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IoT Based Online Bagasse Measurement and Control

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ABSTRACT: Currently in the sugar plant, the bagasse is used as a fuel, when it is mixed with coal for the cogeneration plant. During this scenario, the bagasse parameter such as moisture which is to be continuously monitored and should be maintained at a level to get better efficiency and also that the burning which is also made effectively in the cogeneration plant. According to the bagasse moisture based on the crushing capacity and speed of the milling train, the moisture content varies. In the existing system, there is no system of measuring and controlling the moisture. A small quantity of bagasse is taken and its moisture is calculated in the laboratory. Periodical measurement of moisture by this way is economically not possible. In the proposed system the above drawbacks can be eliminated the moisture which is continuously measured with the aid of IR3000 sensor and controlled with the aid of cloud and IoT technology for cogeneration plant and also helpful in improving the extraction of juice. The readings which can be also monitored in the pc by the help of IoT.

KEYWORDS: IR3000 sensor, microcontroller, baggase

I.INTRODUCTION

The IoT generates massive amount of data and cloud computing provides a pathway for that data to travel to its destination. The moisture content of bagasse which is responsible for extraction of juices from the cane and which determines the amount of juices that can be extracted from it. In the other hand the bagasse is also responsible for the burning purpose in the cogeneration plant where the electricity is produced in such case when the more moisture is present in the bagasse the burning effect which becomes less in the plant. And also that if high moisture which is present in the bagasse there will be a possibility of getting more juices from it. The moisture content is determined by the crushing force of the milling train which is present in the plant. There are about four milling train which is present in the pant and each of the milling train is rotated at a different speed and crushing force.

Because of the speed and crushing force the milling train moisture content is vary. The milling train which is placed one after the other where the fresh cane is cut and inserted from the first train its starts the crushing and followed by the further train. In the final stage of the train where the bagasse will be coming out. Even though it is crushed still there remains juices which is left as waste and this will also affect the other plant cogeneration plant where the burning is to be done if there exist more moisture more ignition for burning required. Periodical measurement of moisture content and increasing the crushing force of milling train by manually is economically not possible.

In this paper it mainly focuses on online moisture measurement and controlling of the milling train. In the exist system there is no such kind of moisture measurement and control. The major drawback in the exist is the juices remain in the bagasse is remain uncrushed and the ignition for the cogeneration plant is also require. In order to overcome the

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drawbacks of the existing system the proposed system is employed. The advanced microcontroller is used which is the heart of the system that controls all sub devices connected across it. In order to sense the moisture content in the bagasse the IR3000 sensor is employed that continuously measure the moisture content and the controlling of the milling train is done with the aid of microcontroller further the moisture reading are send to the IoT gateways and can be monitored in the webpage.

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II.OBJECTIVE

- ✓ To measure the bagasse parameter moisture.
- ✓ The bagasse parameters moisture which is measured by using sensor.
- ✓ This parameter is measured and and by using the microcontroller in automatically.

III.SYSTEM ANALYSIS

A. Existing System In the existing system there is no such kind of moisture measurement and controlling a small quantity of bagasse is taken and tested for moisture in laboratory.

a. Drawbacks

- ✓ The existing system is only taking a portion of bagasse and tested for moisture in laboratory.
- ✓ The bagasse having juice is left uncrushed.
- ✓ The ignition of bagasse in cogen plant makes difficult.

B.Proposed System

In order to overcome the problem in the existing system, the conventional method of the proposed system is employed. The proposed system is to measure and control the bagasse parameters by using microcontroller. The advanced microcontroller operates at very low voltage and it consumes less power and it can be easily altered and number of devices can be connected according to the input and output ports. For the measuring of moisture IR3000 sensor can be used. All these parameter output is given to the amplifier unit. The output of the amplifier is then given to the advanced microcontroller. IoT gateway is connected to the microcontroller. So the parameters can be monitored. The amplifier output is given to the ac drives so the speed of the milling train is controlled . The crushing force which is also controlled by the microcontroller.

IV. LITERATURE REVIEW

The following journal papers are referred to implement the project.

Stuart O. Nelson[1], described on the electrical properties of cereal grains and their use in sensing moisture content of grain and seed. The basic principles are described for using radio-frequency (RF) (including high frequencies and microwaves) dielectric properties, or permittivity, of grain for sensing moisture through their correlation with moisture content. The development of density-independent functions of the permittivity is explained. The findings of recent research are summarized, which indicate that reliable density-independent moisture content determinations can be realized by on-line RF measurements. Development of these techniques will provide useful instruments for on-line monitoring of moisture content in flowing grain and other particulate materials to manage moisture content, prevent spoilage in storage and transport, improve processing, and provide information important for yield determinations in precision agriculture applications.

Samir Trabelsi [2] describes the importance of moisture measurement in grain and seed is discussed, and a brief history of the development of moisture sensing instruments, based on sensing electrical properties of these materials, is presented. Data are presented graphically on the permittivity or dielectric properties of grain and seed showing their variation with frequency, moisture content, temperature, and bulk density, and references are cited for further information. More recent developments on microwave measurements for moisture content and bulk density sensing are briefly described, and numerous studies are cited providing sources of information on these techniques.

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V. METHODOLOGY

The overall working of the project is to measure the bagasse parameter and its controlling is done by microcontroller. Overall representation of the project is shown in the Figure 5.1.

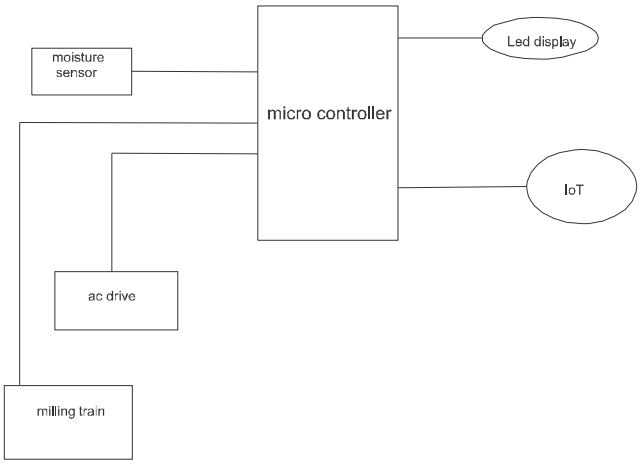

Fig.1 Block diagram of bagasse parameter measuring and monitoring

A. Controller diagram

The system mainly operated by ATMEGA328 microcontroller. This paper consists of moisture sensor which is used to measure the moisture of bagasse.

The sensors can be connected to the amplifier which amplifies the signal. In the advanced processor, it converts the analog to digital signal through inbuilt ADC. Further the signal is transferred to the microcontroller where the controlling process takes place and given to the ac drives and milling train. The ac drives which controls the speed of the milling train and the crushing is increased by giving the sigal to milling train where the milling train cylinder gets close contact and increases the crushing force. Whenever the moisture level goes high it reduces the moisture content by reducing the speed and by increasing the crushing force automatically.

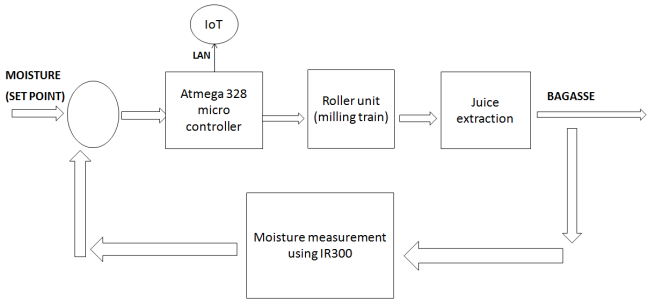

Fig.2 controller diagram

ARDUNO microcontroller is used to measure and control of the parameter automatically. According to the input and output ports, the devices can be connected to the controller. The microcontroller consists of the 28 pins. By using the pin diagram the sensors can be connected and control the parameters. The port1 is connected to the moisture sensor. The port0 is connected to the milling train and ac drive. According to the connections, the operations can be performed.

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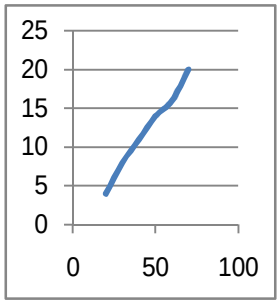
Power supply is connected to the pin 10 and 11. The parameters at normal and abnormal conditions can be displayed by using the LCD.

B. Moisture sensor

The non-contact online measuring system works with an optical measurement transducer. Light of the NIR region is used, which is absorbed by the material moisture. This means that the more humid the material to be measured, the less light is reflected by the material. A light beam, which is emitted by a halogen lamp, is divided into several measuring and reference beams by means of a mirror-lens combination. The rays are led through a filter wheel to filter out the excessive spectral regions of the light. The remaining rays of the NIR region are projected onto the material to be measured. The reflected light, the intensity of which depends on the moisture content, is compared with the reference beams in the measuring head and used to calculate the material moisture. Due to the division into several measuring and reference beams and the dual-detector principle, a high system stability and measuring accuracy -independent of external influences - is ensured.



moisture%	Sensor o/p
20	4
30	8
40	11
50	14
60	16
70	20

Fig.3

C. LCD Display

LCD stands for liquid crystal; this is a output device with a limited viewing angle. The choice of LCD as an output device was because of its cost of use and is better with alphabets when compared with a 7-segment LED display.

D. Milling train

Where the fresh canes are inserted for crushing and juices are extracted which is to be controlled by the microcontroller.

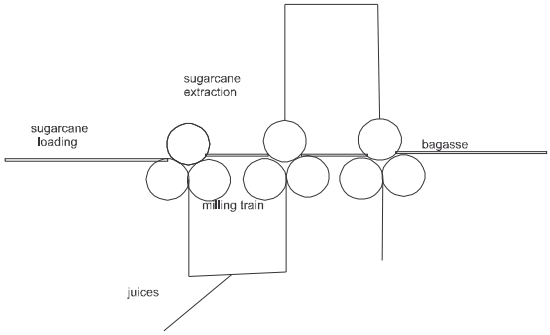


Fig.5

E. Ac drives

Ac drives are responsible for the speed of milling train. This is also be controlled bye ending the output signals from the microcontroller. This is useful for controlling the spped of the milling train.

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F. IoT(internet of things)

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

IoT is simply the network of interconnected things/devices which are embedded with sensors, software, network connectivity and necessary electronics that enables them to collect and exchange data making them responsive.More than a concept Internet of Things is essentially an architectural framework which allows integration and data exchange between the physical world and computer systems over existing network infrastructure.

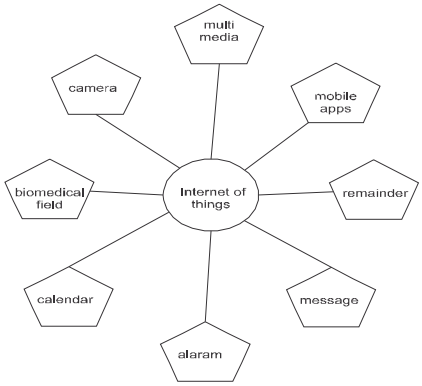

Fig.6

overview of iot technology and architecture:

Internet, things, Internet of things, Internet of Everything! These are some of the buzzwords you may have been hearing, reading & very likely talking about endlessly. These are more than just keywords; IoT (Internet of Things) is a technology concept and/or an architecture which is an aggregation of already available technologies. Similar to the way in which

Internet has changed the way we work & communicate by connecting us (humans) through World Wide Web, IoT aims to take this connectivity to next level by connecting various devices to the internet – facilitating human-machine, machine-machine interactions also.

The visionaries have also realized that this IoT ecosystem has business applications in areas of Home Automation, Automotive, Factory/assembly line automation, Retail, Medical/Preventive healthcare and more.

1.) *Sensors & Sensor technology* – They will sniff a wide variety of information ranging from Location, Weather/Environment conditions, Grid parameters, Movement on assembly lines, Jet engine maintenance data to Health essentials of a patient

2.) *IoT Gateways* – IoT Gateways, as the name rightly suggests, are the gateways to internet for all the things/devices that we want to interact with. Gateways help to bridge the internal network of sensor nodes with the external Internet or World Wide Web. They do this by collecting the data from sensor nodes & transmitting it to the internet infrastructure.

3.) *Cloud/server infrastructure & Big Data* – The data transmitted through gateway is stored & processed securely within the cloud infrastructure using Big Data analytics engine. This processed data is then used to perform intelligent actions that make all our devices 'Smart Devices'!

4.) *End-user Mobile apps* – The intuitive mobile apps will help end users to control & monitor their devices (ranging from room thermostat to jet engines & assembly lines) from remote locations. These apps push the important information on your hand-held devices & help to send commands to your Smart Devices!

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The fundamental components that make internet of things a reality are:

- *Hardware*-Making physical objects responsive and giving them capability to retrieve data and respond to instructions
- *Softwar***e**-Enabling the data collection, storage, processing, manipulating and instructing
- *Communication Infrastructure*-Most important of all is the communication infrastructure which consists of protocols and technologies which enable two physical objects to exchange data

G. Arduino controller

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.

An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

1.2 What You Need for a Working System:

1. Arduino Duemilanove board
2. USB programming cable (A to B)
3. 9V battery or external power supply (for stand-alone operation)
4. Solderless breadboard for external circuits, and 22 g solid wire for connections
5. Host PC running the Arduino development environment. Versions exist for Windows, Mac and Linux

1.3 Installing the Software:

Follow the instructions on the Getting Started section of the Arduino web site, http://arduino.cc/en/Guide/HomePage. Go all the way through the steps to where you see the pin 13 LED blinking. This is the indication that you have all software and drivers successfully installed and can start exploring with your own programs.

1.4 Connecting a Battery:

For stand-alone operation, the board is powered by a battery rather than through the USB connection to the computer. While the external power can be anywhere in the range of 6 to 24 V (for example, you could use a car battery), a standard 9 V battery is convenient. While you could jam the leads of a battery snap into the Vin and Gnd connections on the board, it is better to solder the battery snap leads to a DC power plug and connect to the power jack on the board. A suitable plug is part number 28760 from www.jameco.com. Here is what this looks like.

1.5 Moving On:

Connect your Arduino to the computer with the USB cable. You do not need the battery for now. The green PWR LED will light. If there was already a program burned into the Arduino, it will run.

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Your window will look something like this

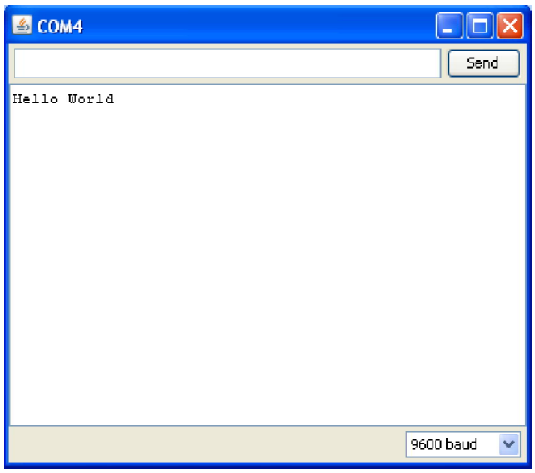

Fig.7

5)Troubleshooting:

If there is a syntax error in the program caused by a mistake in typing, an error message will appear in the bottom of the program window. Generally, staring at the error will reveal the problem. If you continue to have problems, try these ideas

- Run the Arduino program again
- Check that the USB cable is secure at both ends.
- Reboot your PC because sometimes the serial port can lock up
- If a "Serial port…already in use" error appears when uploading
- Ask a friend for help

VI. CONCLUSION

In this project the bagasse parameter moisture can be measured and controlled automatically by using atmega328 processor. The parameter variations of normal and abnormal conditions are represented by using the advanced processor and the readings which can be seen in a datasheet by using IoT by using a pc. The man power is reduced. In future, the number of parameters will be added in the system for various applications. The project which helps in increasing the efficiency and gives the accurate bagasse moisture measurement and controlling of moisture with the less cost and high advantage. This can be easily applicable to the sugar plants. Thus, we are can fulfill aim and objective of the propose system.

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