# IoT Based Smart Sewage Monitoring System using GSM and Wi-Fi Module

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**Abstract:- Monitoring of sewage system is important to keep the city clean. The uneven  monitoring of sewage system leads to blockage of the drainage. Blockages in sewers are major causes of both sewer flooding and pollution. Sometimes due to ignorance the workers may meet with an accident as they might not be aware of the condition inside the manhole. This paper represents an experimentation of the smart sewage system using IoT which is tested and demonstrated at campus of Galgotias University. In this model, a regulator circuit, sensor driver circuit, microcontroller, serial communication devices and IoT module is used to obtain the desired output from the module.**

*Keywords:- IoT, Sensors, Arduino, Wi-Fi, GSM.*

## I. INTRODUCTION

Sewage system plays a crucial role  particularly in big cities. The world is growing rapidly into smart cities but the problems faced are still the ones from primitives. The modern world has great need of modern advancements and sophistication in its planning. Sewage workers continue to lose their lives due to the inhalation of toxic gases present inside the manhole. This also proves improper monitoring of sewage system.

The sewage system has the instability and uncertainty with the features of multi variable, nonlinear, time variant and random treatment process. The objective of this model is to obtain a cost effective, economical and flexible solution for detection of clog and stink or bad odor gases. Two ultrasonic sensors are used to detect the water level and if the difference between the water level is greater than the threshold value, the alert message is transmitted to the person in charge. Output of the sensors is interfaced with the microcontroller i.e, Arduino. It checks the threshold level which is already set and sends an alert message through GSM to the person in charge and this is monitored using IoT. The graph for clog detection and gas detection is shown on monitor using an IoT server Analytics i.e. Thingspeak app.

The best outcome of this system is that it can avoid deaths of sewage workers due to the exposure of harmful gases.

## II. LITERATURE SURVEY

### [1] Smart sensors and Arm Based Drainage Monitoring System

The core unit of this project is ARM7. The ARM7 processor is programmed to sense the sewage water level and blockage. Attached gas sensor gives an early report if any leakage by alert message or sound by buzzers.

### [2] Smart Sewage Alert for Workers in Real Time Applications using IoT

In this, level sensor is used to detect the water level in the drainage and displays it on screen. Sensors are used to detect the clog and flow rate. The WEMOS D1 checks the specific conditions and it sends automatic alert through GSM and update it in real time through IoT.

### [3] Underground Drainage Monitoring System using IoT

This system uses various sensors like temperature sensor, water level sensor and gas sensor that are interfaced with PIC Microcontroller. System monitors the water level and hazardous gases.

### [4] Smart Real Time Drainage Monitoring System Using Internet of Things

A smart real time drainage monitoring system using various sensors is designed. The water level will determine the extent of flood as low, medium or high. Gas sensor is used to measure the amount of various hazardous gases.

### [5] IoT based Sewage Monitoring System

The sewage inspection framework forms were used to save workers lives in unsafe conditions. It sends a remainder to the offices that employ these workers when the ppm levels of specific gases go beyond the prescribed levels. Arduino is used in the survey but Arduino cannot handle so many sensors at a time so it would not be an effective approach.

### [6] An Effective Safety System for Identification and Removal of Toxic Gases in Drainage Cleaning Process

It detects the toxic gases and alert the system by microcontroller. The hazardous gases like H2S,CO,CH4 will be sensed and displayed each and every second in  the LCD display. If the gas concentration level is increased then an alarm is generated immediately and a message will be send via GSM.

*[7] IoT Enabled Underground Drainage Monitoring System using Water flow Sensor*

Water flow monitoring sensor is used as the main sensor. It helps in detecting water flow. By fitting this sensor at various places, area of water leakage can be identified and solved. In addition to this, the volume of water level can also be calculated with the help of water flow sensor and Arduino.

## III. HARDWARE REQUIREMENTS
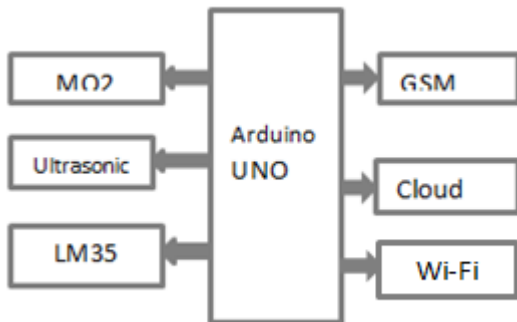
### 3.1 BLOCK DIAGRAM



*Fig1. Block diagram of IoT based smart sewage monitoring system*

### 3.2 ARDUINO UNO

The Arduino Uno is an open source microcontroller board based on the Microchip Atmega328P. It has 14 digital input/output pins.



Fig 2: Arduino Uno

### 3.3 MQ2 GAS SENSOR

MQ2 gas sensor uses a gas sensitive material known as SnO2, a low electrically conductive material in clean air. It is used to detect the presence of gas leak or any other emission that can interface with the control system.



Fig 3: MQ-2 Gas sensor

### 3.4 ULTRASONIC SENSOR

Ultrasonic sensors generate or sense ultrasound energy. The electrical signal output from ultrasonic signal is amplified and processed to find the reflected echo and then calculated to find the distance to specific target [2].



Fig 4: Ultrasonic Sensor

### 3.5 TEMPERATURE SENSOR

LM35 is a temperature sensor, whose output voltage varies based on temperature around it. There will be a rise of 10mV (0.01V) for every 1°C rise in temperature. Its Drain current is less than 60 uA. It provides output voltage in Celsius.
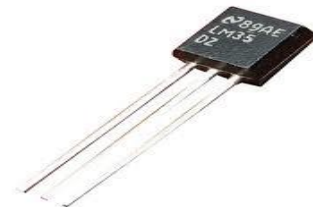


Fig 5: LM35 Temperature sensor

### 3.6 Wi-Fi ESP8266

The ESP8266 is a low cost Wi-Fi microchip, with a TCP/IP stack and microcontroller capability.



Fig 6: ESP8266 module

### 3.7 GSM

SIM800L is used for the communication purposes, it makes proposed system wireless. It is connected to Arduino to receive and transmit the data to the user.



Fig 7: SIM800L

## IV. PROPOSED SOLUTION

Ultrasonic sensors are attached to the sewer tank to sense the water level frequently. The Arduino is programmed to activate the ultrasonic transmitter transducer when the power supply is passed. It is combined with IoT technology. Power supply is given from junction board to Arduino board which emits power to ultrasonic sensor, MQ2 gas sensor, LM35 temperature sensor and SIM800L.

If the blockage occurs in tank, sewage water level rises up. And hence clog will be detected. Due to sewage water bad odour occurred. This bad smell is very harmful and may leads to many diseases like diarrhea. MQ-2 gas sensor is used to detect the stink gas that is interfaced with Arduino. To measure the temperature inside the manhole LM35 temperature sensor is used.. The data sent from Wi-Fi module is then interacted with cloud with an open IoT server Analytics called "Thingspeak". A channel is created in Thingspeak and four fields are created there for four sensors used. Each field chart represents the graphical value of each sensor. When the reading shows a low value, it indicates normal water flow inside the tank whereas a peak in the graph indicates clog or blockage. Similarly gas detection is done. And temperature level is shown in third graph. The data provides continuous values obtained at regular intervals.



Fig 8: Proposed solution

## V. RESULT AND DISCUSSION

The data from the sensor is sent to the microcontroller and to the cloud for graphical representation through Wi-Fi. It is also transferred to the registered mobile number via GSM module. The data from the Wi-Fi is cloud interacted by THINGSPEAK. This is how the whole system works and can be operated easily by anyone.
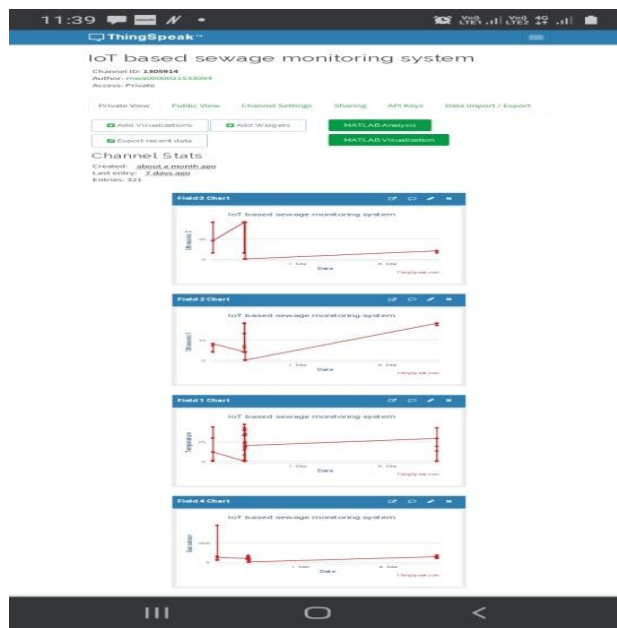


Fig 9: Thingspeak Result

## VI. FUTURE SCOPE

Having implementing this project, gives the removal of clog from the sewage system. It can be further developed by using advanced technologies. The eradication of the clog can be done by using chemicals in sewage pipes. In addition to this, the clog can be removed using robots.

## VII. CONCLUSION

Underground observance is difficult nowadays. This project proposes totally different way for managing underground system [7]. This system provides a smart way of detecting clog, stink gas and temperature. This can be implemented in smart cities and can be operated easily by anyone. It is a low cost, time saving and less human intervention system. The proposed system identifies the sewage water level and hence immediately detects the clog present inside. It also detects the stink gas that occurs due to

the sewage water. And the temperature inside the manhole can also be detected by temperature sensor used.

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