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IoT-Based Sewage Management System

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Abstract: *Monitoring sewage systems is essential for maintaining hygiene, environmental safety, and protecting workers who operate in such environments. Sewage pipelines often contain harmful gases and fluctuating water levels, which situations if they are not monitored properly. Traditional methods usually involve manual inspection, which can be unsafe and may not provide continuous monitoring. This research presents the development of an Internet of Things (IoT) based sewage management system that helps in monitoring sewage conditions in real time. The system is built using a NodeMCU microcontroller along with MQ2 and MQ135 gas sensors to detect harmful gases that may be present in sewage pipelines. A water level sensor is also integrated to observe the level of sewage water and identify possible overflow conditions. The data collected from these sensors is processed by the NodeMCU and transmitted to the Blynk platform through a wireless network. A dashboard is created on the Blynk application to display the sensor readings, allowing the user to monitor the system remotely through a mobile device. When the sensor values cross a predefined threshold level, the system automatically sends alert notifications to the user's mobile phone. This allows quick action to be taken in case of dangerous gas accumulation or rising sewage levels. The proposed system demonstrates how IoT technology can be used to improve sewage monitoring by providing continuous observation and timely alerts.*

Keywords: Internet of Things (IoT), Sewage Monitoring, NodeMCU ESP8266, MQ2 Gas Sensor, MQ135 Gas Sensor, Water Level Sensor, Blynk Platform, Real-Time Monitoring, Environmental Safety

I. INTRODUCTION

Sewage management is an essential part of urban infrastructure as it helps maintain cleanliness, protect public health, and prevent environmental pollution [6][16]. In cities and towns, sewage pipelines carry wastewater from homes, industries, and commercial areas to treatment facilities. However, these pipelines often contain harmful gases and fluctuating water levels that can create dangerous situations if they are not monitored regularly. Toxic gases such as methane, ammonia, and carbon monoxide may accumulate inside sewage systems and pose serious health risks to workers and nearby residents [2][3].

Traditionally, sewage monitoring is carried out through manual inspection[19]. Workers are required to check sewage lines and manholes to identify blockages, gas accumulation, or rising water levels. This process can be risky because workers may be exposed to toxic gases or unsafe conditions. In many cases, problems such as gas buildup or sewage overflow are detected only after they become serious, which can lead to accidents, environmental damage, and costly maintenance.

With the advancement of technology, the Internet of Things (IoT) has provided new possibilities for monitoring and managing infrastructure systems. [17] IoT allows devices and sensors to collect data and transmit it over the internet for real-time monitoring and analysis[13]. By using sensors and wireless communication, it is possible to continuously observe environmental conditions without requiring constant human presence. This makes IoT-based systems useful for applications where safety and timely detection are important.

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The system proposed in this research focuses on developing an IoT-based sewage management solution that can monitor harmful gases and sewage water levels in real time. The system is built using a NodeMCU microcontroller, which acts as the central unit for collecting and transmitting data [5][18]. Gas sensors such as MQ2 and MQ135 are used to detect the presence of harmful gases, while a water level sensor is used to monitor the level of sewage water [2][3]. The data collected by these sensors is sent to the Blynk platform, where it can be viewed through a dashboard on a mobile device.

Whenever the sensor readings cross a predefined threshold value, the system automatically sends alert notifications to the user. This helps in identifying unsafe conditions at an early stage and allows quick action to be taken[4][18]. By providing continuous monitoring and remote access to data, the proposed system can improve the efficiency and safety of sewage management.

Fig. 1: Prototype Model of IOT Based Sewage Management System

II. LITERATURE REVIEW

In recent years, researchers have shown increasing interest in using Internet of Things (IoT) technology for environmental monitoring and smart city applications[17]. Sewage management is one of the areas where IoT-based systems can help improve safety and efficiency. Several studies have explored the use of sensors, microcontrollers, and wireless communication to monitor sewage conditions such as gas concentration, water level, and pipeline blockages.

Some earlier works have focused on gas detection systems for hazardous environments. These systems use gas sensors to detect the presence of harmful gases such as methane, ammonia, and carbon monoxide [2][3][18]. The purpose of these systems is to provide early warning when gas concentration reaches unsafe levels. Gas sensors like the MQ series are commonly used because they are relatively low-cost and capable of detecting different types of gases. These sensors have been widely applied in environmental monitoring and safety systems.

Other research has explored the use of IoT technology for monitoring water levels in drainage and sewage systems. [20] Water level sensors are used to detect rising water levels that may lead to overflow or blockage in pipelines. By continuously measuring the water level and sending the data to a remote monitoring platform, these systems help authorities take timely action before the situation becomes critical. Real-time monitoring also allows better management of drainage systems during heavy rainfall or increased sewage flow.

Many IoT-based monitoring systems use microcontrollers such as Arduino or NodeMCU to process sensor data and transmit it through wireless networks[13]. NodeMCU has become popular in IoT projects because it has built-in Wi-Fi capability and can easily communicate with cloud platforms. By connecting sensors to the microcontroller, data can be collected and sent to online dashboards where users can monitor conditions remotely.

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Several platforms have also been developed to support IoT-based monitoring systems. Platforms such as Blynk allow users to create dashboards and receive notifications on their mobile devices. These platforms make it easier to display sensor data in graphical form and send alerts when certain conditions are detected. As a result, users can monitor systems from anywhere without being physically present at the location.

Although many studies have proposed systems for gas detection or water level monitoring, some of them focus on only one parameter. In practical sewage systems, both gas accumulation and rising sewage levels can create dangerous conditions. Therefore, combining multiple sensors in a single monitoring system can provide a more reliable and effective solution.

The system presented in this research integrates gas detection and water level monitoring using MQ2 and MQ135 sensors along with a water level sensor. By using NodeMCU and the Blynk platform, the system allows real-time monitoring and sends alerts when the sensor values exceed predefined thresholds. This approach helps improve the safety and management of sewage systems by providing continuous monitoring and timely notifications.

Sewage can be classified based on its source and composition, as shown in Table I.

Table I: Types of Sewage

Type	Source	Key Characteristics
Domestic	Households	Biodegradable organic waste
Industrial	Factories	Toxic chemicals, heavy metals
Stormwater	Rain Runoff	Suspended solids, low organic load
Combined	Mixed Sources	Variable composition
Infiltration	Groundwater	Diluted sewage
Agricultural	Farms	Nutrients and pesticides

Table I presents the major categories of sewage along with their sources and characteristics. Domestic sewage mainly contains biodegradable organic matter, whereas industrial sewage may include toxic and non-biodegradable pollutants. Understanding these differences is essential for designing efficient sewage treatment and monitoring systems.

III. PROPOSED SYSTEM

The proposed system is designed to monitor sewage conditions using Internet of Things (IoT) technology. The main goal of the system is to detect harmful gases and monitor the sewage water level so that unsafe conditions can be identified at an early stage. The system uses a combination of sensors, a microcontroller, and an IoT platform to collect data and send alerts when necessary.

In this system, a NodeMCU microcontroller is used as the central unit that connects all the components together.[5][18] The NodeMCU receives data from different sensors and processes it before sending it to the monitoring platform through a wireless network. Since NodeMCU has built-in Wi-Fi capability, it can easily transmit data to an online platform without the need for additional communication modules.

To detect harmful gases that may be present in sewage pipelines, MQ2 and MQ135 gas sensors are used.[2][3] These sensors are capable of detecting gases such as methane, ammonia, and other harmful pollutants that may accumulate in sewage environments. The sensors continuously monitor the gas concentration and send their readings to the NodeMCU.

Along with gas monitoring, the system also measures the level of sewage water using a water level sensor.[20] This sensor helps in identifying situations where the sewage level is increasing beyond a safe limit. Monitoring the water level is important because it can indicate blockages or overflow conditions in the sewage pipeline.

The data collected from all sensors is transmitted to the Blynk platform through the internet. A dashboard is created on the Blynk application where the sensor readings can be viewed in real time. This allows the user to monitor the system remotely through a smartphone.

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To make the system more useful for safety purposes, threshold values are defined for the sensor readings. If the gas concentration or water level crosses the predefined limit, the system automatically sends an alert notification to the user's mobile phone through the Blynk application. This helps in taking quick action before the situation becomes dangerous.

By combining gas detection, water level monitoring, and real-time alerts, the proposed system provides a simple and effective way to monitor sewage conditions. The use of IoT technology also makes the system suitable for remote monitoring and smart city applications.

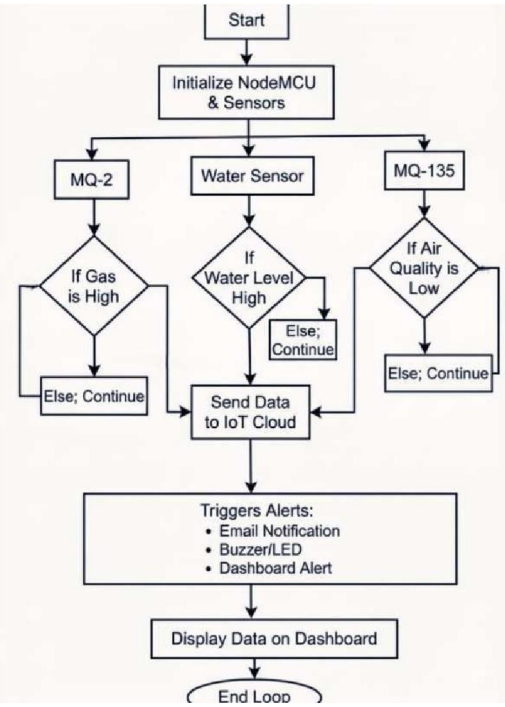

Fig. 3: System flowchart of IoT-based sewage management system using NodeMCU.

IV. IMPLEMENTATION

The implementation of the proposed system involves integrating the sensors with the microcontroller and connecting the system to an IoT platform for monitoring and alerts. The setup is designed in a way that the sensors continuously collect data related to gas concentration and sewage water level, which is then processed and transmitted through the internet.

In this system, the NodeMCU microcontroller acts as the main processing unit. All the sensors are connected to the input pins of the NodeMCU [5][18]. The MQ2 and MQ135 sensors are used to detect the presence of harmful gases that may accumulate in sewage pipelines [2][3]. These sensors provide analog readings based on the concentration of gases present in the environment. The readings are received by the NodeMCU and compared with predefined threshold values set in the program.

A water level sensor is also connected to the NodeMCU to monitor the level of sewage water. The sensor detects changes in the water level and sends corresponding signals to the microcontroller. This helps in identifying situations where the sewage level rises above the normal limit, which may indicate blockage or overflow conditions.

The programming for the NodeMCU is carried out using the Arduino IDE. The code is written to read sensor values at regular intervals and send the data to the IoT platform through the built-in Wi-Fi module [18]. Threshold values for gas

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concentration and water level are defined within the program so that the system can determine when an alert should be generated.

For remote monitoring, the system is connected to the Blynk platform. A dashboard is created in the Blynk mobile application where the sensor readings are displayed in real time. Widgets such as gauges, graphs, and notification alerts are used to present the data in a clear format [4][18]. When the sensor readings cross the predefined limit, the system automatically triggers a notification that is sent to the user's mobile phone.

The implemented system allows continuous monitoring of sewage conditions without requiring physical inspection. By combining sensor data, wireless communication, and a mobile dashboard, the system provides a practical solution for improving safety and monitoring efficiency in sewage management.

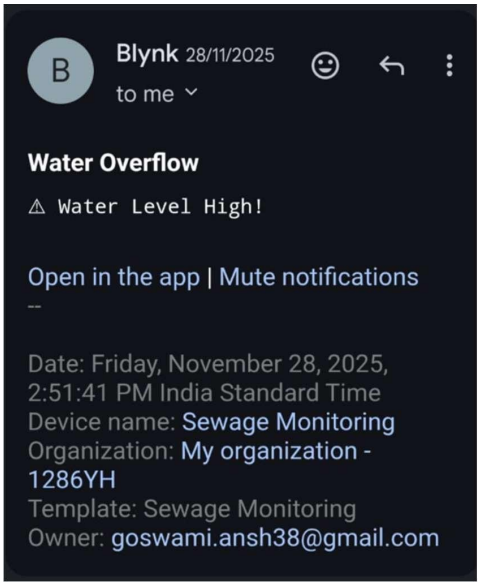

Fig. 2: Water Overflow Alert Notification Generated by Blynk Cloud

V. RESULTS AND DISCUSSION

After assembling and programming the system, testing was carried out to observe how effectively the sensors and monitoring platform work together. During testing, the MQ2 and MQ135 gas sensors were used to detect the presence of gases in the surrounding environment. The sensors produced readings based on the concentration of gases, and these readings were successfully received by the NodeMCU microcontroller [2][3]. The data was then transmitted to the Blynk platform through the Wi-Fi connection, where it could be viewed on the dashboard in real time [4][18].

The water level sensor was also tested to check its ability to detect changes in the sewage water level. As the water level increased, the sensor generated signals that were processed by the NodeMCU. The corresponding readings were displayed on the Blynk dashboard, allowing the user to monitor the level remotely through a mobile device. This feature helps in identifying situations where the water level may reach an unsafe limit.

Another important aspect of the system is the alert mechanism. During testing, threshold values were defined in the program for both gas concentration and water level. Whenever the sensor readings crossed these limits, the system automatically generated alert notifications through the Blynk application. The notifications were successfully received on the mobile device, indicating that the system can warn users in case of unsafe conditions. [18][19]

The results show that the proposed system is capable of monitoring sewage conditions and providing real-time updates through an IoT platform [17][19]. The integration of sensors, NodeMCU, and the Blynk dashboard allows the system to detect abnormal situations and inform the user immediately. Such a system can be useful for improving safety and enabling faster response in sewage management environments.

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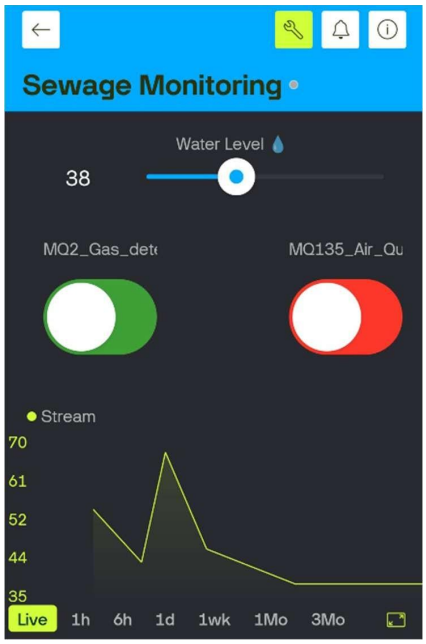

Fig. 4: Real-time monitoring dashboard of the proposed system.

VI. ADVANTAGES AND APPLICATIONS

The developed sewage monitoring system offers several practical benefits in terms of safety, monitoring efficiency, and ease of use. One of the main advantages of the system is that it provides continuous monitoring of sewage conditions without requiring constant manual inspection [17][19]. By using sensors and internet connectivity, the system can observe gas levels and sewage water levels at all times and send the information to the user in real time.

Another important advantage is the ability to provide early warnings. If harmful gas concentration or water level rises beyond the defined threshold, the system immediately sends a notification to the user's mobile phone through the monitoring application [18][19]. This allows quick action to be taken before the situation becomes dangerous. Such a feature can help reduce the risk of accidents that may occur due to toxic gas exposure or sewage overflow.

The system is also cost-effective because it uses commonly available components such as NodeMCU and MQ series gas sensors. These components are relatively affordable and easy to integrate, which makes the system suitable for small-scale as well as large-scale monitoring applications [9][13]. In addition, the use of an IoT platform allows remote monitoring through a smartphone, eliminating the need for complex monitoring equipment.

This type of monitoring system can be applied in various real-world situations. It can be used in urban sewage pipelines to monitor gas accumulation and water levels. Municipal authorities can use such systems to keep track of sewage conditions and respond quickly to blockages or overflow situations. The system can also help improve the safety of workers who are involved in sewage maintenance, as they can be alerted about hazardous gas levels before entering confined spaces.

Apart from sewage systems, similar monitoring approaches can also be used in drainage systems, wastewater treatment plants, and other environments where gas detection and water level monitoring are important [6][17][19]. By providing continuous monitoring and timely alerts, the system can contribute to safer and more efficient management of sanitation infrastructure

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VII. CONCLUSION

This study presented the design and development of an IoT-based sewage monitoring system that helps in observing sewage conditions in real time [17][19]. The system combines gas sensors, a water level sensor, and a NodeMCU microcontroller to monitor important parameters inside sewage pipelines. By connecting the system to an online monitoring platform, the sensor readings can be viewed remotely through a mobile device.

During the implementation and testing of the system, the sensors were able to detect changes in gas concentration and water level effectively. The data collected from the sensors was transmitted to the monitoring dashboard, where it was displayed for the user in real time [4][18]. When the sensor readings exceeded the defined threshold values, alert notifications were successfully sent to the user's mobile phone. This feature allows early detection of potentially unsafe conditions.

The developed system demonstrates how IoT technology can be used to improve the monitoring process in sewage management. Continuous monitoring and timely alerts can help reduce risks associated with toxic gases and sewage overflow [2][3]. In addition, the system can reduce the need for frequent manual inspections, making the process safer and more efficient.

In the future, the system can be further improved by adding additional sensors, data analysis features, or integration with larger monitoring networks used in smart city infrastructure [6][17]. Such improvements could enhance the accuracy and scalability of the system and make it more suitable for large-scale sewage management applications.

REFERENCES

[1] H. Karl and A. Willig, Protocols and Architectures for Wireless Sensor Networks. Wiley, 2005.
[2] Datasheet of MQ2 Gas Sensor, Hanwei Electronics Group.
[3] Datasheet of MQ135 Gas Sensor for Air Quality Monitoring.
[4] Blynk IoT Platform Documentation. Available: https://blynk.io
[5] Espressif Systems, NodeMCU ESP8266 Technical Reference Manual.
[6] A. Zanella, N. Bui, A. Castellani, L. Vangelista, and
M. Zorzi, "Internet of Things for Smart Cities," IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22–32, 2014.
[7] K. Ashton, "That 'Internet of Things' Thing," RFID Journal, 2009.
[8] S. Madakam, R. Ramaswamy, and S. Tripathi, "Internet of Things (IoT): A Literature Review," Journal of Computer and Communications, vol. 3, no. 5, pp. 164–173, 2015.
[9] L. Da Xu, W. He, and S. Li, "Internet of Things in Industries: A Survey," IEEE Transactions on Industrial Informatics, vol. 10, no. 4, pp. 2233–2243, 2014.
[10] D. Singh, G. Tripathi, and A. J. Jara, "A Survey of Internet-of-Things: Future Vision, Architecture, Challenges and Services," IEEE World Forum on Internet of Things, 2014.
[11] P. Suresh, J. Daniel, V. Parthasarathy, and R. Aswathy, "A State of the Art Review on the Internet of Things (IoT) History, Technology and Fields of Deployment," International Conference on Science Engineering and Management Research, 2014.
[12] A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari, and M. Ayyash, "Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications," IEEE Communications Surveys & Tutorials, vol. 17, no. 4, pp. 2347–2376, 2015.
[13] S. Li, L. Da Xu, and S. Zhao, "The Internet of Things: A Survey," Information Systems Frontiers, vol. 17, no. 2, pp. 243–259, 2015.
[14] M. Aazam, I. Khan, A. A. Alsaffar, and E.-N. Huh, "Cloud of Things: Integrating Internet of Things with Cloud Computing and the Issues Involved," IEEE International Conference on Applied Sciences and Technology, 2014.
[15] R. Want, B. N. Schilit, and S. Jenson, "Enabling the Internet of Things," Computer, vol. 48, no. 1, pp. 28–35, 2015.

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[16] N. Ahmed, D. De, and I. Hussain, "Internet of Things (IoT) for Smart Cities: Technology Review and Future Directions," International Journal of Computer Applications, vol. 113, no. 1, 2015.
[17] J. Gubbi, R. Buyya, S. Marusic, and M. Palaniswami, "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions," Future Generation Computer Systems, vol. 29, no. 7, pp. 1645–1660, 2013.
[18] Y. Mehta, S. Jain, and P. Bansal, "IoT Based Smart Monitoring System for Industrial and Environmental Applications," International Journal of Engineering Research & Technology, vol. 6, no. 5, 2017.
[19] M. Rathore, A. Paul, A. Ahmad, B. W. Chen, B. Huang, and W. Ji, "Real-Time Smart City Monitoring Using Internet of Things and Big Data Analytics," IEEE Access, vol. 6, pp. 524–537, 2018.
[20] S. R. Jino Ramson and D. J. Moni, "Applications of Wireless Sensor Networks — A Survey," International Conference on Innovations in Information, Embedded and Communication Systems, 2017.