research 20 (9), 2014, pp. 1127-1132.

[6]. Hirakata Y., Nakamura A., Ohno K., Itami M., 'Navigation system using ZigBee wireless sensor network for parking', ITS Telecommunications 12th International Conference , ITST ,2012, pp. 605-609.

[7]. Tang V. W. S., Yuan Z., Jiannong C., 'An Intelligent Car Park Management System based on Wireless Sensor Networks', Pervasive Computing and Applications, 1st International Symposium, IEEE, 2006 , pp. 65-70.

[8]. Lim DY., Ryoo YJ., 'Development of Remote Monitoring System for Cold- Storage' Industrial Electronics Society, 30th Annual Conference of IEEE, IECON, Volume 3, 2004, pp. 2253-2254.

[9]. Wang J., Wang H., He J., Li L., Shen M., Tan X., Min H., Zheng L., 'Wireless sensor network for real-time perishable food supply chain management' Computers and Electronics in Agriculture 110, 2015, pp. 196–207.

[10]. Junxiang G., Jingtao X.,'Fruit Cold Storage Environment Monitoring System Based on Wireless Sensor Network' Science Direct Procedia Engineering 15, 2011, pp. 3466-3470.

[11]. Y. Ruqiang, S. Hanghang, Q. Yuning, 'Energy-Aware Sensor Node Design with Its Application in Wireless Sensor Networks' IEEE Transactions on Instrumentation and Measurement, Vol. 62, No. 5, May 2013, pp. 1183 – 1191.

[12]. Ladgaonkar B. P., Pawar A. M., 'Design and implementation of sensor node for wireless sensors network to monitor humidity of high-tech poly house environment' International Journal of Advances in Engineering & Technology, Vol. 1,Issue 3, 2011, pp.1-11.