Chapter 1: Introduction

1.1 INTRODUCTION

Water level indicator is system which is used to monitor the level of water in a container or water body. According to Cond A Roy (2016) it is defined as a system by which we can get the information of water. Muj et al (2016) also explained that the design of a water level indicator is done to monitor the level of water and might be characterized as a framework by which we can get the data on the rate of water usage and power usage. This circuit not only indicates the amount of water present in the tank but also gives an indication when the tank is full. As the water continues to fill the tank, the LEDs light up gradually.

1.2 BACKGROUND OF THE PROJECT

As a developing country, Zimbabwe faces its share of problems, and one of it is shortage supply of clean and safe water of every household it the city. Its current solution is to have a timetable of supplying water to different area on different days. So most people have resorted to storing water in container tanks (JoJo tanks) for future use. The disadvantage of these tanks is that no one know the level of the water inside and the time is takes to fill up these tanks is unknown due to pressure of the water and other facts, hence this result in overspilling of water overnight and misuse of the water in the tank.

A lot of land in the country is being left unused and crop production has been reducing for years due to misuse of land. This is because of the lack of knowledge on the amount of water need per plant in that particular region, which leads to under watering or over water (which is also over consumption of power).In the agricultural sector water levels are most important to know because this one of the reasons why the section is under developing. As a result ,for my project, I propose developing an automatic water level indicator which notifies people the level of water in the tank and rings when the tank is full.

1.4 PROBLEM STATEMENT

The fact which encouraged me to conduct this research is that in many cases where water container tanks are being used or water is being stored, one would find frequent water overspill and misuse of water. Most of the times people do not even know the rate of which they are using their water. The lack of knowledge on the rate of water use and water levels hugely affects the agriculture section on irrigation, land use, power usage, etc. If the status call allow to continue, cities will continue to suffer from scarcity of water due to lack of management of water containers and misuse of the water by the public. The main objective of this paper is to

create a better way managing the level of water in container tanks and record the rate of use of water by developing an automatic water level indicator which will be installed inside the water container tanks.

1.5 Objectives

The device is expected to accomplish several objectives by designing an automatic water level indicator. Sensors are located at different levels of the tank. The objectives of the project are as follows:

1. To design a water level indicator with an alarm

The proposal sought to design a water level indicator with an alarm. There are situations when the pump keeps pumping water to the tank until it spills out. Thus, the water level indicator system will be able to track water in the tank and has notifications of water at different levels accordingly.

2. To develop a cost-effective water level indicator with an alarm that will communicate different levels of water in a tank.

The current water level indicators use microcontrollers which are expensive thus out of the price range for many households. The proposal sought to design a water level indicator that does not use a microcontroller to make it more affordable.

3. To demonstrate how the water level indicator would work.

5. To prevent wastage of water and energy

6. To prevent the pump from overworking

1.6 METHODS AND INSTRUMENTS

The hardware components of the projects are 3 leds, buzzer, transistors, 9V power supply, connecting wires and a board.Sensors are located at different levels of the container, each led indicates a specific level at which the water is at in the container so circuit expresses the level through the lighting of led. We also use a buzzer in the circuit to notify that the container is full since the circuit is silent.

1.7.1 EXPECTED RESULTS

A system that :
Indicates the accurate water level inside a container
Notifies the people that the tank is full by ringing
Easy to install and cost less
Helps conserve water
Helps us take statistics on rate of water usage in every household in a specific area

1.7.2 SIGNIFICANCE OF THE PROJECT

A water level indicator helps save money by limiting the waste of water and electricity. These devices accurately regulate how much energy is used to protect against any unnecessary water/electricity usage. Over time, the money saved is quite substantial.

Zimbabwe is facing power shortage so we need to be more careful with the electricity we use, a water level indicator is ideal at saving power. Normally, regulating water levels can consume electricity and waste water. However, with automatic indicator, the electricity usage is limited as well as less water needed to regulate supply and the buzzer notifies you when to turn off the pumps.

1.8 FEASIBILITY STUDY

i. Financial

The hardware components of the indicator are easy to access and they are cheap hence the indicator will be cheap and accessible to all people. Since its part are it makes it easy and cheap to repair and maintain the indicator

ii. Technical

The water level indicator will be easy to install and easy to maintain. Sensors are located at

different levels of the container, so the LEDs will light at different level indicating the water level in the tank hence making the indicator easy to read and understand for everyone. The indicator is not affected by any geography as long as the tank is set upright.

1.9 CONCLUSION

The automatic water level indicator system proposed possesses certain advantages over the existing ways of determining the level of water inside the containers for example floating switch technology, such as it conserves water and it is accurate. Maintenance Cost of our system is virtually negligible as our system does not include any additional hardware components.

This paper provides a solution to reduce water loss and wastage in houses . Knowledge on the water level helps converse water, energy and allow us to determine the rate of which the water is used allowing the use to make distribution of power and water. Moreover, the purview of our project can be augmented for Coordination Control which places traffic signals on a coordinated system so that drivers encounter long strings of green lights. This will also provide data for future road design and construction or where improvements are required and which are urgent like which junction has higher waiting times.

Chapter 2: Literature Review

2.1 Introduction

A number of papers have been published with an aim to overcome the disadvantages of not knowing the level of your water hence resulting into wastage of water. The various methods use to find the level of the water in a tank or any other containers such as dipping a measuring stick in the container and weighing the container. In this chapter we are going to discuss about other authors think about an automatic water level indicator.

2.2-2.x Analysis of Study

This study by Ria Sood, Manjit Kaur and Hemant Lenka focuses on the requirements of water level controllers in agricultural irrigation. Each crop needs a different amount of water, according to the article, and this can be accomplished by using an automatic water level controller, which will also help reduce water waste. Here they use a method to measure the flow rate of water in irrigation pipelines. It measures the flow rate using a Hall Effect Sensor. A turbine rotor G1/2 Hall Effect inside the water flow sensor is used as a detection device, and the turbine speed changes depending on the water flow rate.

Agricultural land management techniques are compatible with the conservation of water resources, according to Pandey et al., 2011[1]. For the selection of various land uses, agricultural techniques, and their spatial configurations, hydrological diagnostics are required. Monitoring the water level in a river or reservoir is crucial for applications linked to agriculture, flood protection, the fishing industry, etc., according to Jaehyoung Yu Harnsoo Han in 2006 [2]. Four different types of measuring features—pressure, ultrasonic waves, heat, and image—can be used to categorize the water level measurement systems that have been created. 2004 [3] Muhd Asran Bin Abdullah - His idea demonstrates how human control is only effective for a short period of time and is not precisely accurate. The sensors offer a superior option for precise level measurements and water level processing on an autonomous basis.

By the year 2000 [4], 50% of all engineers, up from the 16% who regularly used them at the start of the decade, will be designing with sensors, predicts Dana Gardens. Lee and Park, B.Y., 2008[5] - Despite having an easy-to-use pressure sensor, it has the drawback of needing to be calibrated and updated periodically due to the possibility of fracture from constant water pressure. conditions water.Because it monitors the duration of the ultrasonic wave pulse from the emitter to the receiver that is reflected by the water surface, the ultrasonic wave sensor is not reliant on the water pressure. In 2009, Kon et al. [6] The most recent method is described as using an

image sensor to determine water level: It can offer details about the sensor and the water level, in contrast to other types of sensors, to confirm the observed data. It additionally benefits from not being impacted by weather.

Sanam Pudasaini, Anuj Pathak, Sukirti Dhakal, and Milan Paudel present an SMS-based automatic water level control system in this research paper. The automatic control system now includes SMS notification, allowing the user to direct the flow of water during flushing. Two systems complement one another. SMS system and automatic level control system The microcontroller was loaded with the program after it was developed in the Arduino program development environment. The system's water level is automatically controlled. Battery power powers the controller. Every time the system detects a download status and an empty level, the user receives an SMS notification. The process will be automated by placing a single sensor unit in the tank, which will automatically control the motor and measure the water level on a regular basis. The daily task of filling the tank and checking for overflow is done automatically by this system.

Asad Ahmed Mohamed Eltayeb and Zhang Jiang Min are involved in the design and development of an automatic water level control system, which has seen a better form of software and hardware architecture merging for interface purposes in his research. To detect water levels, the system employs advanced sensing technology. It controls the motor with Arduino and relays. Various wires are connected to various nodes of the cup. When water is poured into the cup, it makes contact with the wire and indicates the level of water in the tank. As a result, the water level was displayed on the LCD screen.

Additionally, Jerry C. Whitaker (2010)[7] noted that ultrasonic echo ranging transducers can be utilized for continuous liquid level monitoring in both wet (contact) and non-wet (non-contact) setups. Depth sounders and fish finders for boats and vessels are an intriguing use for wet transducers. Silk products like granules and powders can also be utilized with non-wet transducers.

2.x Conclusion

This system configuration helps save money by limiting the waste of water and electricity reducing their bills. The system also additionally reduces the power usage by using a 5V power

supply and notifying when the container is full. The system in simple words provides a simple yet effective solution to improper water management in irrigation systems and houses.

Chapter 3: Methodology

3.1 Introduction

There are many methods of designing an automatic water level control with switching device but all these methodologies require human assistance. In this project an automatic water level indicator for both over head and underground tank with switching device is designed using electronic to notify the water level to user without any assistance. The system design was carefully arranged to indicate the water level in the tank or any water storage unit and a buzzer automatically goes off when the tank is full. The approach used in this work is the modular design approach the overall design was broken into function block diagrams. Where each block in the diagram represent a section of the circuit that carries out a specific function. The system was designed using functional blocks, in this method the circuit is designed to display 3 different level using three transistors acting as sensors to monitor the level of water in the tank. The LEDS will be used to display the level of the water for the user to understand and the buzzer to notify the user that the tank is full.

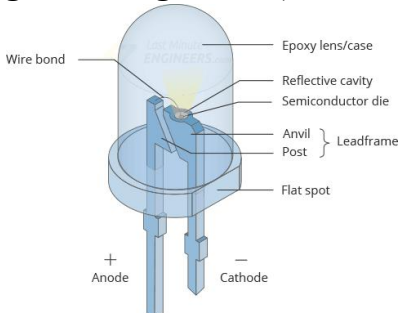
3.2 SYSTEM ANALYSIS

This project design automatic water level controller for both over head and underground tank with switching device is to ensure a higher rate of water monitoring the major component used in the project design are, Transistor bc547, resistors, buzzer, the power supply unit and LEDs

In this project lead wires can be dipped at different levels of the container. The other end is connected to the base of a transistor via a resistor. The other end of the transistor is connected to the LEDs. After the connections are made the circuit is then excited by 9V battery. The positive terminal of the battery is given to bottom of the measuring tank measuring tank that generates the flow of ions in the liquid present in tank. The base of the three transistors makes contact with the water at three different levels such as low, medium and high. When the base terminal makes the contact with the water the current starts to flow from base to emitter terminal. This current flow in the emitter terminal makes the LED to glow at different levels. If the water level is full, then the circuits beep through the buzzer notifying that the water level is full.

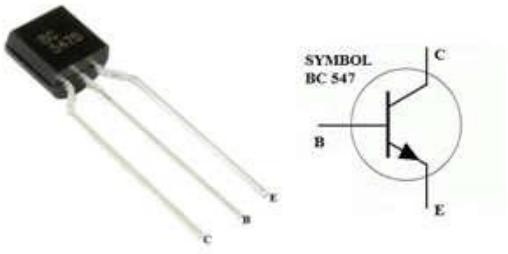
3.3. Hardware

- **Light emitting diodes** (different colors) : Used for the signal of different levels of water.



- **Transistor bc547**

A transistor is a semiconductor device, commonly used as an amplifier or an electrically control switch.

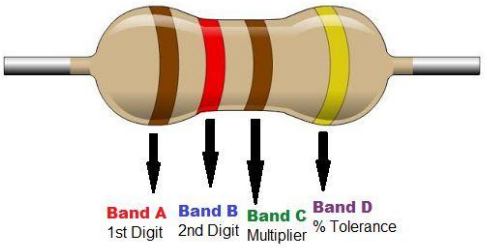


- **Connecting wires** : used to make connections

- **Buzzer** : it is used to produce alarm when water is full in the tank.

- **Resistor(330 ohm)**

Resistance is the property of a component which restricts the flow of electric current.



Used For Controlling Current into the transistor.

- **Bread board** : to make the basic connections
- **Water** **container**

3.4 Weaknesses of the existing systems (Hardware)

- Water level controls need to be replaced every 3 years.
- The rust, foul and deteriorate
- Electronics are usually built separately
- More difficult installation
- Most float switches are outdated
- No LED indicator lights
- No Warranty or Guarantee

Chapter 4: Design Phase

4.1 Introduction

System design is a process that is carried out to clearly create the system's architectural design. The system is split down into discrete standalone components in system design, with the interfaces between them explicitly defined. This stage is a necessary precursor to the main developer stage. To satisfy the given criteria, the handling and data processing for each unit with the system is taken into account. It is a procedure for defining user requirements and developing a system based on these criteria to fulfill the user's functional demands. This chapter may be thought of as the process of translating the system's theory into a practical implementation. In a word, system theory is the multidisciplinary study of systems, whereas practical application may be thought of as a finished product that can be sold

4.2 System Design

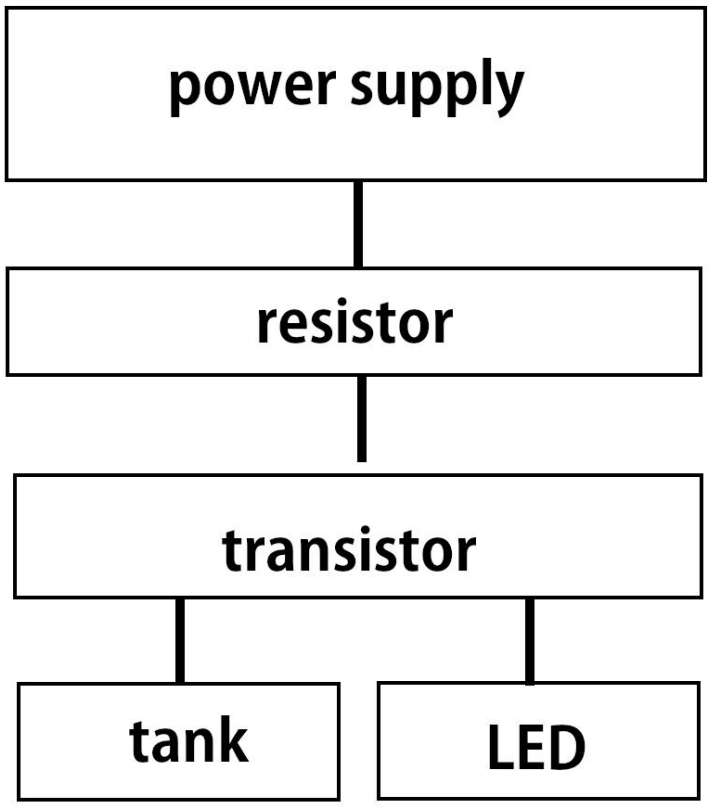
When the tank is empty there is no conductive path between any of the 3 indicating probes and the common probe (which is connected to 5v+ supply) so the transistor base emitter region will not have sufficient biasing voltage hence it remains in cut off region and the output across its collector will be Vc approximately 4.2v. As in this case the microcontroller is used in the active low region (which means it considers 0-2 volts for HIGH and 3-5 volts for LOW) now the output of transistor which is 4.2v approximately will be considered as LOW by the microcontroller and hence the default value given by microcontroller to the seven segment display is 1 which indicates as the tank is empty.

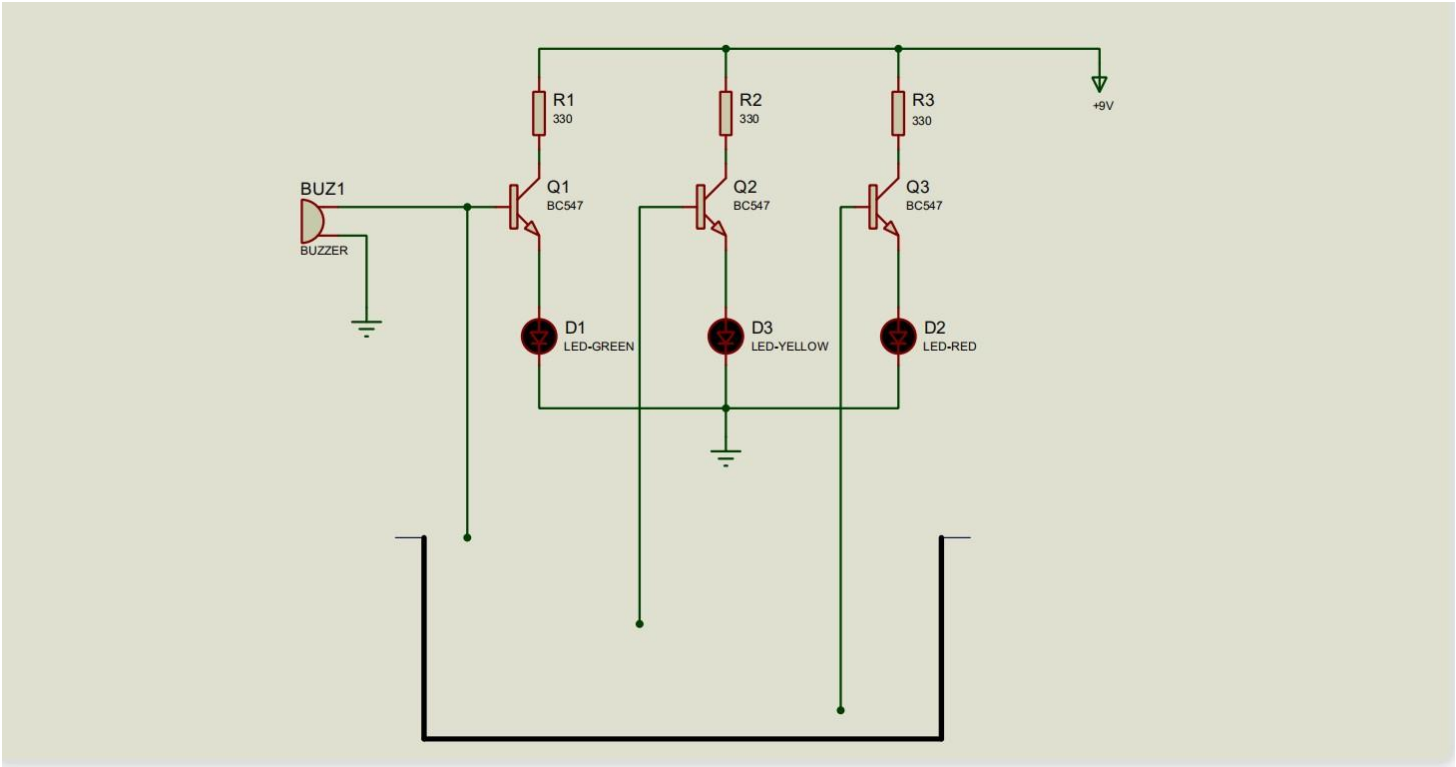
Now as the water starts filling in the tank a conductive path is established between the sensing probes and the common probe and the corresponding transistors get sufficient biasing at their base, they starts conducting and now the outputs will be Vce (i.e. 1.2v-1.8v) approximately which is given to LED. Here the LEDs are connected in such a way which detects the highest priority input and displays by lighting up corresponding water level in the three light segment.

When the tank becomes full, the top level probe gets the conductive path through water and the corresponding transistor gets into conduction whose output given to last LEDs with this input it lights up and also activates the continuous buzzer by which user can understand that tank is full and can switch off the motor and save water.

4.3 Architectural design

4.4





Physical design

4.7.2 Input design

I am going to use a water glass as my container and determine the level of the by pouring water in a water glass.

4.7.3 Output design

When pouring the water in the glass the LEDs will gradually light up as it reaches the level where the sensor is located.

4.10 Conclusion

We have managed to produce a fast and convenient application
Our application is growing as well since some research on other potential applications is already being undertaken in order to extend types of skills covered in the application.

Chapter 5: Recommendation and Conclusion

5.1 Introduction

This chapter explains how the suggested system's implementation and assessment may be carried out. In a nutshell, this chapter explains how to put a choice or plan into action, including execution and a focus on the actual coding of the proposed system. The development platforms that were used in the project's development are discussed in this chapter

5.3 Testing

Functional testing

The automatic water indicator is working as designed whenever it's starts or stops. I have created a system which is able to determine the level of water in a tank or a reservoir , we tried to implement the system on both large water containers and smaller ones and the results which we yielded were the same

Performance Test Cases

The systems designed in a way that it can handle high volumes and pressure of water

Security Test Cases

The system is secure

5.4 Installation

Qualified personnel must carry out installation only. System engineers must also carry out updating the system and all changes must be tested and go through change management best practices. These will ensure that service outages will be reduced to a minimum. Once the system is installed, the users will be trained on how to operate the system and will be provided with a copy of the user manual (user manual is under Appendix A).

5.5 Maintenance

To ensure optimum performance of the system we propose the system be serviced after every quarter. This proactive preventative maintenance will help in identifying faults before quickly. Users must also engaged authorized personnel for servicing and repairs of the system

5.6 Recommendations for future/further development

In the future I recommend that all water tanks come with a pre-installed water level indicator. The increase more sensor in the tank for a more accurate reading. A micro-controller should be introduced so that the system can automatically start filling water in the tank and stop when the tank is full or on irrigation it automatically stop when the required water for the plant is reached. I also recommend a micro-controller for remote control over the internet and notification on the status of your water level on your devices.

5.7 Conclusion

We have managed to determine whether our system satisfies specified business requirements or not. Our system has managed to deliver the best service to clients. There is now proper communication between the city council and the residents, in time payments of bills and also updates which should be known by the residents. Our residents are now able to download their bills on the internet and also view their account balance so that they prepare for following payments . The system is user friendly and convenient.

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