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Intelligent plastic waste bottle disposal system

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***Abstract*—The project described here is used to collect waste water and cool drink bottles in an intelligent way, such that it makes the consumer for disposal and brings awareness about the plastic recycling methods. The system designed here uses embedded technology and acts as a standalone unit. It comprises of a load cell which is used for measuring the weight of the plastic waste a user gives for recycling. A RFID reader reads the user information it acts like smart card, according to the weight of plastic bottle he gives, points will be credited to his account. The points he got will be sent as SMS to his mobile number. With this points he can discounts in shops which he purchase. This system is fully automatic and can be implemented where people deposit many plastic waste, like railway station, bus stands, Cinema Halls, Shopping malls etc., While implementing this system improper plastic waste deposited can be eliminated which is main cause for spreading of viral diseases in India. In future, the system will be extended to collect plastic carry bags, and also instant coin vending can be added.**

***Keywords*—Standalone unit, Load cel, RFID Reader.**

I. INTRODUCTION

Recycling plays a vital role in saving the environment. It helps in reducing the wastes everywhere and therefore saves the environment from too much pollution. Today, only 11% of the total amount of waste in Metro Manila is recycled. This is mainly due to incomplete segregation. A survey conducted by Tao Po! showed that 22.8% of their respondents does not segregate wastes because it is inconvenient for them.

A system was developed to automatically detect the plastic bottles. The system differentiates the waste based on the size and weight of the bottle. The study, however, showed findings that there were few cases when the system mistakenly identifies the plastic bottle as a tin can especially when its cap hits the platform which means that the system is not accurate enough. Moreover, the system developed still needs a laptop or PC to run. This may not be convenient and cost efficient because it will require having computers near the device when applied in waste management facilities.

Radio Frequency Identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies.

Load cell selection in the context of trouble free operation concerns itself primarily with the right capacity, accuracy class and environmental protection, rather than with a particular measuring principle like bending, shear, compression or ring torsion. While saying this, it should also be recognized that a measuring principle might offer distinct advantages in terms of overload capabilities or the ease of mounting. Types of load cells such as Strain gauge load cells, Tension load cells, Pneumatic load cells, Pneumatic load cells, Hydraulic load cells, Shear Load Cells, Compression Load Cells, Bending Load Cells, Ring Torsion Load Cells, Pancake Load Cells, Single Point Load Cells.

Available power source is an Ac voltage arrives at 230V.Since our electronic circuits require only very minimal voltage and current we use step down power transformer. Step down transformer is designed in such a way that the input is 230V and output of 12V. Another thing is that electronic circuits operate in DC whereas available output of transformer is Ac of 12V. So, rectifier circuit is used to convert AC to DC. Rectifier circuit consists of four diodes formed in bridge fashion to convert incoming AC to DC.

II. METHODOLOGY

A. System Flow

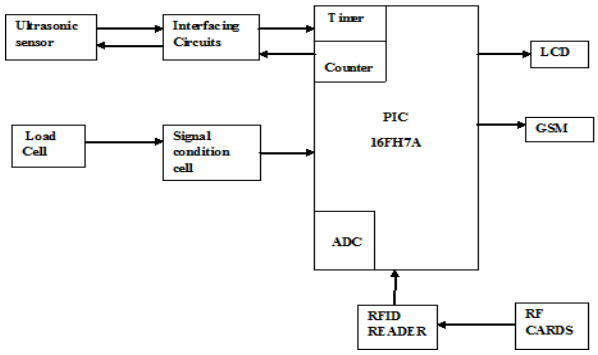

Fig.1. System Block Diagram

As the material is dropped on the system, the ultrasonic sensor takes the ultrasonic detection is based on measuring the time taken between transmission of an ultrasonic wave and reception of its echo of transmitted wave.

Load cells are designed to sense force or weight under a wide range of adverse conditions. They are not only the most essential partof an electronic weighing system, but also the most vulnerable.

B. Ultrasonic sensor

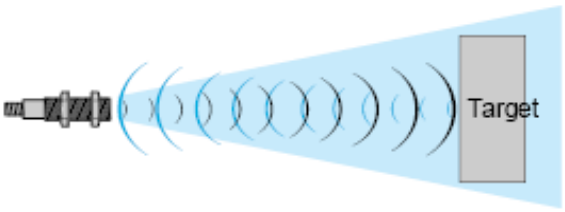

Fig. 2. Ultrasonic Sensor

The principle of ultrasonic detection is based on measuring the time taken between transmission of an ultrasonic wave (pressure wave) and reception of its echo (return of transmitted wave).

Osisonic ultrasonic sensors are of the cylindrical type. They comprise:

1. High voltage generator
2. Piezoelectric transducer (transmitter and receiver)
3. Signal processing stage
4. Output stage

C. GSM modem

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer.

Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low -- only about six to ten SMS messages per minute.

Fig. 3. GSM modem

D. Coneect to PC

- Connect a mobile phone or GSM/GPRS modem to a computer / PC. Then use the computer / PC and AT commands to instruct the mobile phone or GSM/GPRS modem to send SMS messages.
- Connect the computer / PC to the SMS center (SMSC) or SMS gateway of a wireless carrier or SMS service provider. Then send SMS messages using a protocol / interface supported by the SMSC or SMS gateway.

Fig. 4. Connect with PC

E. LCD Display

- In recent years, the LCD is finding widespread use replacing LED's. This is due to the following reasons:
- The declining prices of LCD's.

- The ability to display numbers, characters and graphics. This contrasts with LED's, which are limited to numbers and few characters.

i) LCD Programming Chart

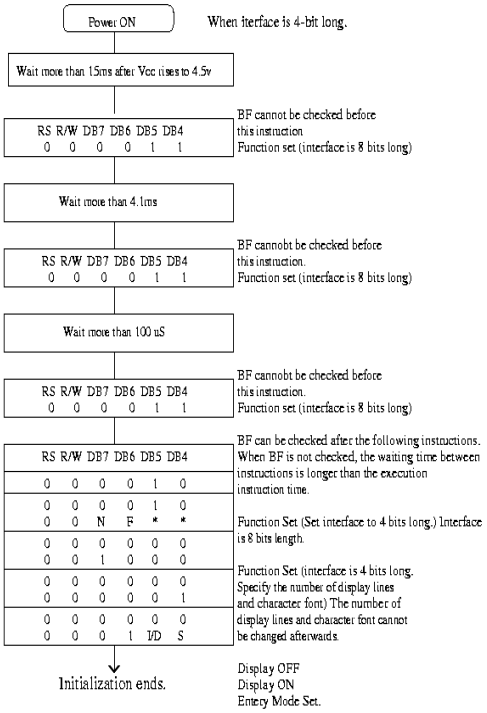

Fig. 5. LCD programming chart

F. Dual operartional amplifier

i) Pin configuration

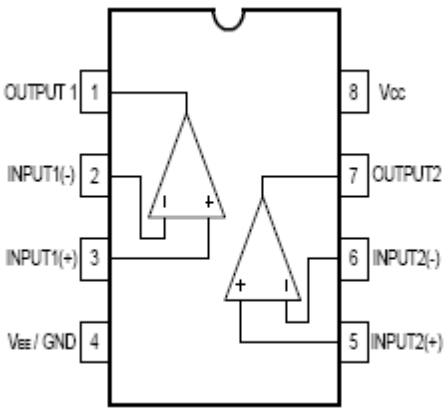

Fig. 6. Pin configuration of LM358

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The UTC LM358 consists of two independent high gain, internally frequency compensated operational amplifier. It can be operated from a single power supply and split power supplies.

i) Features

- Internally frequency compensated for unity gain.
- Wide power supply range 3V - 32V.
- Input common-mode voltage range include ground.
- Large DC voltage gain.

G. RFID card and reader

RFID, the technology of tomorrow, is here today. In the most basic level, it identifies unique objects, processes, transactions or events. RFID does this by using a burst of radio waves to move information, much like carrier pigeons were used to move information from point to point centuries ago. It is possible to explain RFID using only two basic building blocks - A Tag and a Reader.

A unique serial number is stored on a microchip that is the size of the period at the end of this sentence. A tiny antenna is also attached to the microchip. Together, the chip and antenna are called a tag. Typical tags range in size from a stamp to a credit card. The built-in antenna allows the tag to receive information from a device called a reader. When commanded by the reader the tag transmits information over the air using radio waves. The reader then converts the radio waves from the tag into digital information that's forwarded to a downstream computer.

i)Inductive Coupling

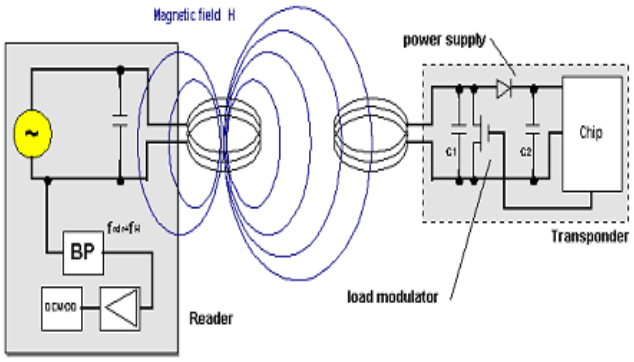

Fig. 7. Inductive coupling of Transponder and the Reader

Inductively coupled transponders are almost always operated passively. This means that all the energy needed for the operation of the microchip has to be provided by the reader. For this purpose, the reader's antenna coil generates a strong, high frequency electro-magnetic field, which penetrates the cross-section of the coil area and the area around the coil. Because the wavelength of the frequency range used (< 135 kHz: 2400 m, 13.56 MHz: 22.1 m) is several times greater than the distance between the reader's antenna and the transponder, the electro-magnetic field may be treated as a simple magnetic alternating field with regard to the distance between transponder and antenna.

III. RESULTS AND CONCLUSION

Aside from considering the ultrasonic wave of the material, a different treatment in the frequency produced by the object can be used which is averaging the frequencies, most of the plastic bottles produce 600HZ to 1700HZ. The few samples which cause the overlap. It has been observed that the system will better work if the cut off frequency of plastic bottle is 1000Hz. This study demonstrated that even though the cap of the plastic bottle hits the platform first, it can still be detected by the system as a plastic bottle. The measurement of weight of the plastic bottle is obtained in this study using the load cell. The disposal system gives the credit points for the waste plastic bottles. The credit points are displayed using the LCD display. RFID is used to identify the membership and it having the information of the credit point of the person. The waste plastic bottles collected by this disposal system is taken for the recycling process.

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