

# Environmental Monitoring in Grain Granary based on IoT Platform

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**Abstract:-** Agriculture industry faces different losses both before and during harvest of grains due to lack of technology usage. Lot of food is wasted during storage of grains. Hence, there is a need to improve the storage facilities of grains to maintain its quality and quantity efficiently in order to reduce food as well as financial loss. An efficient storage system is used to ensure the grain's quality by controlling and monitoring environmental conditions, such as temperature, light, humidity, pests and hygiene. The technique which is used will measure the level of grains inside silos by using efficient level sensors and monitor the environment in silos by using environmental sensors and then recorded parameters will be sent periodically to the main computing device and will be displayed automatically on the display which is placed. In this paper we propose a smart solution for efficient monitoring of grain storage in order to reduce food wastage. Fire sensor also used to find the fire accidents and inform to authority. In this paper we propose a smart solution for efficient monitoring of grain storage in order to reduce food wastage. Fire sensor also used to find the fire accidents and inform to the owner so as to take required action.

## I. INTRODUCTION

As we all know India is an Agriculture dependent country as it is one of the most important factors of Indian economy. Food preservation is really important to full fill the hunger of the entire population. In order to do so we need to store food grains so as to not break the supply chain. When compared to the population the food productions is a bit low ,addition to this if the food produced is wasted due to environmental conditions it would be difficult to supply the food for the population. So there is more need of preservation, protection and storage of food grains to overcome those scenarios.The main motive of this paper is to preserve the food grains from spoiling and storing them for longer duration. Due to environmental changes like temperature, humidity etc some food grains are spoiled to overcome those these storing of the food grains is done by setting the environmental conditions according to the crop being in storages And they can be used for longer period, also the crops produced.

Unseasonal crops can be stored by setting up the environment with is suitable for them to be free without spoiling and they can be used throughout the year. In this paper we are using different sensors by which we can store the food grains. Where the quantity and quality of food grains can be maintained. All the food grains are high of cost during unseasonal by using storage systems we can

reduce the inflation of the food grains price and Make them affordable for all types of economic groups. Due to environmental changes they maybe a chance of insects and fungus attack to the grains this can also be prevented in the storage systems. Over the past years, IOT and WSN technology have been used in agriculture practices for improving the efficiency of food production and transportation, but these technologies are not used in storages, so here we came up with an idea by implementing technology for storing food grains.

## II. LITERATURESURVEY

- Real time monitoring and controlling system for grain granary which is done by Vinay suryawanshi, Mahesh and Kumbhar has done International journal of recent research in interdisciplinary sciences (IJRRIS) in the year 2014 March .This system overcomes drawbacks of traditional approach of grain storage and provides flexibility and reliability disadvantages of this is microcontroller is not a multitasking it cannot perform two outputs simultaneously.
- Intelligent system for monitoring and controlling grain condition gassed on ARM7 processor done by Vinayaka and Roopa the international journal of latest technology in engineering management and applied science(IJLTEMAS) in the year 2016 July it is used for real time online detection, easy acquisition and good stability but the disadvantage of this is it is of low speed and high latency(lagging).
- Smart grain storage monitor and control done by Ahmed Toman. American scientific research journal for engineering technology and sciences(ASRJETS) in the year 2017 October it is Inexpensive, simplicity of the system it has High efficiency in detecting the errors disadvantages of this is it is time consuming and it provides inaccurate results and also high maintenance.

## III. PROPOSEDSYSTEM

The main idea is to design a grain granary to store the food items. And create an environment which is suitable for the food items and keep them fresh and stay for longer duration without spoiling them. Various sensors like temperature, humidity, moisture, fire are used to sense the internal environment and remedies are also done by using a coolant fan and exhaust fan.

Information regarding the sensors is displayed on the sensor. Wi-Fi module sends the message regarding the problem raised to the registered mobile number.

**IV. SYSTEM ARCHITECTURE**

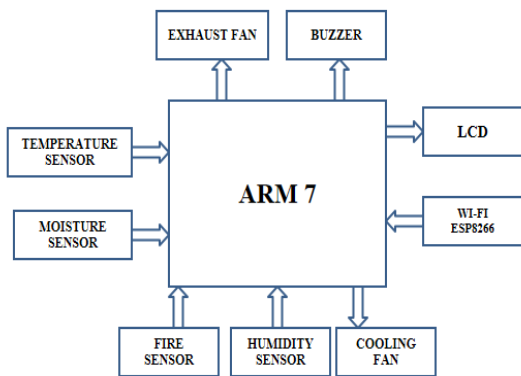


Fig. 1

**V. HARDWARE COMPONENTS**

*A. Module 1-ARM 7*

The LPC2148 microcontroller is designed by Philips (NXP Semiconductor) with several in-built features & peripherals. Due to these reasons, it will make more reliable as well as the efficient option for an application developer. LPC2148 is a 16-bit or 32-bit microcontroller based on ARM7 family. The LPC2148 microcontroller has 512-kB on-chip FLASH memory as well as 32-kB on-chip SRAM. Also, this microcontroller includes inherent support up to 2kB finish point USB RAM.

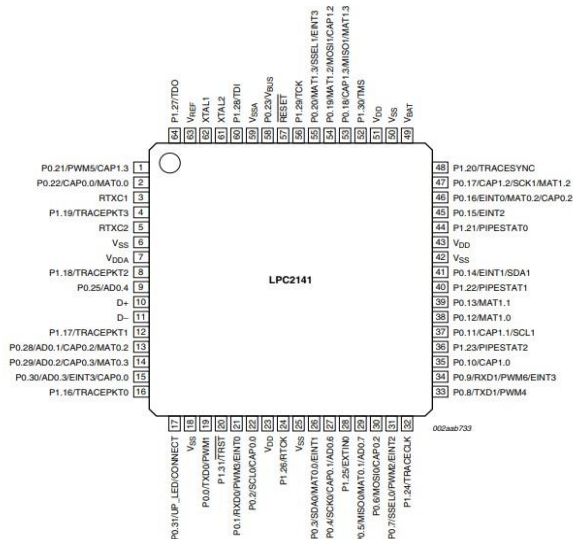


Fig. 2

*B. Module 2- FireSensor*

A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system a natural gas line, propane & a fire suppression system.



Fig. 3

*C. Module 3-TemperatureSensor*

Temperature sensor is a device which measures the changes in the temperature and also any physical changes either coldness or heat energy which Indicates those changes it through analogue or digital output that is generated by an object or system.



Fig. 4

*D. Module 4-HumiditySensor*

Humidity sensor is a device that measures the changes in the environment and converts those sensed changes into electrical signals. To measure the humidity first these sensors must measure the temperature. These humidity sensors work without measuring the reference temperature they work on the basis that alter electrical currents or changes in the air. There are different types of sensors available they are capacitive, resistive and thermal. All these measure minute changes in the atmosphere in order to calculate the humidity in the air.

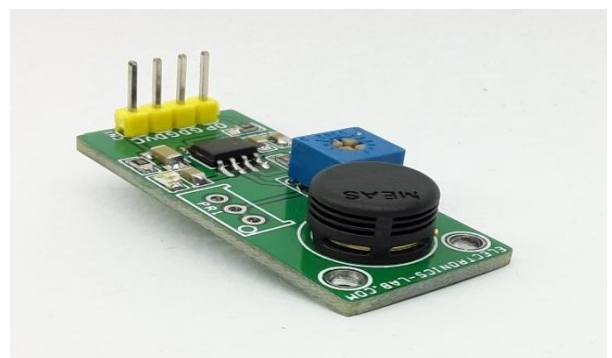


Fig. 5

**E. Module 5-moisture Sensor**

Each grain type is different, so a working knowledge of the moisture levels that are acceptable for each is necessary. Also needed are the proper instruments for measuring the moisture level with accuracy, so moisture can be regulated during each step—from processing to storing.

With varying moisture content in grains, on-line Near-Infrared (NIR) moisture measurement technology is a key tool in ensuring optimum efficiency and quality control. The ability to measure moisture and make process adjustments during the production cycle is crucial.



Fig. 6

**F. Module 6-Relay Switch**

High voltage electronic devices can be controlled using relays. A Relay is a switch which is electrically operated by an electromagnet. The electromagnet gets activated with a low voltage, for example 5 volts from a micro controller and it pulls a contact to make or break a high voltage circuit. One of the most advantages is you can do with an Arduino controlling higher voltage (120-241V) devices like fans, light, heaters and other household appliances.



Fig. 7

**G. Module 8-LCD**

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels.



Fig. 8

**VI. WORKING**

First ARM7 reads the data from all the sensors. Then it checks for the sensor conditions written in code which is dumped in ARM7 board. If the temperature increases more than 35 degrees the intimation to the registered mobile will get the message and it is displayed in the LCD the coolant fan is ON until the temperature is set below 35 degrees. Same with that of humidity sensor but here the exhaust fan is ON until the humidity level is set. Any of the sensors detect the problems the LED is ON and buzzer sound is also given to alert regarding the situation.

**VII. IMPLEMENTATION**

All the three sensors and the ARM will be placed at the grains storage. When the grains or food items are placed the functioning of the system starts. Then the ARM activates the Buzzer through Relay switch. Various food products can be stored for keeping them fresh for longer duration. Unseasoned food products can be stored and used during no production of the food items or grains.

**VIII. RESULT**

The above result shows when the condition which is given in the code to the respective sensors is not satisfied. Then the LED and buzzer is ON. On the LCD the specifications are displayed.

**IX. CONCLUSION**

According to the model designed grain losses can be reduced to the maximum extent. Also accurate information regarding the internal environment status of the granary helps in maintaining the quality of the grains. Secure interface has been developed if any of the risk factor occurs in the granary the owner is intimated with help of the message and the buzzers and LED's work according to the specifications provided. This would be a better way to store and the grains and food products where the quality and quantity is maintained.

### REFERENCES

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