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Smart Manhole Toxic Gas Identification and Alerting System-Review

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Abstract: Sewer gas is a complex mixture of toxic and nontoxic gases produced and collected in sewage system by the decomposition of organic households or industrial wastes. It includes harmful gases such as oxides of carbon, Sulphur, nitrogen, ammonia and methane. Sewage cleaners are very much affected by these gases. In order to overcome this problem, we are proposing a system which includes integrated sensors for sensing the gases, Arduino UNO and a LCD display to quantify toxic gases which is produced in the system. This system will help to identify the gas level inside the drainage manholes so that the worker can get some idea of entering into the manholes. It helps the workers and provides them safety before getting down into the manholes and it will sense the level of the gas inside. In order to reduce the toxic gases concentration, Sprinkler mechanism is provided with the resource chemical for detoxification treatment. Whenever the gas concentration level exceeds the specified threshold level, an actuator mechanism triggers the sprinkler.

Keywords: Carbon Sulphur, Ammonia, Methane, LCD, Sensors, Sprinkler Mechanism

I. INTRODUCTION

Due to decomposition of organic matters, industrial effluents and other sewage matters, gas is formed with the combination of different chemical mixtures. Sewer gases also have the potential to create fire and explotions apart from odour and health effects. Hydrogen sulphide and ammonia are highly toxic components. Inhaling small amounts of hydrogen sulphide leads to irritation in eyes and respiratory tracts. And can also cause headache, dizziness, drowsiness, nausea and nervousness. On the other hand, methane causes deficiency of oxygen content in our body, which may lead to suffocation and death. Manual monitoring and cleaning the drainage is necessary but this system helps to prevent the huge accidental death of human due to over gas in manholes. It has been implemented among these some were theoretical research approach and some were demonstrated in practical field to detect the gas but both approaches were effective manhole gas sensing unit has been developed which is capable to detect the toxic and explosive gases individually within a minute and generate LED glow at the various levels if any of the gas is beyond its threshold limit it gives an alert through LED glow and LCD Display.

II. LITERATURE SURVEY

[1] Smart manhole toxic gas identification and alerting system by L.K.Hema, Velmurugan S, Suriya.Pa, R.Indumathi. In this proposed system, using a set of integrated sensors incorporated with microcontroller unit process and LCD display to quantify toxic gases produced in the system. It recognizes the scale of toxicants and then intimates the workers to acquire the safety precautions before entering into the manholes.

[2] Smart real time manhole monitoring system by Chandraprabha R, Ashwini C.V, Dharani M, Harshitha G, Kruti mohan. In this system IOT based real time alerts the managing station through an email when any manhole crosses its threshold values. This system reduces the death risk of manual scavengers who clean the underground drainage and also benefits the public.

[3] IOT based smart safety monitoring system for sewage workers with two-way communication by A.Vellingiri, K.Dharni, M.Arunadevi, R.L. Aravind Lal. The proposed system will gives alert through the LCD Display after reaching the threshold level of each gas sensors then people gets alert. Heart Beat sensor calculates the range of the Pulse rate then output at the abnormal range will give alert through notification through an IOT.

[4] IOT based smart drainage worker safety system by Pushpakumar R, Rajiv S. This system will help to identify the gas level inside the drainage manholes so that the worker can get some idea of entering into the manholes. It very helps workers and safety to them before getting down into the manholes and it will sense the level of the gas inside.

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[5] Wireless sensing system for the welfare of sewer laborer's by V.D Ambeth Kumar, D. Elangovan, G. Gokul, J. Praveen Samuel, V.D. Ashok kumar. Embedded system is designed using a microcontroller with internet of things, for the purpose of detecting and monitoring the hazardous gas leakage, which aids in the evasion of endangering of human lives.

[6] Smart real time Drainage Monitoring system using internet of things by Gaurang Sonawane, Chetan Mahajan, Anuja Nikale, Yogita Dalvi. The system will be able to monitor all the these things in real time scenario which will allow us to take proper actions of the particular problem in drainage system.

[7] IOT Based smart detection system for harmful gases in underground sewages by R. Vijayalakshmi, Dr.D. Sengeni. The proposed system contains sensors, GSM and buzzer which gives alert to the person getting down into the manhole.

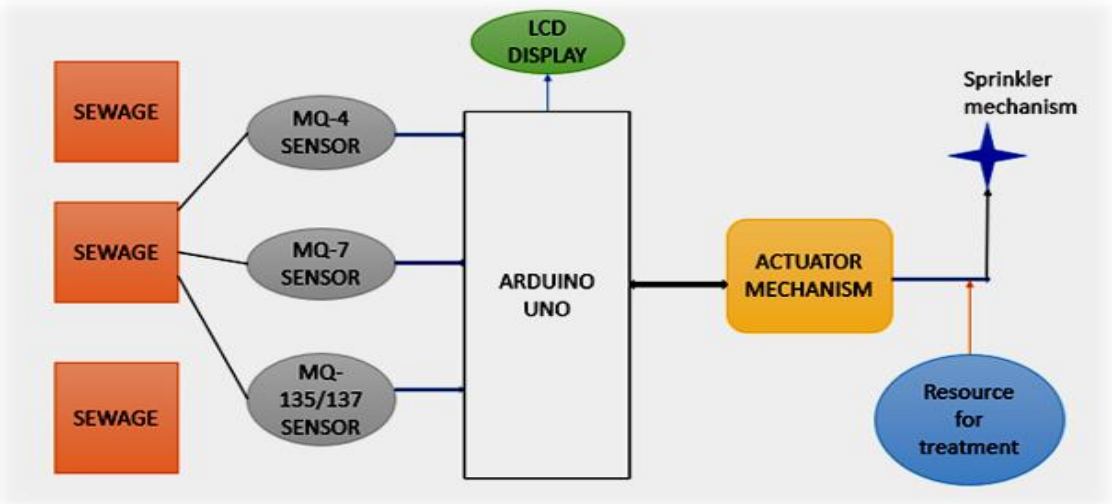
[8] Underground drainage monitoring system using IOT by Yash Narale, Apurva Jogal, Himani Choudhary, S.P. Bhosale. It gives a description of water wise system and detection method to detect Leakage defects in sewer pipeline.

[9] Underground drainage monitoring system by Saiesh R, Prasad Ainapur, Sanil Sanjay Wadakar, Ritik Sharma, Dr. Sayed Abdulhayan. An underground Drainage monitoring system is designed which has various sensors that detect the overflow of the sewage, level of drainage, the concentration of harmful gases within the manhole, flow rate and sends the information to the authority via GSM module.

[10] IOT based sewage monitoring and alert sytem using Raspberry PI by Jyothi Chillapalli, Yogesh.H.Jadav. The device offers live streaming of video to check blockages, if any.

III. METHODOLOGY

Sewage workers safety has always been a concern. Keeping their safety in mind, Smart Manhole System is proposed which consists of various sensors, alert system namely Buzzer, LCD display, Arduino Uno etc. The system measures the concentration level of toxicants like methane, carbon dioxide, carbon monoxide, ammonia etc., present in the manhole by making use of various gas sensors like MQ-4, MQ-7, MQ-135 and MQ-137. The Microcontroller unit i.e., Arduino Uno unit processes the obtained sensors values and displays it on LCD display. When the concentration level of toxicants increases or the threshold values are crossed, via buzzer an intimation is given to the sewage workers to acquire safety measures before entering the manhole. Once the threshold values are crossed, Actuator gets turned ON and it triggers the Sprinkler mechanism. Sprinkler mechanism consists of resource chemicals such as a mixture of sodium hypochlorite and water as detoxification agent to reduce the concentration of toxicants in the manhole. After certain period of Sprinkler mechanism the toxics concentration reduces and provides favorable working conditions for the sewage laborers to ensure their safety.



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IV. CONCLUSION

The proposed system helps in avoiding the sudden accidents of sewage workers. It also introduces a smart approach to measure the concentration level of hazardous gases. The proposed system helps the sewage workers at a basic level of understanding of toxicants concentration. Once the toxicants cross the threshold values an indication is sent via buzzer and sprinkler mechanism gets activated which helps to ensure sewers safety. This system hopefully will be the helping hand for sanitation department and brings a change in sewage workers life to ensure safety of workers.

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