Smart Inverter Monitoring System – Sims

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Abstract: The survival of day to day life mainly depends on the electrical power supply. When any power shut down or breakdown of power supply happens due to unexpected reasons, the need of power backup is necessary to run our life at least for minimum duration of two to three. As a solution of this problem, batteries are invented. Inverter battery works in the mechanism of converting Direct Current (DC) into an Alternating Current (AC). The distilled water in the battery plays a major role, as ordinary water contains minerals and salts which fill the pores and forms a layer on the plates, affecting the normal electro-chemical reaction that generates power in the battery. The electro-chemical reaction has been analyzed based on level of distilled water. When the level of distilled water. The decrease of water level below the threshold value and if not monitored, the lifetime and the efficiency of the battery get affected and battery may be overheated. Hence, it is very much important to refill the distilled water on time. When the battery gets overheated, the hydrogen sulphide present inside acts as hazardous gas turns out from batteries which affects the human health and in turns decrease the life time of battery. In this work, smart inverter monitoring system (SIMS) has been developed which will monitor and inform the authorized owner by SMS notification to phone number via a GSM Module. The developed system gives better results with good reliability.

Keywords: battery, sensor, gas

I. INTRODUCTION

A decade ago, computer started to play a major impact on human life. So, there was a huge consume of electric power. From 2008 onwards we are in shortage of power consumption and storage. So, there occurs a need for power backup. Because of this reason batteries are invented. This project is developed keeping in mind to maintain and enhance the life time of battery. Now day’s batteries are having an indicator at the top, which will show the level of distilled water. In the busy schedule, mostly humans forget to check the water level indication periodically. Failing which, the battery gets over heated and Hydrogen Sulphide (H$_2$S) hazardous gas turns out from batteries which creates an odor smell affects human health and in turns reduces the life time of battery. Due to this, the efficiency and lifetime of the batteries gets affected. To overcome this, smart inverter monitoring system (SIMS) has been developed which will monitor and inform the authorized owner by SMS notification to phone number via a GSM Module in the following cases if the

1. Temperature increases beyond threshold limit.
2. Hydrogen Sulphide (H$_2$S) hazardous gas starts leaking.
3. Distilled water level of the battery get reduces.

The rest of the paper is as follows. Section.1 gives the basic introduction about the inverter and battery. Section.2 briefs about the literature survey of the research work done so far. Section.3 describes the proposed system and the methods implemented. Section.4 discusses implementation and results and Section.5 relate the conclusion.

II. LITERATURE SURVEY

To develop the home which is fully automatic [1] author gives the solution to control all the home appliances like light, fan, door cartons, energy consumption, and level of the gas cylinder using different sensors like IR sensors, LM35, Node MCU ESP8266, LDR module, and Arduino UNO. With the help of sensors, the author detects the human presence and completes their task within the time period. The author also gives the solution for low energy consumption and automatic gas indication system. To monitor the surroundings [2] of the user to be comfortable and to be pleasant even through the weather condition is different. The author controls the whole system using Arduino and Wi-Fi. The system also has a voice recognition unit for the sake of blind or disabled people. This system is automatic and also can be controlled using a cell phone for the case that the user needs the surroundings according to his/her wish. Sensors such as Temperature – Humidity sensors, Light Dependent Resistors, Atmospheric pressure sensors, LPG gas or smoke sensors and sound sensor determine different parameters of surrounding environment. In paper [3] author incorporated IOT into the house to transfer data over the network making them convenient and automated. It would send notifications to the user through internet connectivity when a trespasser and can also ring an alarm if required. The security among the network is achieved through AES Encryption. Here Raspberry Pi is used to decrypt the data and verify them with the entries present in Raspberry Pi memory itself. A response is sent back to the device only if the provided details are correct. The GPIO pins of Raspberry Pi are connected to appliances and based on the given request any appliance can be controlled easily. It is also configured to provide automatic and immediate response in case of smoke detection or trespasser, so that the user can take appropriate action based on the sent response. A camera module is also used to capture the image to inspect the situation accurately. The image is sent over the mail and a text message to alert the user. At the end, the overall control of the appliances is passed over to the user. The author in paper [4] implements automation of home using IOT to the great extent. The author uses IOT for the better usage of combining the software with electronic and mechanical devices and helps to exchange the data effectively. For the implement of this the author uses embedded Wi-Fi module ESP8266 which will help to low power consumption. In paper [5], author gives the overview about Smart homes based on Internet of Things (IoT). The basic characteristics of a smart home are multi

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functionality, automation, interactivity, efficiency, adaptability. The author also discusses about various IoT protocols and shown a comparison among their automation architecture. As a result the author concluded the fact that choosing the correct hardware and IoT protocols will increase their efficiency and reduce the drawbacks of existing systems. Also he recommends a friendly user interface like speech, MQTT protocol as a transmission mode and a Raspberry pi as a central controller for smart homes.

III. PROPOSED SYSTEM
In this product a small part of transparent material that covers the distilled water level indicator at the opposite sides have been removed and used a small steel foil just above the threshold value marker (red) at both sides with a small rod tied at the top of the indicator in which 2cm rod fall outside on both sides. The one side of the foil is connected with a 5V Arduino board using wires and the other end of the foil is connected with the resistor. The 9th and 10th pin of the Arduino is connected to the Rx and Tx of the GSM 800A (Global System For Mobile Communication) module respectively. The GND of Arduino board is connected with GND of GSM modules using jumper wires. The LM35DZ temperature sensor is used to indicate rise of heat in the inverter battery. The first pin of sensor to 5v, second pin to the A0 to read output as analog and third pin of sensor to GND of Arduino board. The sensor TGS 2602 is used to indicate emission of hydrogen sulphide hazardous gas (H2S).

The smart inverter monitoring system will give the SMS notification to the authorized phone number, when the distilled water in the battery decreases due to the electro-chemical reaction, the indicator goes down gradually. When the rod (tied at the top of the indicator) touches the foil the input to the Arduino will become high and now the receiver receives the message from the GSM module that “Water level is low” Now, he will fill the distilled water in the battery. The LM35DZ sensor has used to indicate the increase rise in temperature and the product will give the message “Temperature is high” notification to the authorized phone number. For sending the message loop method is used. The method DigitalRead() have used to read the information from arduino. IF decision statement is used to check whether the input is low or high. If the input is high it calls the mssgw() method which contains the message and the receiver's phone number and the message is sent to the receiver using GSM module.

Figure.2 shown above is the block diagram of the proposed system. In Arduino board the code is uploaded, the header files were included in setup method. In loop method, the input is read using the statement DigitalRead(). IF decision statement is used to check whether the input is low or high. If the input is high it calls the mssgw() method which contains the message and the receiver's phone number and the message is sent to the receiver using GSM module.
Celsius temperature, the input to the Arduino will become high and now the receiver receives the message from the GSM module that “Temperature increases in the battery”. Thus the efficiency and the lifetime of the battery is maintained.

To sense the H$_2$S gas release from battery rises, the TGS2602 sensor was used to identify and the message was sent using Arduino and GSM Module. When H$_2$S gas released from the battery the input to the Arduino will become high and now the receiver receives the message from the GSM module that “Hydrogen sulphide gas is found”. Thus the efficiency and the lifetime of the battery is maintained.

**IV IMPLEMENTATION AND RESULTS**

The following diagram shown in Figure 4 represents the model of the product which includes the entire sensor in the bread board.

![Figure 4 Model of the Product](image)

Figure 5 denotes the demonstration of the message sending to the owner mobile number via Arduino in the monitor display.

![Figure 5 Message sent to the System displayed in monitor](image)

**V. CONCLUSION**

The smart inverter monitoring system (SIMS) has been developed and implemented for monitoring and remind the authorized owner by SMS intimation under the following circumstances.

1. Temperature increases beyond threshold limit.
2. Hydrogen Sulphide (H$_2$S) hazardous gas starts leaking.
3. Distilled water level of the battery get reduces.

The product was successfully completed and the SMS notification within the stipulated time period to the authorized person has been verified with the system. Moreover, the action taken at right time after intimation alert enhances the lifetime and efficiency of battery. In the case of H$_2$S leakage and temperature rise the human life can be saved due to this alert notification and suitable remedy measures can be taken to prevent the leakage of hazardous gas.

**REFERENCES**

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