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# Life Saving Smart Product for Underground Drainage Cleaning System

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## *Abstract:*

The majority of cities have subsurface drainage systems, and it is the responsibility of municipal corporations to keep cities clean, healthy, and safe. If the drainage system is not properly maintained, clean water can become contaminated by drainage water, which increases the risk of the spread of infectious diseases. Since dangerous gases are odourless if exposed for a long period of time, they can cause major health issues, yet individuals who clean drains are unaware of the risk of a sudden attack of deadly gas. During the past few decades, a lot of dangerous mishaps happened as a result of improper gas leakage detecting systems being used. An efficient monitoring system is required in the drainage channels to solve all of these issues. The suggested detection system includes two gas sensors for methane, hydrogen sulphide, and carbon monoxide. Since carbon monoxide, hydrogen sulphide, and methane gases are extremely harmful to humans, the suggested system will notify users by an LED glow once each gas sensor's threshold is reached.

**Keywords—sensors, buzzer, oxygen cylinder, node micro controller**

**Introduction**

A sewer system is an underground network of pipes that is frequently used to transport sewage from residences and businesses to a treatment plant, where it is cleaned up and released into lakes, streams, or any river to permanently drain the area. One of the most crucial components of the sewer system is the sewer manhole. A sewer manhole is a building that provides access to the subterranean wastewater collection system.

Manholes are not made for people to work in on a regular basis, although workers may need to enter one to finish tasks like cleaning, repair, inspection, etc. Due to accidents and diseases like hepatitis and typhoid brought on by sudden or prolonged exposure to dangerous gases like carbon monoxide, hydrogen sulphide, and methane, thousands of sewage cleaners die each year due to improper care for their profession.

The sewage workers or manual scavengers face various issues like hydrogen sulphide, ammonia, carbon-dioxide, nitrogen dioxide, sulphur dioxide and respiratory system problems due to absence of any safety measures taken by them. This system plays a major role for sewage workers by taking care of their work and also alerts them in case of raise in the level of gases beyond the threshold limit.

To prevent the poisoning of gases, one must have a better understanding of environmental dangers. In order to know the massive growth in the typical level of effluents and to take corrective action, these gases must be kept on track. On the other hand, the currently available systems are expensive and not very portable. Also, implementation is challenging.

In the past, a microcontroller was employed in the surveillance rover to detect the presence of carbon monoxide (CO) gas. The gadget has a processing part that receives input, processes it, and outputs results. For this system to work, the base station needs to be close to the sensors.

**Existing system**

A dangerous industrial practice is underground mining. The very procedures and technology that could increase safety and production are hampered or constrained by the challenging physical environment and unique topology that make mining hazardous. In the mining sector, there is no clearly recognized regulatory standard for employee risk. Individual organizations have created criteria for employee risk, using ideas that were initially developed in the chemical and oil and gas processing industries.

The biggest risks in the mine include potential gas threats such gas igniting, explosion, and pollution. The mine is thought to have a significant risk of a gas-related danger. Plans for managing mine gas are put into place to eliminate or reduce probable gas dangers. The consideration of gas concerns in mine design and ventilation, environmental monitoring, and mining systems are examples of control strategies utilized for prevention.

Fires (diesel fires, hydraulic fires, and electrical fires) pose the greatest risk in underground mines. Explosive gases produced by subterranean fires (such as carbon monoxide and carbon dioxide, as well as blast gases from explosions), electrical fires (such as cable arcing and transformer fires) and underground explosions (such as gas explosions, dust explosions, premature explosions of charges, drilling into misfires, etc.).

The worldwide mining sector is under increasing pressure to increase subterranean safety while also enhancing overall operational effectiveness. Automation is being embraced by the sector, which is also promoting the creation of new technology. Modern underground operations are increasingly dependent on communication technologies.

Data transmission lines can be used in underground mines to convey important information from distant places for monitoring and control purposes or to provide a communication link between staff members. Robotics and intelligent systems have been suggested in the last ten years for the localization of gas sources.

Such systems might be used to look for gas leaks, dangerous substances, and sources of pollution. Finding a gas source, however, is more difficult than it first appears. Gas molecules are mostly disseminated by the movement of the fluid medium because the diffusion of gas molecules is typically a very sluggish process. In both military and civilian applications, such as surveillance, monitoring, personal location, and many more applications, wireless sensor networks have grown in popularity.

In general, safety and economics are the two main reasons for deploying wireless sensors in underground and difficult-to-access locations. The installation of wireless sensors is inexpensive and safe from the standpoint of system performance. It broadens the network's measurement coverage to include areas where wiring is not practicable.

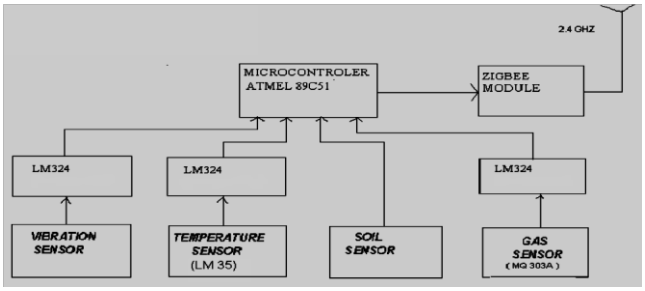


Fig 1- Block Diagram of Existing system

Numerous positions connected to gas detection and security system assurance exist in the current system. It has been used to detect the gas in some of these cases, some of which were theoretical study efforts and some of which were practical field demonstrations. A device called a manhole gas sensor unit has been invented that can individually identify poisonous and explosive gases within a minute and produce LED glow at different levels. If any gas exceeds its threshold limit, a warning is given through LED glow, LCD display or buzzer. When dangerous gases like carbon monoxide, methane, or hydrogen sulphide are detected, outside employees and municipal police will receive notifications.

**Objectives of the proposed system**

i) Dynamic modeling of high safety smart stick and helmet for salvagers.
ii) Development of smart stick and helmet to reduce risk in the salvagers working atmosphere.
iii) Fabrication of various sensors and IoT systems to increase the efficiency and reduce the risk in the domain.
(iv)Test the smart stick and helmet with the real Situation and ensure the safety features in the System for salvagers need.

**Proposed system**

In the suggested design, a gas sensor is installed inside the stick. The presence of dangerous gases in the drainage is found using this sensor. The sensor sends information to the node MCU if it discovers the presence of dangerous gases. The controller then sends the relay the output. The vibration motor is then supplied via the relay.

The stick then begins to vibrate. The vibration is caused by the force generated in the vibration motor. The stick-mounted forced draught fan is present, attracting gases from the drainage system.

The vibration disappears after sucking out the gases in the drainage. The employee can then enter the drainage system and begin working. If the gas leaks once more while they are working, the worker helmet's gas sensor will detect it. The sensor provides input to the node MCU after detecting the gas leak. The oxygen unit will then turn on, and an emergency call will be placed to the ambulance. Then, a buzzer and an LED illumination warn the recipient as well.

The gas sensor, relay, node microcontroller, buzzer, FD fan, and 12V battery are all present in the stick with this method. The gas sensor notifies the node MCU after seeing gas in the drainage. The node MCU then feeds the relay's input with its output. The buzzer, FD fan, and vibration motor are then turned on by the relay. The gases in the drainage are being sucked up by the exhaust fan. Gas sensor, node microcontroller, relay, buzzer, and oxygen unit make up the helmet. Additionally, it performs the same function as the relay and stick for the oxygen unit, buzzer, and transmission of information to the receiver and ambulance unit. The receiver sounds a buzzer and emits a glowing led. Then, a "emergency call" notification is sent to the ambulance.

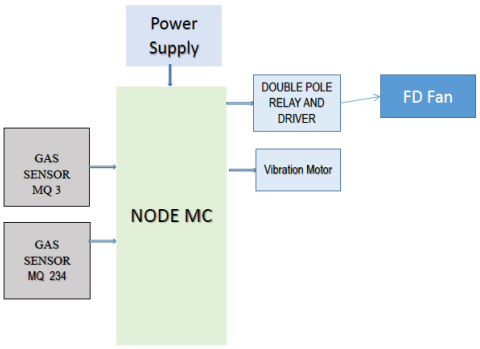


Fig 2- Block Diagram of smart stick

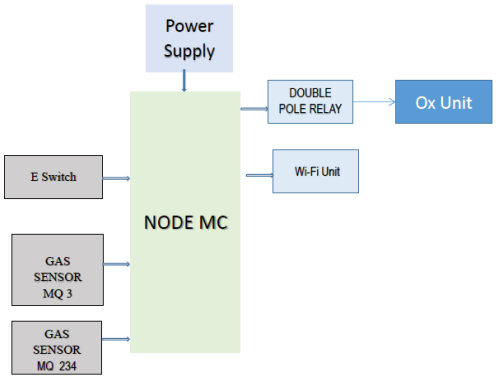


Fig 3- Block Diagram of smart helmet

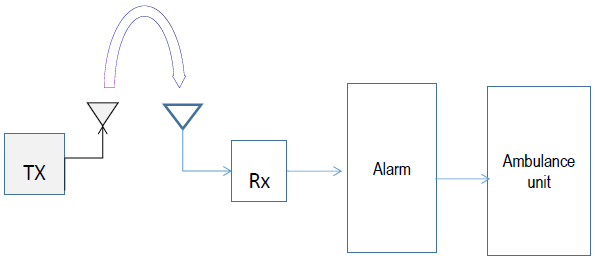


Fig 4- Block Diagram of ground station

**Components description**

**Gas Sensor MQ 5 or MQ234:**

The MQ5 Gas Sensor works well with liquefied gas, natural gas and coal gas, all of which are frequently used in cities, but it is ineffective with ethanol or smoke.

A plastic and stainless steel net crust is used to support the MQ-5 gas sensor, which is made up of a micro AL2O3 ceramic tube, a Tin Dioxide (SnO2) sensitive layer, a measuring electrode, and a heater. For delicate components to function properly, the heater offers the ideal working environment. Four of the six pins on the wrapped MQ-5 are used to retrieve signals, and the remaining two are utilized to supply heating current.

**Gas Sensor MQ 3:**

SnO2, a substance with limited electrical conductivity in clean air, is the gas sensitive component utilized in the MQ-3 gas sensor. When combustible gas is present in the air, the sensor's electrical conductivity will rise in proportion to the combustible gas's intensity.

Gases such as LPG, alcohol, propane, hydrogen, co2, and even methane can all be detected using the MQ3 gas sensor. This sensor makes it very simple to identify gases. A 5V supply can be used to power this sensor. Six pins make up this sensor. Two pins are utilized to generate heat, and the other four pins are used to fetch signals.

Positive, negative, and digital terminals are used using 3 of the 4 available pins. The digital output pin will be set to zero if this sensor is unable to detect the gases. Off went the output LED glow. If gas is detected, the digital output pin value is set to 1. After that, the output LED started to glow. By changing the sensor's potential divider, we can modify its sensitivity.

**Node Microcontroller unit (MCU)**

A low cost, open source IOT platform is the node micro controller unit. It originally included hardware based on the ESP-12 module and firmware that runs on the ESP8266 WI-FI SOC from the Express if system. A 32-bit controller is used. It has thirty pins. 17 GPIO pins are available. The power pins number four. Three 3.3V pins and one $V_{IN}$ pin. The $V_{IN}$ pin can be used to directly supply the ESP8266 and its peripherals.

The on-board voltage regulator's output is 3.3V. Power can be provided to the external components using these pins. The ESP8266 node MCU development board has a ground pin called GND. The GPIO pins are used for I2C, I2S, UART, PWM, IR Remote control, LED illumination and button programming, among other things.

**Vibration motor**

A DC motor without a core is a vibration motor. Its size is little. From the node MCU, it receives input. The vibration motor then begins to turn. The vibration is produced by the unbalanced mass. It vibrates silently to alert users to the presence of a signal.

**Oxygen Unit**

This is a small, 6V DC air pump of the submersible type. It is quite straightforward to use and understand. It only has to be connected to the oxygen, a suitable pipe, and powered for the engine to begin pumping air. Excellent for firefighting robots, fountains, waterfalls, plant watering systems, and other structures.

This motor is small, lightweight, and compact. Either one of our DC Motor Drivers or one of our Relay Boards can be used to control it from a microcontroller. To power this pump, utilize our 5V SMPS Power Supply Adapter. You may also use our 6V solar panel in conjunction with the proper 6V voltage regulator to power the pump.

**Buzzer**

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric (short for piezoelectric) auditory signaling device. Buzzers and beepers are frequently used as alarm clocks, timers, and to validate human input such a mouse click or keyboard. Some of the main benefits of a piezo buzzer include excellent frequency response, small size, wide voltage utilization range, high sound intensity, low energy consumption, and simple compatibility. As a result, the tool has found extensive use in numerous industries.

**Advantages of proposed system**

i) This smart product is used to save the life of the drainage worker.
ii) It is used to detect the harmful gases in the drainage.
iii) The emergency switch is used to inform the co-worker if he is in any emergency need.
iv) The buzzer alerts the workers if he is in danger condition.

**Hardware**


Fig 5 Real time implementation

**Output**

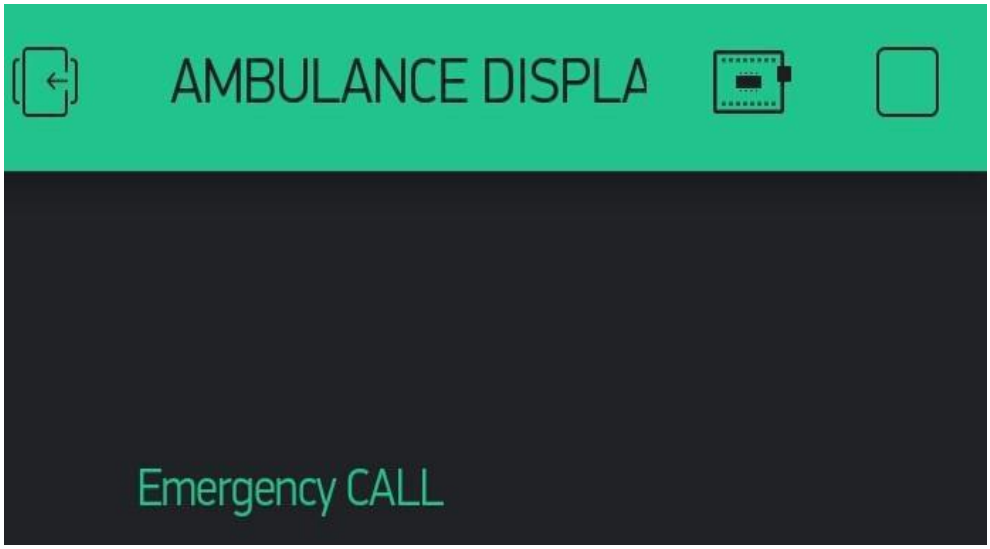


Fig 6 Output of the system

**Conclusion**

This smart stick and helmet is used to save the life of sewer worker. It is used to detect the harmful gases present in the drainage. If it detects the presence of harmful gas in the drainage it alerts the worker by buzzer and sending information to the receiver. It helps to identify the worker condition. It helps to prevent the worker from many diseases like hepatitis, breathing problem, eye irritation, and fatal death. If any serious condition it send information to the ambulance.

**Future Scope**

i) In future we can add storage unit for store the methane gas sucking out by the Forced Draft fan.
ii) We can use this gas for cooking purpose.
iii) Also we can add heart beat and temperature sensor along with the helmet.

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## REFERENCES

1. Nitin Asthana ; Ridhima Bahl ; IOT Device for Sewage Gas Monitoring and Alert System 2019
2. Yi Qian; Kejie Lu; David Tipper; Towards Survivable and Secure Wireless Sensor Networks 2018
3. Abdellah Chehri Paul FortierPierre-Martin Tardif, Security Monitoring Using Wireless Sensor Networks, CNSR 2017.
4. Santhosh Kumar B R, Rohit K, Manjunath, Varalakshmi N, Sondarya S Lokeshwari, Sahana D N,"Eco-friendly IOT based Waste segrega-tion and management", 2017 International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques, ,(ICEECCOT), 15-16 Dec. 2017.
5. Fachmin Folianto, Yong Sheng Low, Wai Leong Yeow, "Smartbin: Smart waste management system" ," 2015 (ISSNIP), 7-9 April 2015. 4. Sharanya.A, U. Harika, N. Sriya, Sreeja Kochuvila, "Automatic waste segregator" ,2017 ICACCI, 13-16 Sept. 2017.
6. Krishna Nirde , Prashant S. Mulay , Uttam M. Chaskar, "IoT based solid waste management system for smart city" ,,(ICICCS) 2017, 15-16 June 2017.
7. Gopavanitha, K. and Nagaraju, S. "A low cost system for real time wa-ter quality monitoring and controlling using iot."2017 International Conference onEnergy, Communication, Data Analytics and Soft Computing (ICECDS), 3227–3229(Aug 2017).
8. Keshamoni,K. and Hemanth,S. "Smart gas level monitoring, bookingamp;amp; gas leakage detector over iot."2017 IEEE 7th International Advance Com-puting Conference (IACC), 330–332 (Jan 2017).