Radio Frequency Identification (RFID) Technology used in Pharmaceutical

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ABSTRACT The last century has witnessed many advancements and innovations in the field of medical science .This has led to sudden dawn in the medical industry and thus this century comes with an optimistic approach towards conquering fatal effects of medical delays to a large extent . As more and more multinational companies and individuals venture into this ever golden field , manual intervention for record keeping becomes a herculean task .Hence this article proposes the use of Radio Frequency Identification (RFID) technology for automatic detection of number of expired medicine cartons from a lot of thousands .This technology has a promising effect of decreasing human efforts thus increasing precision and accuracy .The process starts with sensing of an RFID tag to get the unique number stored in it which is used as a primary key to get the details of the medicine carton on which the RFID tag is attached .The machine then cross verifies the expiry dates of the carton with that of the database present in the micro-controller and gives the appropriate result showing whether the medicines are expired or not .

INDEX TERMS Radio Frequency Identification (RFID)technology

INTRODUCTION RFID involves a unique identification of an object, animal or person incorporating the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum of that object. The three main components of an RFID system comprise of: a transceiver and a scanning antenna often integrated into one reader also known as an interrogator and an RFID tag also called transponder which further consist of a microchip, memory and antenna.

This project involves the usage of a passive RFID tag which does not require a battery . Rather, the reading antenna is the source of power of the tag, whose electromagnetic waves induces a current in the RFID tag's antenna. The RFID tag holds 1000 KB of data. It also contains a unique identification number.The low frequency RFID tag used here works on a range of 125 KHz. The LF RFID has short transmission range of 0-3cm.

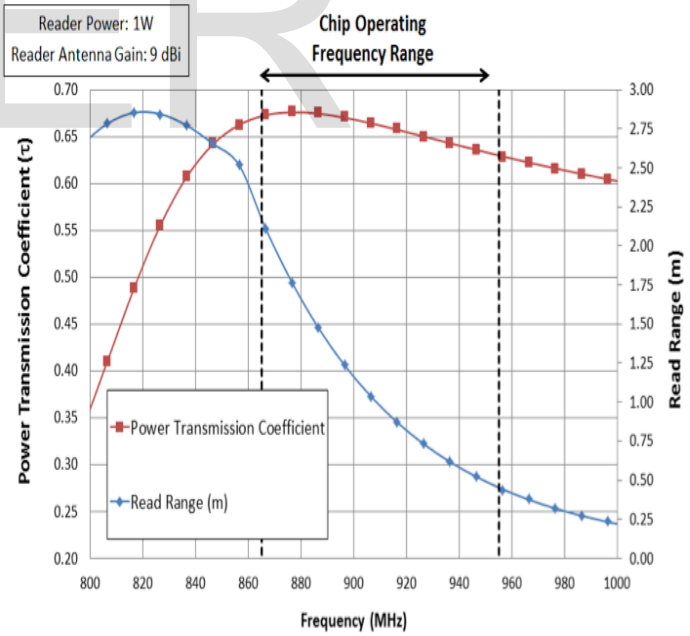

Figure1. RFID tag read range and antenna optimization

The article proposes a system that works on low frequency RFID to detect whether the medicines in a particular carton, to which the RFID tag is attached, contains expired medicines or not by displaying an appropriate message and sending a signal to the

buzzer.In case, the carton contains expired medicines, the red bulb glows along with a buzzing sound and a message showing the details about expiry dates. If not, the green bulb glows.[1]

METHODOLOGY AND MATERIALS REQUIRED

In the proposed RFID system , the main decision making task is handled by the PIC16F877A micro-controller . A micro-controller can be considered as a micro computer incorporated on a single integrated chip . It contains one or more processor cores along with programmable input/output peripherals and memory .[2]The micro-controller used here is PIC 16F877A and it is an 8-bit micro-controller . It also has an architecture of 40 or 44 pin package , being upward compatible with PIC16C5X , PIC16C7X and PIC12CXXX devices . PIC16F877A serves as the most efficient microcontroller for the proposed system because of the following features :

i. 256 bytes EEPROM data memory
ii. ICD
iii. 2 PWM 10 bit
iv. 8 channels of 10 bit Analog to Digital converter
v. 3 wire serial peripheral interface
vi. 2 wire inter-integrated circuit
vii. Universal Asynchronous receiver transmitter
viii. Self programming
ix. Parallel slave port
x. 25 mA sink/source per i/o [3]

The next important component used is bridge rectifier .A bridge rectifier is mainly a full-wave rectifier that uses four or more diodes , connected in a bridge circuit configuration and is efficient in converting Alternating Current (AC) into Direct Current (DC) .[4]

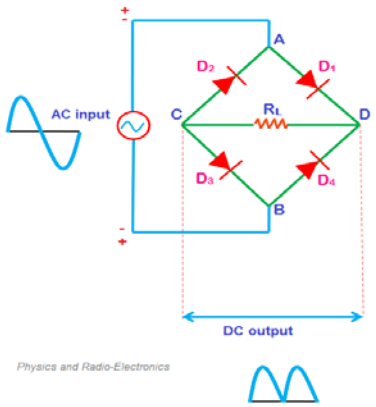

Figure 2. Bridge rectifier

The RFID system actually comprises of RFID transceiver and RFID transponder . The RFID transceiver consists of : RFID reception and transmission system on the same integrated circuit . Its working is similar to RFID readers . A particular radio frequency signal is emitted by these devices and perceived by the RFID tag . When the RFID tag is programmed to a compliant frequency , a return radio frequency signal is emitted which contains the tag protocol , asset description , serial number and managing organizations . The transceiver is usually connected to a computer or a programmable logic controller (PLC) via a programmed input/output module which provides a more comprehensive data to the computer or PLC which further may or may not re-code the tag . There are some tags that once written cannot be changed , hence providing protection against corruption and unauthorized interrogation . One of the biggest benefits of using RFID transceiver is that it saves time that is a single module is used to read and rewrite a tag taking only single input from the operator .[5]

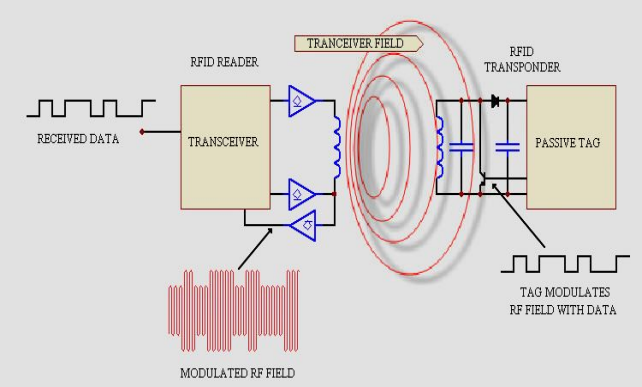

Figure 3. RFID transceiver and transponder

The RFID tag contains a transponder which receives radio frequencies from a transceiver , amplifies it and re-transmits it back to the transceiver but this time with a changed frequency .The data is stored in the difference of the two frequencies .The process basically starts with the mutual induction between the two coils leading to generation of voltage in the tag . When a load with a varying resistance is attached , it leads to a varying current .This varying current further leads to a mutual induction , generating a voltage in the transceiver .

This model works under the supply of 0-5 V whereas the main power supply given is 0-12 V .So , the high voltage supply needs to be converted to low voltage for which a step-down transformer has been used .

The 16x2 LCD display works as a display screen where the generated message regarding the expiry dates is shown . Te technology uses liquid crystals to produce a visual image on an electronic display module . The 16x2 LCD display shows 16 characters per line with 2 such lines , each character utilizes 5x7 pixel matrix space .[6]

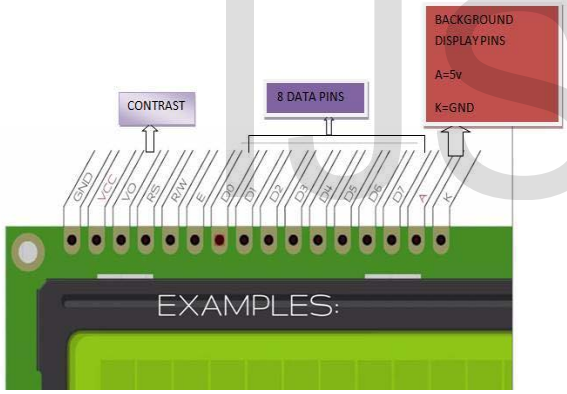

Figure4. 16x2 LCD display

The primary switching device used in the system is electromagnetic relay switches .They are also the primary protection devices .They respond to one or more electrical components ex: current or voltage by opening or closing the circuit contacts . They are mainly used to isolate the state of an electronic circuit from one stage to another . These relay switches are constructed of mechanical , electrical and magnetic components and also have mechanical contacts and operating coils . The coils are activated when the system is provided with a supply , the mechanical contacts open or close . [7]

The timer component used is a crystal oscillator .It is an electronic oscillating circuit that works on the mechanical resonance produced by a piezoelectric crystal material creating electrical signals of definite and accurate frequency . This stabilizes the frequencies for the radio transceiver .[8]

ARCHIRECTURE AND MODULES

The process starts with feeding of a regulated AC power supply of 0-12 V .The bridge rectifier used in the system converts AC to DC and the step-down transformer lowers the voltage range into 0-5 V making it suitable for the micro-controller . The main process starts with sensing of the RFID tags(transponder) by the RFID transceiver . The frequency of the transceiver is regulated by a crystal oscillator . The received signal fetched from the transponder is fed into the micro-controller . The micro-controller further interprets the signal and compares the result with the data present in the SD card . The microcontroller compares the expiry dates of the medicines of the corresponding RFID tag with the current date . If the medicine is expired ,the system shows the expiry date on the LCD display along with the buzzing sound and illumination of the red bulb .If not , the expiry date is still shown on the LCD display with the illumination of the green bulb .When one RFID is checked completely ,the system is reset .

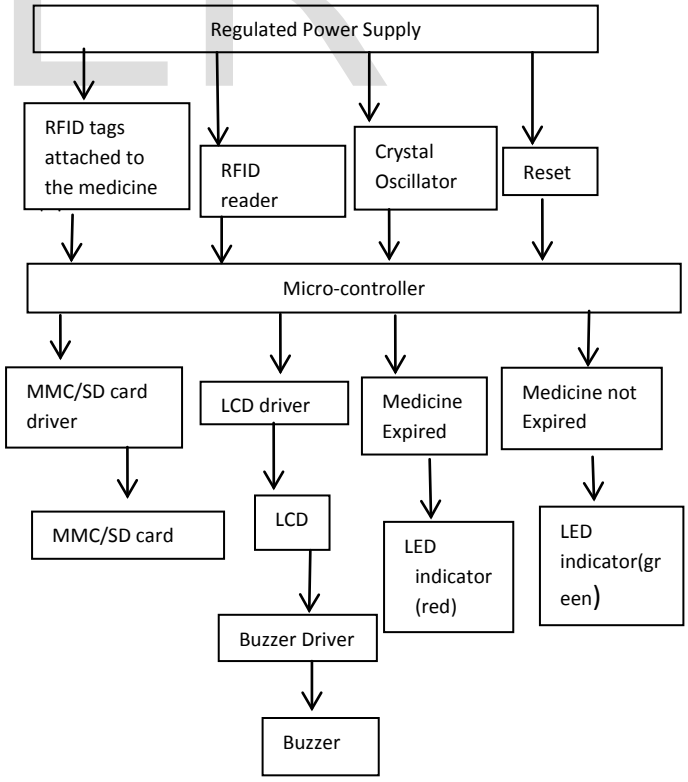

Figure2. Architecture diagram of RFID system

CONCLUTION

In this project we have shown a efficient way to handle medicine carton in storage space . Through our model any storage manger or handler can easily manage the medicines. With the use of microcontroller we have identified the medicines that are expired with a easy method of light and buzzer (when expired it will blink the red light with buzzing sound and when it is not expired it will show the green light).

REFERENCES

[1] https://en Wikipedia.org wik/ Microcontrollers

[2]www.physics-and-radioelectrinics.com/electronicsdevices-andcircuits/rectifier/bridgerectifier html

[3]www.gadgetspace.com/learnmore/data-aqisition-signal-condition/data-input-devices/rfid-transreciver

[4]https://www.microchip.com/wwwproducts/en/PIC 16F877A

[5]https://electronicforu.com/resources/learn-electronics/16x2-led-pinout-diagram

[6]https://www.elporus.com/differnt-types-of-relay-used-in-protection-system-and-their-working

[7]https:en.wikipidea.org/wiki/Crystal_oscillator