

# Safety System for Sewage Workers

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**Abstract** - A large number of sewage works die due to the inconsistent and shortage of facilities available and because of the release of harmful gases while cleaning the sewage. Real time monitoring system will help as a safety equipment for the workers working in the sewage. In this project, the device will monitor the pulse rate of the person using a Heart beat sensor and the concentration of CH<sub>4</sub> with respect to atmospheric oxygen and aware the worker and exterior unit when parameters change from the safe range. This result will promptly aware the worker to stay guarded and in the toxic gases prior to any harm

**Key Words:** Sewage, Sensor, Blynk app, ESP32 CAM

## 1.INTRODUCTION

Sewage system is facility that consist system of pipes for carrying off liquid and solid waste from homes and business to the treatment facility, where the water is being treated and set free into natural water bodies to permanently remove the contents out from the area. Sewer manhole is one of the most vital parts of the sewer system. Sewer manhole is a form through which a person can acquire entry to the below ground waste water collection system. Manholes are not sketched for someone to work in regularly, but workers may need to enter inside the sewage to complete their jobs such as repairing, cleaning, inspection etc. A better knowledge related to hazards in the surroundings is essential for the prevention of poisoning of gases. These gases have to be kept on track so that huge rise in the normal level of effluents should be known and corrective measures can be taken. In contrary, the existing systems at hand are not much portable and are not affordable.

## 2. METHODOLOGY

In phase1, the proposed framework helps to monitor the range of gases in sewage. An Arduino based safety system using sensors and IOT is designed. The sensors used are gas sensors, vibration sensors, pulse sensors and alcohol sensors. Gas sensors are used to sense the dangerous gases. Vibration sensor is involved in detecting any vibrations. Pulse sensor is used to check the pulse value of a worker in the sewage. Alcohol sensor are involved in detecting the alcohol ranges. These sensor assembly helps us to identify if the toxic gases is present or not. A power supply called "AC adapter" is utilized by the whole system.

In phase 2, the gases are been controlled and monitored continuously. ESP32 CAM module is used in this system. It helps to capture live images of the worker and the sewage. Wi-Fi module is used to get the values from the controller and sends the data to the cloud. By using this system, we could control the level of harmful gases and save the lives of sewage workers. In addition to that, an emergency key is also added to give signals to the display unit whenever required. By that way the rescue team can save the workers from the accidents. The hardware used in this proposed system is used as a hand band. The workers can wear the band and can enter the manhole.

## 2.1 System Architecture

This basic block diagram indicates that the gas sensor, vibration sensor, pulse sensor and alcohol sensor values are read by the Arduino controller and sends the data to the cloud. ESP32 CAM gives the live updates of the workers. All these parameters gets displayed in an mobile application (BLYNK). An emergency button is added if any dangerous situation occurs. Arduino initializes the system to connect to the server. The input from the sensors are sent to the microcontroller. The microcontroller reads the values and it sends to the cloud through Wi-Fi module.

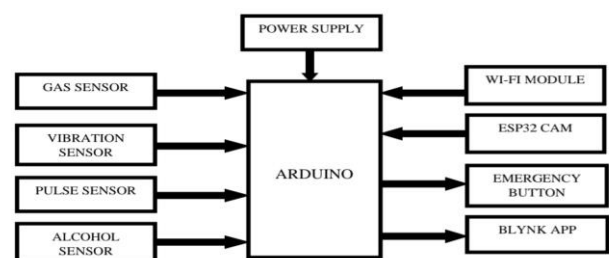


Fig -1: Block diagram

ESP8266 carry out all the logical and mathematical operations inside and conveys the correct signals to the Blynk cloud for the necessary actions. ESP32 CAM records the live images of the workers in the sewage. If any parameter exceeds above the normal value it gives alert message to the Blynk app.

## 2.2 Working

The proposed framework will give a keen answer for safety of sewage workers. It assists with executing the innovation of IOT alongside methodology of the framework accessible. The sensors such as gas, pulse, vibration, alcohol sensor are used to monitor the condition of sewage and workers. At the beginning Arduino initializes the system to connect to the server. The input from the sensors are sent to the microcontroller. The microcontroller reads the values and it sends to the cloud through Wi-Fi module. ESP8266 carry out all the logical and mathematical operations inside and sends the proper signals to the Blynk cloud for the necessary actions.

ESP32 CAM records the live images of the workers in the sewage. If any parameter exceeds above the normal value it gives alert message to the mobile application. The emergency button is also pressed. By this way we can save the lives of many sewage workers. After installation, unlock the application, and there will be a screen with the option "New Project". A new screen will pop up when we click on "New Project", where we need to set the parameters like Board, Connection type and Project name, .

Select the option Arduino UNO for the device and connection type as Wi-Fi and click on "Create". We will get an Authenticate ID on our registered email, after the successful Creation of the Project. Save the Authenticate ID for future reference. Open the project in Blynk, click on the "+" sign where we will get the widgets which can be used in this project. Here a "TERMINAL" widget is selected to display the values of sensors and a "Notification" widget is selected to receive the notifications from Arduino UNO.

## 2.2 Hardware Description

### 1) Arduino uno

Arduino Uno is an open source microcontroller board based on the ATmega328P which is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board. The Arduino uno has 6 analog inputs, 14 digital input and output pins, a quartz crystal, a USB connection, an In-Circuit Serial Programming header, a power jack and a reset button. It has everything that needed to support the microcontroller. Simply join it to a computer with a USB cable to get started.

### 2) Gas sensor

MQ2 gas sensor is a sensor which operates on sensing the concentration of gases in the air. This sensor contains a sensing material so when it comes in contact with the gas its resistance changes. This sensor works on 5V DC voltage. In the concentration of range 200 to 10000ppm it can detect gases.

### 3) Vibration sensor

Vibration sensors are piezoelectric accelerometers that are used to sense vibrations. Those measurements help in detecting imbalances in the asset and predict future breakdowns. These sensors are used for normal vibration measurement. Frequency of vibration sensor ranges from 0.2 up to 2500 Hz. The operating temperature of these sensors is between -50°C and +85°C.

### 4) Pulse Sensor

The MAX30100 sensor is a pulse oximetry and heart rate monitor sensor. This sensor is a plug-and-play heart-rate sensor. When the heart beat detector is working, the LED flashes with each heart beat.

### 5) Alcohol Sensor

MQ3 is the most commonly used sensors in the MQ sensor series. They are also known as Chemi resistors, because sensing is based on the resistance change of the sensing when it is being exposed to alcohol. By placing the alcohol sensor in a voltage divider network the alcohol concentrations are detected.

### 6) ESP32-CAM module

The ESP32-CAM which is in small size and low power consumption camera module based on ESP32. This ESP32-CAM comes with an OV2640 camera. For face recognition it has a very small-size camera module that can toil independently as a minimum system with a footprint of only 40 x 27 mm and deep sleep current of up to 6mA.

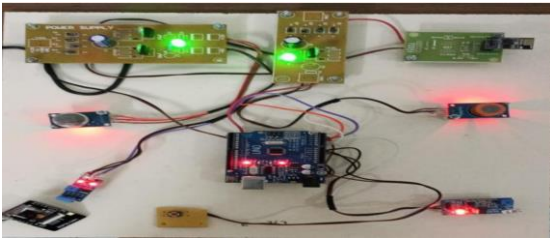
### 7) ESP8266 Wi-Fi Module

The ESP8266 Wi-Fi Module is a self carry microchip which is mainly used for IOT applications. This is a low-cost Wi-Fi microchip, which has built-in TCP/IP networking software. This Wi-Fi module is cost effective board.

### 8) Mobile Application

Blynk was set up for the IOT. This can remotely track devices, display sensor data, store data, simulate. There are three major components on the platform they are Blynk app, Blynk server and Blynk libraries.

### 3. RESULT AND DISCUSSION



**Fig-2: Hardware module**

The Figure 2 shows the hardware module of the proposed system in which the results are taken by these hardware components. The list of sensors such as the gas sensor, pulse sensor, vibration sensor and alcohol sensors are used to monitor the condition of sewage. At the beginning, the Arduino initializes the system to connect to the server. The input from the sensors are sent to the microcontroller.

The microcontroller look through the values and it sends to the cloud through Wi-Fi module. ESP32 CAM documents the live images of the workers in the manhole. If any parameter run over above the normal value it gives alert message to the mobile application. The emergency button is also used when it is needed.



**Fig -3: Mobile Application**

The above figure shows the values of the sensors used in the proposed system. These values are sent and received by the IOT. ESP32 CAM Module captures the live images of the workers. All these parameters are exhibit in the mobile application called Blynk.

### 4. CONCLUSION

Safety System for Sewage Workers plays an important role in saving the workers lives. Even though, several techniques is existing for the same, still sewage cleaning is one major concern. This suggested system is a microcontroller based safety system for sewage workers using IOT. This device is planned in such a way that the necessary parameters are calculated which needs to be

monitored for safety of the workers. The device discovers vital application in sewage systems. The proposed methodology helps in preventing the sudden accident of workers that occurs while cleaning and also helps to keep the society clean. The device assist in monitoring the overflow of the sewage water.

### REFERENCES

- [1] IOT BASED SEWAGE MONITORING SYSTEM Anushka Pendharkar, Jyothi Chillapalli, Kanksha Dhakate, Subhalaxmi Gogoi, Yogesh Jadhav (2020).
- [2] AN IOT BASED DRAINAGE OVERFLOW FORECAST MONITORING SYSTEM B. V. Subba Rao, J . Sirisha, S. Sai Kumar (2020)..
- [3] K. Elissa, Title of "URBAN UNDERGROUND DRAINAGE MONITORING SYSTEM USING IOT" D. Deepak Kumar, N. Indrajith, Dr. V. Jayaprakasam (2020)
- [4] IOT BASED SMART DRAINAGE WORKER SAFETY SYSTEM Pushpakumar R, Rajiv S (2019).
- [5] SMART SAFETY MONITORING SYSTEM FOR SEWAGE WORKERS WITH TWO WAY COMMUNICATION Sudhanshu Kumar, Saket Kumar, P.M. Tiwari (2019)
- [6] SEWAGE LEVEL MAINTENANCE USING IOT B. Sumathy, G. Gowthaman, K. Hari Haran, G. Keerthee Rajan, A. Sweeto Jeison (2019)
- [7] WEB-BASED REALTIME UNDERGROUND DRAINAGE OR SEWAGE MONITORING SYSTEM USING WIRELESS SENSOR NETWORKS Navin G Haswani, Pramod J Deore (2018)
- [8] SMART REAL-TIME DRAINAGE MONITORING SYSTEM USING INTERNET OF THINGS Gaurang Sonawane, Chetan Mahajan, Anuja Nikale (2018)
- [9] HUMAN SAFETY SYSTEM IN DRAINAGE, UNUSED WELL AND GARBAGE ALERTING SYSTEM FOR SMART CITY V.S. Velladurai, M. Saravanan, R. Vigneshbabu (2017)
- [10] DRAINAGE OVERFLOW MONITORING SYSTEM USING IOT (DOMS) R. Girisrinivaas, V. Parthipan (2017)