



## An Effective Approach to Design and Construct a Smart Liquid Dispenser using RFID Cards

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### Abstract:

In today's world the importance of automation has immensely increased. Smart dispensers are most commonly used for beverages (like Tea, Coffee, etc.) in various fields such as software companies, malls, hospitals, theatres etc., This Project is aimed in automatic filling of the Cup/(Bottle) with certain measurements and duration of time. Control system is the main part of this project which includes Arduino, Microcontroller to control various components in the system. RFID is used to scan the registered RFID cards (/ID cards) and give the access to water (beverage) to those cards only. Filling of any kind of liquid can be carried out by this project. In simpler words, access to the water (beverages/any other liquid) will be given only on those registered and selected ID cards. This liquid dispenser can dispense liquid in different quantities like  $1/4^{\text{th}}$  of the cup/(bottle), or,  $1/2$  of the cup/(bottle), or, fill the total cup/(bottle). The main advantage of this project is to get the required amount of liquid as an output and to overcome the misuse. If any unauthorized users try to access the machine, then it doesn't accept the card and automatically deny the access.

**Key words:** Dispensing, RFID card, Automation, Arduino, authorized, unauthorized, Master card (RFID), Buzzer, IR sensor, RFID Scanner, etc.,

### 1. Introduction:

There are many places where liquids get wasted due to human negligence where people forget to off the tap after drinking the liquids. It is necessary for controlling the drinking liquid by using Smart Liquid Dispenser based on sensors in which the devices are used to ON and OFF the taps automatically using sensors and also monitor the liquid level and gives notification about level of liquid to the authorized person by informing when the liquid level is reached.

The dispenser is a machine which provides the beverage like coffee, cold drink, it is also used for water dispensing. These machines are likely used in various area like commercial, industrial, shops, organizations etc.

The machines or dispensers are usually operated on either coin or note or manually switch

operated. This project presents system which operates not on coin or note, it operates on RFID system. This system gives the access through only RFID which avoid the misuse of machine.

A small RFID reader is fitted in the machine. The identity card which contains RFID tag is given to each employee or student. According to estimation the numbers of liters per day as per client's requirement are programmed, then an employee or student goes to vending machine show his card to the reader then the drink is dispensed. Many offices nowadays are super structured buildings and occupy a large workforce. Same goes for colleges too. In order to fulfill the drinking liquid requirement a number of dispensers are placed throughout the building. Now their management has become difficult. The purpose of technology is to make our life style easier. So, with the advantage of

technologies, we can change things as we do in a better way.

The management of water dispenser becomes smart and easy using Arduino. Liquid dispenser management system proposed here it involves building of the smarter and automatic liquid dispensers. These dispensers are built with the help of Arduino.

## 2. Literature survey

Liquid dispensing machine can be classified on the basis of the application as follows:

1. Dispense only.
2. Mix and dispense type,
3. Meter mix and dispense type and
4. Hot melt dispense application [2].

A dispense only unit is designed to dispense only. It does not mix, nor does it have any metering capabilities. These include manual and power driven dispenser.

Mix and dispense type mix two or more liquid at a determined ratio and then dispense.

Meter, mix and dispense type meter, mix and dispense mix ratio and shot size. Hot melt dispense type melt a media from a solid form and dispense as a liquid. Also, liquid dispensing machine can be classified on the basis of their operations [3] which are

- i. Continuous dispensing,
- ii. Foot control,
- iii. Manual driven,
- iv. Power driven and
- v. Programmable microprocessor.

Various researches have been carried out in order to design the automated programmable liquid dispenser system. A few of these are discussed here as: In [3] a coffee dispensing system machine is designed using microcontroller. The design circuit is tested and its power and switching time is compared with the CMOS technology.

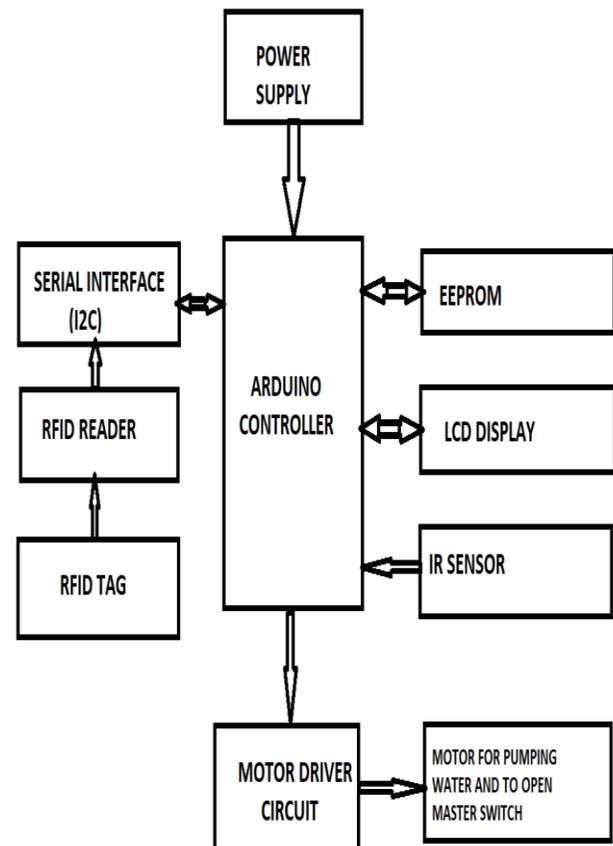
Fauziah Zainnudin [4] proposes a dispensing machine for cold and hot for water and tea using conceptual modeling-based microcontroller in which the process of three main states are defined user selection state, cold state and hot state) has been modeled using process approach.

In [4] the concept of automatic programmable mobile payment is discussed. The concept is based on short message payment with the AT89C51 microcontroller.

The automated drug dispensing system (ADD S) in use today - such as those manufactured by Pyxis, Inc. using microcontroller are predicted on a transformation in drug distribution originating in the United States in the early 1960s. Automated programmable unit dosed drug dispensing system designed using microcontroller of AT8051 family series ready to administer drug according to the administration schedule determined by the nurse [5].

## 3. Proposed Methodology:

### Block Diagram:



**Fig 1: Block Diagram**

### Working Principle:

A water pump's working concept is primarily based on the positive displacement principle as well as kinetic energy to push water. For activating the water pump's motor, these pumps

employ AC or DC electricity, but others might be powered by various types of engines, such as gasoline or diesel.

The water pump is a small, portable device that can be used for a variety of domestic tasks. These pumps transport large amounts of water from one location to another. A water pump's primary function is versatility.

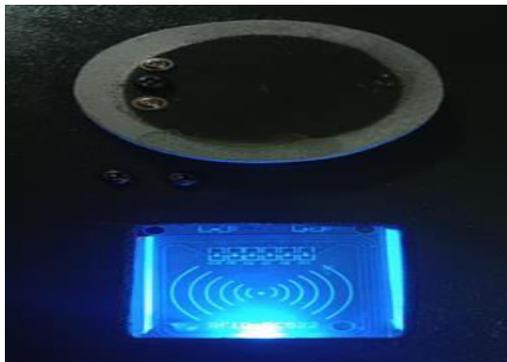


Fig 2 RFID reader.

When the power supply is given to the dispenser then it shows the message as “WELCOME PLEASE PLACE UR ID CARD” as shown in the figure below:



Fig 3 Figure showing the message on LCD display as: “WELCOME PLEASE PLACE YOUR ID CARD”, when the power is on.

After that we have to place the id card in front of the code reader if it accepts the card then it shows the message as “ACCESS GRANTED CHOOSE UR OPTION” as shown below:



Fig 4:Figure showing the message on LCD display as: “Access Granted Choose Your Option”, when an authorized card is placed.

Then a button is selected to get desired measured quantity of water. After the button is pressed the automatically water is released from the tap into the glass or any equipment placed under the tap. When a person selects 300ml of water that quantity of water is released and automatically the water is stopped. These four buttons are used to get measured quantity of water. But extra button which id below the 4 buttons offers water without measurement but only according to their requirement.

This option is accessed using a card called “MASTER CARD”. It only depends on the “ON” and “OFF” buttons which depends on the person

requirement. If the person wants half glass of water then he/she can switch off the button after half glass of water is filled. When master card is placed it displays the message “WELCOME MASTER CARD ACTIVATED” as shown in the figure below:



Fig 5:Figure showing the message on LCD display as: “WELCOME MASTER CARD ACTIVATED”, when master card is placed.

If a fake card is placed then it recognizes the card and the gives the message as “ACCESS-DENIED-UNAUTHORISED-ID-CARD”.



Fig 6:Figure showing the message on LCD display as: “Access denied WRONG ID CARD”, when wrong(unauthorized) card is placed.

## 4. Results and Discussions:

### 4.1 Result when an authorized RFID card is placed:

Whenever an authorized RFID card is placed in-front RFID scanner, the RFID scanner scans the RFID card and shows the following message on the LCD screen “ACCESS GRANTED CHOOSE YOUR OPTION”. After that if any one of the buttons are pressed then the amount of liquid selected by the user is dispensed and stops automatically.



Fig 7Figure showing the dispensing of water when an authorized card is placed and any of the button is pressed.

### 4.2 Result when a MASTER (RFID) card is placed:

Whenever a “MASTER card” is placed in-front RFID scanner, the RFID scanner scans the RFID card and shows the following message on the LCD screen “MASTER CARD ACCESS GRANTED CHOOSE YOUR OPTION” and then opens the fourth button which can only be accessed by master card. After that if any one of the buttons are pressed then the amount of liquid selected by the user is dispensed and stops automatically. If fourth button is pressed, we can stop the liquid flow(dispensing) by again pressing the fourth button. It only depends on the “ON” and “OFF” buttons which depends on the person

requirement. If the person wants half glass, then he/she can switch off the button after half glass is filled.



Fig 8: Figure showing the dispensing of water when master card is placed and any of the button is pressed.

#### 4.3 Result when an unauthorized RFID card is placed:

Whenever an authorized RFID card is placed in-front RFID scanner, the RFID scanner scans the RFID card and shows the following message on the LCD screen “ACCESS-DENIED-UNAUTHORISED-ID-CARD” and activates the buzzer



Fig 9: Figure Showing “Access denied WRONG ID CARD” when a wrong (Unauthorized) RFID Card is placed.

#### 5. Conclusion:

This project focuses on smart liquid dispensing machine using the Arduino controller and RFID technology which is used to control the consumption of product and also reduce the waste of product in low budget. Automatic Liquid Dispenser system employs the use of different technologies in the whole design of its development and implementation. The system is used by the microcontroller to automatic the process of liquid which is used by human beings and the use of the LCD in this system which provides the communication between users and system through LCD screen. This project makes dispensing of liquids easier and reduce the energy and time.

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