IMPLEMENTATION OF FULLY AUTOMATED PLANT FOR GRAIN STORAGE SYSTEM

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Abstract— *This paper will useful for Tamilnadu Civil Supplies Corporation (TNCSC) to design fully automated plant to storing the paddy properly,in which RFID is used to find the details of the particular farmer[1]. And it will be acknowledge through LCD display. Here the farmers can also re-get the paddy without selling it. First the paddy is transfer from bunker one to bunker two where humidity sensor is placed to detect the moisture level of the paddy. If it is good it's directly divert to selection stage. Else it is diverting to bunker three . Here we use air pre heater to dry the paddy and it's bring back. After that it reaches fd fan and vibrator to remove the waste particle[2]. Atlast the weight scale is placed under master storage system to calculate the quantity of the product. . Bluetooth module is used to send message about all specification such as weight ,cost of the paddy to the corresponding farmer and if we replace bluetooth module by GSM it will link with banking sector to credit money for received paddy.*

Keywords—*Automated plant ; Bluetooth module;Bunker; GSM ;Gearmotor; RFID; Sensors;*

1. INTRODUCTION

1.1 EMBEDDED SYSTEM

Embedded Technology is now in its prime and the wealth of knowledge available is mind blowing. However, most embedded systems engineers have a common complaint. There are no comprehensive resources available over the internet which deal with the various design and implementation issues of this technology. Intellectual property regulations of many corporations are partly to blame for this and also the tendency to keep technical know-how within a restricted group of researchers.

Before embarking on the rest of this book, it is important first to cover exactly what embedded systems are, and how they are used. This wikibook will attempt to cover a large number of topics, some of which apply only to embedded systems, but some of which will apply to nearly all computers (embedded or otherwise). As such, there is a chance that some of the material from this book will overlap with material from other wikibooks that are focused on topics such as low-level computing, assembly language, computer architecture, etc. But we will first start with the basics, and attempt to answer some questions before the book actually begins.

1.2 WHY USED AN EMBEDDED SYSTEM ?

Embedded systems are playing important roles in our lives every day, even though they might not necessarily be visible. Some of the embedded systems we use every day control the menu system on television, the timer in a microwave oven, a cellphone, an MP_3 player or any other device with some amount of intelligence built-in. In fact, recent poll data shows that embedded computer systems currently outnumber humans in the USA. Embedded systems is a rapidly growing industry where growth opportunities are numerous.

1.3 POSSIBLE REASONS

Processors have shrunk in size with increased performance Power consumption has drastically reduced. Cost of processors have come down to affordable level. There is a greater awareness now that rather than a totally hardwired electronic system, incorporation of a programmable processor in a circuit makes the design more robust with the reduction in the design time cycle. The concept of a development environment where you can prototype the system and do a simulation/emulation also reduces the design cycle and total development time. The latest model of the Ford car has more than 21 microcontrollers performing functions such as anti-lock breaking system.

2 . PROPOSED SYSTEM

2 .1 BLOCK DIAGRAM

In this project PIC micro controller 18F4520 is used. At the input side of the microcontroller ,RFID reader, temperature, humidity sensors ,selection switch and weight scale are connected. And at the output side Bluetooth module, driver motor, fd fan, vibrator ,blower ,LCD display are connected. RFID is used to know about the details of the farmer. Sensors are used to measure the temperature and humidity level of the paddy.Selection switch is used to select the operation,LCD display is used to shows the details of farmer. Gear motor is used to control the flow of paddy. Fd Fan and vibrator are used to remove the Sheller and stony particles. Blower is used to pass hot air to the paddy. Bluetooth module is used to send the message to the farmer mobile. "Fig. 1," shows the block diagram of our project.

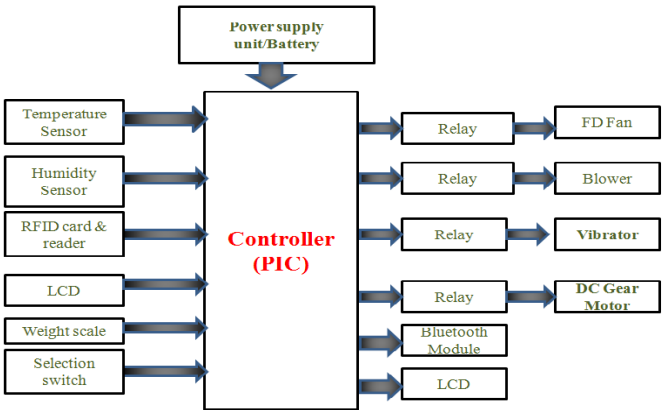

Fig. 1. Block Diagram of Automated Grain Storage System

2.2 . FUNCTIONAL DIAGRAM

Function diagram explains the working of fully automated plant. Initially farmer inserts his RFID card in to the RFID reader. Then LCD display shows the details of the farmer. Then he put paddy into the bunker. Here the selection swith is present.We can select the option whether the paddy is for customer or storage. Then sensors analyses the health of paddy. Humidity sensor sense the humidity level of the paddy, if it is below the reference level then transmit the paddy into the material handling stage. Here blower is placed to send hot air which heats the paddy. Temperature sensor is also placed to check whether the paddy attains the correct temperature. Then bad paddy is converted into good paddy. Then it allowed to flow across the fan and vibrator section to remove the sheller and stony particles. Finally the selected material is go to customer or to store. The storage tank has the weight scale to calculate the weight of the selected paddy and then the information about total weightage and amount of paddy is send to the farmer mobile through bluetooth module. "Fig. 2," shows the function diagram of our system.

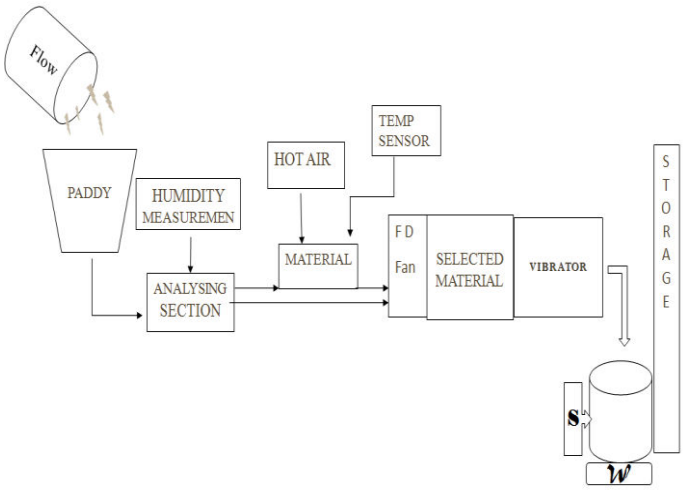

Fig. 2. Functional Diagram of Automated Grain Storage System

3.COMMERCIAL NOTES

By employing this work,the storage system will be having the fully automated design which improves the quantity and quality of product, which eliminate the manual checking and avoids the wastage of food.

3.1 RFID

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less[5]. The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information. *Reader or Interrogator* – The reader, sometimes called an interrogator or scanner, sends and receives RF data to and from the tag via antennas.

In our project every farmer should have a RFID card. When the farmer enters into the TNCSC plant, he first inserts the card into the READER. Using electromagnetic principle reader reads the information in the card. And the details are displayed through LCD display. It shows farmer's ID number, farmer's name, account number, mobile number etc.

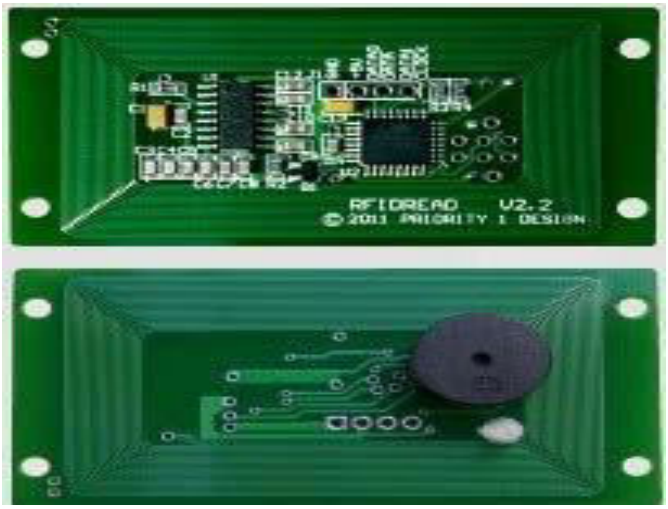

Fig. 3. RFID READER

3.2 . BLUETOOTH MODULE

The particular module that I have can be powered from 3.6 to 6 volts, because it comes on breakout board which contains a voltage regulator. However, the logic voltage level of the data pins is 3.3V. So, the line between the Arduino TX (Transmit Pin, which has 5V output) and the Bluetooth module RX (Receive Pin, which supports only 3.3V) needs to be connected through a voltage divider in order not to burn the module. On the other hand, the line between the Bluetooth module TX pin and the Arduino RX pin can be connected directly because the 3.3V signal from the Bluetooth module is enough to be accepted as a high logic at the Arduino Board.

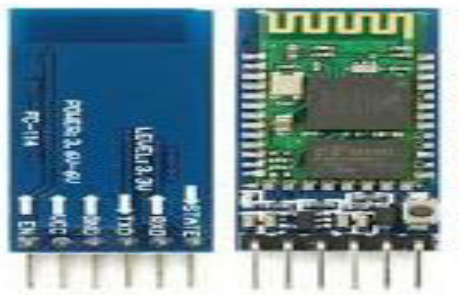

Fig. 4. Bluetooth module

3.3 HUMIDITY SENSOR

Humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. “Fig. 5,” shows the picture of humidity sensor of our system.

Application of a dedicated digital modules collection technology and the humidity sensing technology, to ensure that the Product has high reliability and excellent long-term stability[4]. Sensor sense the health of the paddy. If it is below the reference temperature then blower is on and passes the hot air to paddy.

Fig.5. Picture of Humidity Sensor

3.4 . TEMPERATURE SENSOR

It has three terminals. Operating voltage is 5v.here LM35 sensor is used. . “Fig. 6,” shows the picture of temperature sensor of our system.

Fig.6.Picture of Temperature Sensor

After blower pass hot air temperature sensor checks whether the paddy attains the correct temperature

3.5 SELECTION SWITCH

GCX series 22mm metal-bezel selector switches are rugged, economical devices offered in a variety of colors and styles[8]. Selector switches are available in two- or three-position configurations, with key-operated, or opaque (black) or illuminated knob operators. Maintained or spring-return action styles offer a choice of control logic.

Fig.7 Selection Switch

3.6 FD FAN

A forced-draft (FD) fan is a type of pressurized fan that gives off positive pressure within a system. It is mainly used in industries that employ boiler systems in order to promote boiler efficiency, but it has a wide range of applications.

Typically, outlet and inlet dampers are utilized in order to maintain the pressure in the system. A common FD fan has a wheel at the center that hangs on a shaft along with integrated inlet boxes.The fig 8 shows the figure of the fd fan.

Fig.8. Forced-Draft fan

Draft, in the context of boilers, is defined as the difference between the pressure within the boiler and the atmosphere. In some cases, it is also described as the pressure difference in combustion chambers that leads to air flow and flue gas movement.

3.7 GEAR MOTOR

Gear motor is used to control the flow of paddy from one bunker to another bunker. Its operating voltage of motor is 5- 9V DC.speed is 100 RPM. “Fig. 9,” shows the picture of IR sensor of our system.

Fig.9 Picture of Gear Motor

4. BUDGET

S.No	Name of the component	Requirement	Cost (Rs)	Total (Rs)
1	PIC microcontroller	1	900	900
2	Temperature Sensor	1	373	373
3	Humidity Sensor	1	699	699
4	Weight scale	1	350	350
5	LCD	1	154	154
6	Gear motor	3	420	1260
7	Vibrator	1	263	263
8	Power supply unit	1	770	770
9	FD Fan	1	550	550
10	Bluetooth Module	1	1300	1300
11	RFID Reader &card	1	550	550
12	Selection swith	1	90	90
13	Relay	7	98	686
Total				7945

5.APPLICATION

- To reduce human work in the plant.
- To provide good alternative solution for paddy storage.
- Fully automated and decision making based on sensor.
- Sophisticated field instrument

6 . ADVANTAGES

This project attributed to automation include higher production rates and increased productivity, more efficient use of materials, better product quality, improved safety, shorter workweeks for labour, and reduced factory lead times. Higher output and increased productivity have been two of the biggest reasons in justifying the use of automation. Despite the claims of high quality from good workmanship by humans, automated systems typically perform the manufacturing process with less variability than human workers, resulting in greater control and consistency of product quality. Also, increased process control makes more efficient use of materials, resulting in less scrap.

Worker safety is an important reason for automating an industrial operation. Automated systems often remove workers from the workplace, thus safeguarding them against the hazards of the factory environment. In the United States the Occupational Safety and Health Act of 1970 (OSHA) was enacted with the national objective of making work safer and protecting the physical well-being of the worker. OSHA has had the effect of promoting the use of automation and robotics in the factory.

7 . DISADVANTAGE

A main disadvantage often associated with automation, worker displacement, has been discussed above. Despite the social benefits that might result from retraining displaced workers for other jobs, in almost all cases the worker whose job has been taken over by a machine undergoes a period of emotional stress. In addition to displacement from work, the worker may be displaced geographically. In order to find other work, an individual may have to relocate, which is another source of stress.

8.RESULT

In this project, we design a plant fully automatically. Every process will be handled and controlled by microcontroller (PIC series).Field instruments such as temperature and humidity sensors are used to find the temperature and humidity level of the paddy. Depends on the feedback of sensors, the gear motor control the flow of paddy.Weight scale is used to find the weightage of paddy. SCADA software is used to monitor entire plant.

9.CONCLUSION

In this project, implementation of fully automated plant for grain storage system were presented. A prototype was successfully developed and tested to establish the proof of concept.

This is an enormous improvement over existing Commercial products. We will make the machines to work on its own with the help of inputs received from the sensors which are monitoring the total plant. And also we discuss about wireless sensor network to analyze the real time health of the paddy. And the GSM technology is used here, to send SMS to the farmer about all specification of paddy. We are concluded our projects are able to automize the paddy storage plant. And maintained the quality and quantity of paddy.

10 .REFERENCES

[1] Sandeep Mann, Anil Kumar, Surya Tushir,Akooh Asrar Bashir – "Traditional grain storage practices in India: SWOT analysis". 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products (CAF2016), CAF Permanent Committee Secretariat, Winnipeg, Canada.

[2] Narendra Kumar G., Chandrika Swamy, and K. N. Nagadarshini- "Efficient Garbage Disposal Management in Metropolitan Cities Using VANETs", Journal of Clean Energy Technologies, Vol. 2, No. 3, July 2014.

[3] Anas Siddiqui, Usman Saleem, Abdul Ur Rehman, Sohaib, Shiraz Latif-"GPS and GSM Based Advanced Vehicle Monitoring and Information System" First International Conference on Modern Communication & Computing Technologies (MCCT'14), 26-28 February, 2014, Nawabshah, Pakistan.

[4] W. D. R. Somawardhana, G. A. Deegala, I. A. N Fernando, G. C. Dassanayake, P. S. Haddela and Ajith Perera- "Vee-Bissa: The Agricultural Decision Support System 2013 IEEE 8th International Conference on Industrial and Information Systems", ICIIS 2013, Aug. 18-20, 2013, Sri Lanka.

[5] M.A.EUNICE-"Real Time paddy crop field monitoring using Zigbee Network",International Journal of Engineering Sciences Research-IJESR,. Vol 04, Special Issue 01, 2013, ISSN: 2230-8504; e-ISSN-2230-8512.

[6] T K.Nirmal Kumar,R.Prapakaran – "Zigbee Wireless Sensor Network Technology Study for Paddy Crop Field Monitoring", International Conference on VLSI, Communication & Instrumentation (ICVCI) 2011 Proceedings published by International Journal of Computer Applications® (IJCA).

[7] Mahesh M. Galgalikar ,Gayatri S Deshmukh – "Real-time automization of agricultural environment for social modernization of Indian agricultural system", International Conference on VLSI, Communication & Instrumentation (ICVCI) 2011 Proceedings published by International Journal of Computer Applications® (IJCA) ©2010 International Journal of Computer Applications (0975 - 8887) Volume 1 – No. 22

[8] Ning Wang , Naiqian Zhang, Maohua Wang – "Wireless sensors in agriculture and food industry—Recent development and future perspective", Received 18 March 2005; received in revised form 12 September 2005;