IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified ⁒ Impact Factor 8.066 ⁒ Peer-reviewed / Refereed journal ⁒ Vol. 10, Issue 5, May 2023
DOI: 10.17148/IARJSET.2023.10528

OPTIMIZING BATTERY LONGEVITY WITH AN AUTOMATIC DISTILLED WATER FILLING SYSTEM

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Abstract: Since the start, lead-acid batteries have been developed for more than 100 years. Lead-acid battery have good high-low temperature tolerance and high-current discharge performance, low-cost electrode materials, loose the assembly environment, mature charging mechanism and high security have an absolute advantage in the communications and UPS power industry, the automotive industry,industrial and mining enterprises and weapon systems. However, as a rechargeable battery, lead-acid batteries are countered with problems such as difficulty in estimating battery power, short life, and difficulty in balancing battery packs., the battery management system has become the focus of technology research and development in the battery industry. With the rising demand in the EV industry, thereis a drastic demand for an efficient battery management system. In India we can seean exponential increase in the number of electric rickshaws which use Lead Acid battery instead of the using a more efficient lithium-ion battery. hence it is importantto build a battery monitoring and management system for lead acid battery.

I. INTRODUCTION

Lead–acid batteries have existed as business items for over 100 years and have tracked down application in numerous different frameworks. The most remarkable application has been in the car business for turning over gas powered motors and for giving the energy to drive electrical gear in vehicles, like lights, windows, andpresentations. These batteries are ordinarily called SLI batteries (beginning, lighting, and start) and are equipped for giving the high flows expected to at first wrenching the motor. Different applications incorporate photovoltaic energy stockpiling, reserve energy capacity (especially for giving reinforcement crisis power and continuous power supply for vital hardware, like lighting, phone, and correspondence frame works), and transportation gadgets like underground mining movements, submarines (especially for quiet mobility when lowered), golf trucks, milk and postal conveyance trucks, and little electrically fueled vehicles and trucks. Lead-corrosive batteries comprise roughly 40% of the world's complete battery deals, which can be credited to their advanced and vigorous innovation and massive expense advantage. Lead corrosive batteries comprise of lead plates that are completely drenched in a poolof electrolyte comprised of sulfuric corrosive and water. That water is basic to how a lead corrosive battery capability, permitting particles (power) to stream between the plates. Yet, during the re-energizing interaction, as power moves through the water piece of the electrolyte, that water is separated into its center components: hydrogen and oxygen gas. These gases are highly combustible hence it is necessary to place batteries in a highly ventilated region. As more water is changed over into hydrogen and oxygen gases, the water level inside the battery drops. Hence, most lead corrosive batteries should be refilled with refined or de-ionized water added to the cell containingelectrolyte occasionally to ensure its health is maintained at the optimum level

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II. LITERATURE REVIEW

1) "Design and Fabrication of Automatic Water Filling System" by A. O. Adekunle, O. O. Olutayo, and O. O. Oni. This paper presents the design and fabrication of an automatic water filling system using a programmable logic controller (PLC)2015.

In the paper, he authors describe the system architecture, which includes a water level sensor, a solenoid valve, a flow sensor, and a PLC. The PLC is used to control the operation of the system, including monitoring the water level, opening and closing the solenoid valve to fill the tank, and measuring the flow rate of the water. The authors also discuss the fabrication process, including the selection of components, circuit design, and system assembly. They tested the system by filling a 100-liter tank with water and found that it was able to fill the tank to the desired level with an accuracy of ±5%.Overall, "Design and Fabrication of Automatic Water Filling System" provides a detailed example of how to design and build an automatic water filling system using a programmable logic controller.[1]

2) "Automatic Water Filling System Using Arduino Uno" by M. A. H. Mamun and M. A. Islam. This paper describes the design and implementation of an automatic water filling system using Arduino Uno2017.

describes the design and implementation of an automatic water filling system using Arduino Uno microcontroller. The system consists of a water level sensor, a solenoid valve, a flow sensor, and an LCD display. The water level sensor detects the level of water in the tank, and when the water level falls below a certain threshold, the solenoid valve opens to fill the tank. The flow sensor measures the flow rate of the water and stops the filling process when the tank is full. The LCD display shows the water level, flow rate, and other relevant information. The authors tested the system by filling a tank with 10 liters of water and found that it took around 12 minutes to fill the tank. They also measured the accuracy of the flow sensor and found that it had an error of around 2%. Overall, the "Automatic Water Filling System Using Arduino Uno" paper provides a useful example of how to design and implement an automatic water filling system using Arduino Uno microcontroller.[2]

3).Development of Automatic Water Filling System using Raspberry Pi" by S. V. Bagul and S. R. Kulkarni. This paper presents the development of an automatic water filling system using Raspberry Pi and IoT technology 2017.

The paper discusses the development of an automatic water filling system using Raspberry Pi and IoT (Internet of Things) technology. The system is designed to fill up water tanks or reservoirs automatically and efficiently, thereby eliminating the need for manual intervention.The system consists of a water level sensor, a solenoid valve, a Raspberry Pi, and an LCD display. The water level sensor is used to measure the water level in the tank, and the solenoid valve is used to control the flow of water into the tank. The Raspberry Pi is used to process the data from the water level sensor and control the solenoid valve. The LCD display is used to display the status of the system and the water level in the tank.The authors have used Python programming language and the Raspberry Pi operating system (Raspbian) to develop the software for the system. They have also used the Flask web framework to create a web interface for monitoring and controlling the system remotely. [3]

III. OBJECTIVE:

The objective of the project is to build a device that can automatically detect the amountof electrolyte present in each individual cell of a battery and can auto-refill the de- ionized water when it is below the required optimum level.

IV. COMPONENTS USED

1).SOLENOID VALVE

A solenoid valve is an electromechanically worked valve. Solenoid valves vary in the attributes of the electric flow they use, the strength of the attractive field they create, the component they use to direct the liquid, and the sort and qualities of liquid they control.

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2).PIC CONTROLLER

PIC microcontrollers (Programmable Point of interaction Regulators), are electronic circuits that can be modified to complete a tremendous scope of undertakings. They can be customized to be clocks or to control a creation line and considerably more.

3).FLOAT SENSOR

Float level sensors are consistent level sensors including an attractive float thatascents and falls as fluid levels change.The Float Sensor is used to detect the level of water present inside each cell and whenit reaches the required level it sends a signal to the PIC controller and it stops the flowof De-ionized water.

4).DC WATER PUMP

This is lightweight, small size, high efficiency, low consumption, and lownoise water pump.

Specification：

Working Voltage: DC10~13V

No Load Current: 250mA

Temperature Range: -30~0° C

Suction Lift: 100mm

Spit Out Lift: 500mm

5).SURGE TANK

The Surge Tank volume is 50 percent to that of the lead acid battery, it acts as astorage for the De-ionized water from which is sent to the electrolyte when the water level decreases inside the cell

Specification ：

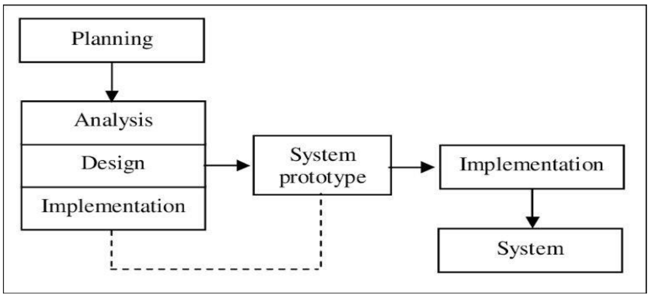
Tank height -125.2cm

Tank width-173cm

Tank length -260 cm

Volume of Tank-5.4L

V. METHODOLOGY



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The oversight that a BMS gives normally incorporates:

- Checking the battery
- Giving battery security
- Assessing the battery's functional state
- Consistently streamlining battery execution
- Detailing functional status to outer gadgets

Here, the expression "battery" suggests the whole pack; be that as it may, the observing and control capabilities are explicitly applied to individual cells, or gatherings of cells called modules in the general battery pack gathering. Lithium- particle battery-powered cells have the most elevated energy thickness and are the standard decision for battery packs for the overwhelming majority shopper items, fromPCs to electric vehicles. While they perform greatly, they can be somewhat unforgiving whenever worked external a for the most part close safe working region (SOA), with results going from compromising the battery execution to through and through hazardous outcomes.

The BMS positively has a difficult expected set of responsibilities, and its general intricacy and oversight effort might traverse many trains, for example, electrical, computerized, control, warm, and pressure driven.

VI. PROPOSED METHOD

In our method Nodemcu plays an major role in case of controlling input and output. Float or level sensor which provides input signal to the controller whereas Relay which executes the operation provided by the controller. The operation of the relay is On/Off. It is connected to Solenoid value to regulate flow of water from the Surge tank to the battery. Controller has inbuilt wifi module which helps to send data to cloud. With help Blynk app, we can monitor level of each compartment in battery.

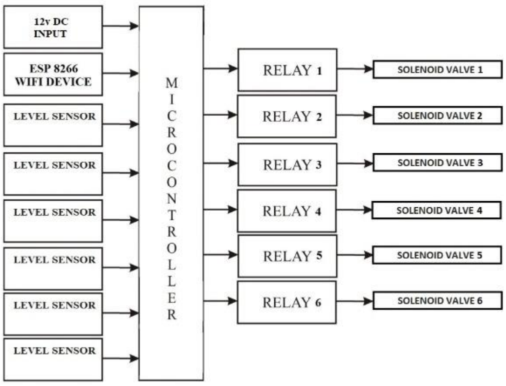

Fig 1 Overall Block Diagram

Once power supply is given to the PCB board where controller, relay, float are connected together. Water level in each compartment of the battery get notified to the controller. The float sensor sends the signal either(1/0) true or false. Suppose one of the battery compartment water gets reduced due to the discharge cycle. It gets notified to controller by float sensor. Then the controller sends the signal to the relay to On the pump and simultaneously another signal send to the relay to open the solenoid value of that particular compartment. After water level in that compartment gets increased and the float sensor alerts the controller to turn Off the relays. At that time solenoid value gets closed first and followed by the pump.

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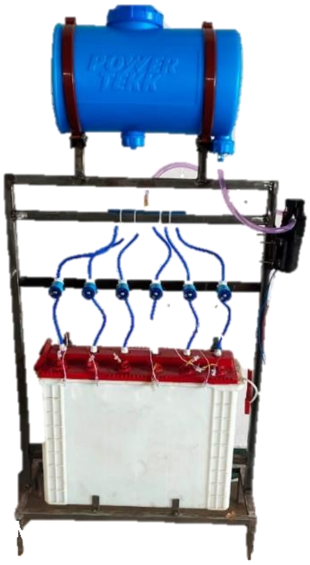

Fig 2 Project Fabrication

This loops works continuously based on the signal provided by the float sensor based on the level of water in each compartment of the battery. All this data are send to the to cloud. So that we can monitor them irrespective of our location.

VII. CONCLUSION

Lead acid battery De-ionized automatic watering system is developed, manual watering can mean around 8 hours every 4/6 weeks of battery filling, which is time consuming, expensive and inconsistent if managed by the maintenance worker whichresults in adverse effects of the battery in the long run resulting in poor battery health. Hence an efficient battery management system is developed

REFERENCES

[1]. Design and Fabrication of Automatic Water Filling System" by A. O. Adekunle, O. O. Olutayo, and O. O. Oni. This paper presents the design and fabrication of an automatic water filling system using a programmable logic controller (PLC) 2015.

[2]. "Automatic Water Filling System Using Arduino Uno" by M. A. H. Mamun and M. A. Islam. This paper describes the desand implementation of an automatic water-filling system using Arduino Uno .

[3]. Development of Automatic Water Filling System using Raspberry Pi" by S. V. Bagul and S. R. Kulkarni. This paper presents the development of an automatic water filling system using Raspberry Pi and IoT technology 2017.

[4]. Automatic Filling System for Distilled Water" by A. Z. A. Abidin and N. A. N. Yusoff. This p aper describes the design and implementation of an automatic filling system for distilled water using a microcontroller-based control system 2014.

[5]. Design and Implementation of Automatic Water Filling System" by O. O. Onasanya, A. T. Oladeji, and O. A. Ogunseye. This paper describes the design and implementation of an automatic water filling system using microcontroller-based control 2014.

[6]. .Atzori, L.; Iera, A.; Morabito, G. Understanding the Internet of Things: Definition, potentials, and societal role of a fast evolving paradigm. AdHoc Netw. 2017, 56, 122–140.

[7]. Szumanowski and Y. Chang, “Battery management system based on battery nonlinear dynamics modeling,”

DOI: 10.17148/IARJSET.2023.10528

IEEE Trans. Veh. Technol 2008., vol. 57, no. 3, pp. 1425–1432, May 2008.

[8]. Irsyad N. H., Edi Leksono, M. Iqbal, FX Nugroho S., Nugraha, Deddy Kurniadi, Brian Yuliarto, Development of Battery Management System for Cell Monitoring and Protection, IEEE Int. Conf. on Elect. Engineering and Computer Science, pp. 24-25 Nov. 2014.

[9]. C. Hommalai and S. Khomfoi "Battery Monitoring System by Detecting Dead Battery Cells", International Journal of Science and Research, Vol.1, pp. 5-15, 2011.

