

## GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

### WATER VENDING MACHINE WITH MEASUREMENT OF WATER

Mr. Pavan. S. Kejdiwal<sup>\*1</sup>, Mr. Gaurav. S. Daberao<sup>2</sup>, Prof. P. S. Dorale<sup>3</sup>, Mr. Mahesh. R. Pandao<sup>4</sup> & Mr. Mohammad Atique<sup>5</sup>

<sup>\*1,2,3,4&5</sup>Student Electrical Engineering, MGI-COET Shegaon

---

#### ABSTRACT

Today's need of the people for rural as well as urban cities is drinking water. so we need to provide pure water to the people at cheaper rate, but we know that now a day's water vending machine are available and operated at only one coin but we have designed water vending machine which is operated on 1 Rs ,5 Rs and 10 Rs at low cost, the disadvantage of existing vending machine is that it provide water on time based due to which when the water level decrease it gives somewhat less amount of water due to gravitational force but the machine which we have designed having advantage is that it will firstly measure the water perfectly and give to the consumer due to that proper amount of water is given to the user.

*Keywords: Arduino, Flow Sensor, Solenoid Valve, Coin Acceptor.*

---

#### I. INTRODUCTION

We know that the population is increased day by day, due to that requirements and need of the people is also increased but in that, the most important factor for rural as well as the urban cities is pure drinking water, not only the pure water but also fresh or we can say safe for human being.

The advancement of life is increased because of that the water vending machines are available and operated on the coin, and also some of the vending machines are operated in different coins but biggest disadvantages of that machines is that they are totally time based.

When the water level of the tank is reduces due that gravitational force will also reduced because of this the water is provided to the consumer is somewhat in less amount. But our machine advantage is to provide water without time base that is firstly we measure the specific amount of water for coin accepted by machine due to that the proper amount of water is provided to the consumer.

As it is coin operated machine the required quantity of water and affordable to the common people. Coin acceptor is the mechanism use to insert the coin of Rupees 1, 5 or 10 into the machine.

#### II. SYSTEM DIAGRAM

The block diagram for water vending machine with water measurement is as shown in fig.1 the first four blocks are single phase supply, Transformer, Rectifier and Regulator are use for getting a regulated power supply. The remaining blocks are Arduino Nano, 16X2 Display, Coin Acceptor, Relay, Motor, Solenoid Valve and Flow Sensor. With the help of the above devices and components we can operate the Water Vending Machine.

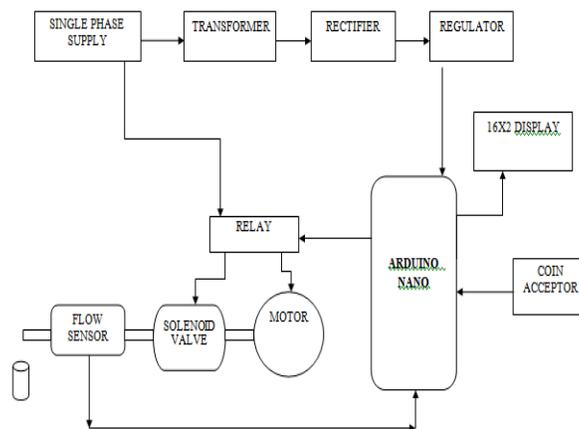


Fig. 1: Block Diagram

### III. DESCRIPTION

#### A. Arduino nano

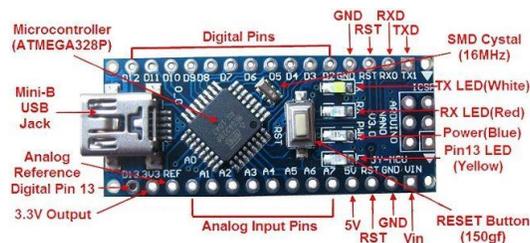


Fig. 2: Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328. It comes with an operating voltage of 5V. However, the input voltage can vary from 7 to 12V. There are 14 digital pins which can be configured as input or output and 8 analog pins incorporated on the board. Arduino Nano comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage. Tiny size and breadboard friendly nature make this device an ideal choice for most of the applications where a size of the electronic components is of great concern. As it has Atmega328 so it comes with a flash memory of 32KB. Flash memory is used for storing code. The 2KB of memory out of total flash memory is used for a boot loader. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM. Each of the 14 digital pins on the Nano can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kohms. In addition, some pins have specialized functions Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip. It also has External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.



*Fig. 3: Flow Sensor*

This sensor sits in line with your water line and contains a pinwheel sensor to measure how much liquid has moved through it. There's an integrated magnetic Hall Effect sensor that outputs an electrical pulse with every revolution. The Hall Effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry. The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall Effect pulse output). By counting the pulses from the output of the sensor, you can easily calculate water flow. Each pulse is approximately 2.25 milliliters. Note this isn't a precision sensor, and the pulse rate does vary a bit depending on the flow rate, fluid pressure and sensor orientation. It will need careful calibration if better than 10% precision is required.[7]

Features:

Model: YF-S201

Sensor Type: hall Effect

Working Voltage: 5 to 18V DC

Max current draw: 15mA @ 5V

Output Type: 5V TTL

Working Flow Rate: 1 to 30 Liters/Minute

Pulses per Liter: 450

1/2" nominal pipe connections, 0.78" outer diameter, 1/2" of thread

Size: 2.5" x 1.4" x 1.4"

Connection details:

Red wire: +5V

Black wire: GND

Yellow wire: PWM output.

**C. Solenoid valve**



*Fig. 4: Solenoid Valve*

A solenoid valve is an electromechanical device in which the solenoid uses an electric current to generate a magnetic field and thereby operate a mechanism which regulates the opening of fluid flow in a valve. Solenoid valves differ in the characteristics of the electric current they use, the strength of the magnetic field they generate,

the mechanism they use to regulate the fluid and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve use in our device is direct acting solenoid valve. It is of 9W and operates at AC 230 v power supply.

Direct operated (direct acting) solenoid valves have the most simple working principle. The medium flows through a small orifice which can be closed off by a plunger with a rubber gasket on the bottom. A small spring holds the plunger down to close the valve. The plunger is made of a ferromagnetic material. An electric coil is positioned around the plunger. As soon as the coil is electrical energized, a magnetic field is created which pulls the plunger up towards the centre of the coil. This opens the orifice so that the medium can flow through. This is called a Normally Closed (NC) valve.

#### D. Coin acceptor

DG600F Series of coin acceptor is a electronic coin acceptor with high reliability, Which is widely used in amusement facilities, vending machines and so on.



*Fig. 5: Coin Acceptor*

It recognize 6 groups of coins in different denomination and also able to forbid accepting all coins. It has Industrial standard connector ---10Pin Parallel port Special connector ---5Pin Serial port. We are interfacing this coin acceptor to Arduino Nano by serial communication.

#### E. Transformer



*Fig. 6: Transformer*

It is one of the components used for obtaining the regulated power supply. It is based on the principle of electromagnetic induction. It has primary and a secondary coil, primary is connected to the main power supply and secondary is connected to the circuit .So a step down transformer of 12 volts is used. The transformer used here is centre tapped transformer.

#### F. Rectifier

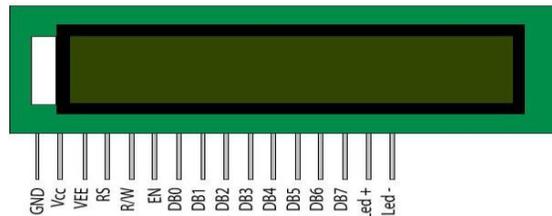
It is used to convert alternating current to direct current. Centre tapped rectifier which consists of two diodes is used. On one side AC voltage is given and the rectified DC output is obtained on the other side.

#### G. Regulator

Voltage regulator is used to get a constant voltage level. IC 7805 is used as a voltage regulator. It is a member of fixed series of 78xx linear voltage regulator. It is used to maintain a regulated voltage of 5V DC.

#### H. LCD display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.



*Fig. 6: LCD Display*

These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD [6].

#### I. Water pump

Pumping of water is done by a device called AC submersible water pump. It moves water by mechanical action. Rotary mechanism is basically involved in its operation. It operates on AC power supply of 230 volts, connected parallel in Solenoid Valve.

#### J. Software description

The programming is done on Arduino with the help of Arduino integrated development environment called as Arduino software (IDE).

### IV. WORKING

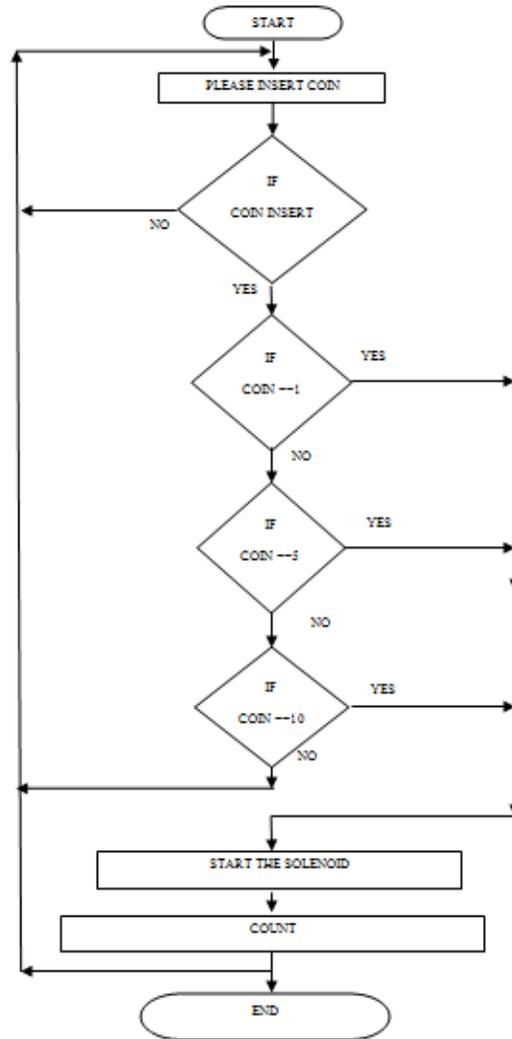
Our vending machine works on the principle of detection of coin and measurement of water. When a person insert a coin in the coin acceptor, if the coin is valid then it accept the coin otherwise it is not valid it will reject. After accepting coin the coin acceptor will send amount of coin to Arduino via serial communication.

After receiving amount from the coin acceptor, the Arduino start the Solenoid Valve and Water Pump. As water pump gets on water starts flowing through the Solenoid Valve & Flow Sensor. So Flow Sensor rotor will start rotating, and it will give signal to Arduino to calculate the required amount of water to flow through the sensor.

After flowing required amount of water from sensor Arduino will give command to the Solenoid Valve & Water Pump to stop. After finishing the first operation, the machine will ask to insert coin.

When this vending machine is running in first operation mode it will not accept another coin. After finish first operation mode it will take next coin.

## V. FLOWCHART



## VI. CONCLUSION

Due to our machine we are one step to the future technology and it is a one step to enter in eco-friendly world. This machine is very easy to use and can be easily accessed by the ordinary person mostly in rural areas as well as urban areas.

The system of the machine is programmed for different coins with the help of algorithm and programming in Arduino. The water vending machine can be installed on roads (high ways), rail way stations, hospitals and other public places to provide a drinking a safe drinking water to people at low cost. The biggest advantage of this machine is, it will dispense exact amount of water because of flow sensor.

## VII. FUTURE SCOPE

In future we are trying to develop the Currency Note acceptor type water vending machine which accepts Currency Note as well as number of coins. We also add RFID card based water vending machine.

### REFERENCES

1. *Shatrughan Modi, Dr. Seema Bawa, "Automated Coin Recognition System using ANN" in 2011 International Journal of Computer Applications (0975 – 8887), Volume 26– No.4, pp13-17.*
2. *P. Pradeepa, T. Sudhalavanya, K. Suganthi, N. Suganthi, M. Menagadevi [2013], "Design and Implementation of vending machine using Verilog HDL", International Journal of Advanced Engineering Technology, Vol. IV, Issue I, E-ISSN 0976-3945, pp. 51-53.2.*
3. *M.S.Varadarajan [2012], "Coin Based Universal Mobile Battery Charger Veltech",IOSR Journal of Engineering (IOSRJEN), Volume 2, Issue 6, and ISSN: 2250*
4. *Manish Navlakha<sup>1</sup>, Imran<sup>2</sup>, Lokendra Singh Rathore<sup>3</sup>, Lovekush Sharma<sup>4</sup>. " Water Vending Machine" in International Journal of Engineering and Management Research, Volume-7, Issue-2, March-April 2017*
5. *Aditi Mohan, Niyati Tiwari, Rajdeep Ghosh, Prof. A.A Shinde," Coin Operated Water Dispenser."in 2017, International Journal of Engineering and Technology, volume 04, Issue 05, e-IISSN: 2395-0056*
6. *Indrajeet Deshmukh, Shubham Angre, Digvijay Kadke, Roshan Rahane, prof. Dabhade sir, "Desighning and Implementation of Water Vending Machine " IJARIE-ISSN(0)-2395-4396, Vol-2 Issue-3 2016.*
7. *S. Sinha, D. Banerjee, N. Mandal, r. Sarkar, S. C. Bera, "Design and Implementation of Real Time Flow Measurement System Using Hall Probe Sensor and PCB based SCADA" in 2015,IEEE Sensors Journal (Ref. No. Sensors-12139-2015).*