Real Time System for Monitoring and Improving the Flow of Sewer System

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Abstract: **For the purpose to reduce the overflow pollution in sewer water system, a real time system was developed to monitor and control the system automatically to reduce the blockade in sewer system and also reduces the death rate of sanitation workers. Ultrasonic sensor , motor, Wireless communication and web-based geographic information was used. WSN which integrates the data and sends to the server ,which can be viewed in WEBGIS.**

***Keywords*-wireless communication; ultrasonic sensor; motor; real-time observation; storm drainage storage.**

I. INTRODUCTION

Sewer is an artificial conduit or system are generally networks which carry waste water and rainwater to one or more terminal points, where it is treated and/or discharged to the environment.

In Indian cities produce nearly 100,000 million liters of sewage per day, enough to irrigate 10 million hectares and barely 21% of this is treated. The untreated waste water was seeping into water sources, thereby creating a ticking health bomb among our people.

Official records of Chennai Metro water confirm 20 worker deaths since 2003. All over-India, the number of deaths of sewerage workers would run into the thousands. Workers who manage to survive from the sewers suffer from several ailments including tuberculosis, Imagine a Worker who plunging into a 21-foot-deep sewer through its narrow mouth, holding his breath for over 32 seconds, scooping the filth inside with his bare hands or a shovel, and emerging from it covered in muck. The only precaution he takes is to light a match over the hole sometimes, to detect the presence of toxic gases such as hydrogen ,sulphide or methane. Worker does not have any clue as to what lies deep inside the hole.

Common clinical findings that may be associated with substantial exposure to hydrogen sulfide include syncope, headache, seizures, lethargy, dizziness, abnormal reflexes, sore throat, cough, dyspnea, cyanosis, pulmonary edema, hemoptysis, chest pain, eye irritation, weakness, nausea, vomiting, and malaise.3,65 Of 250 workers reporting hydrogen sulfide exposure in Alberta, Canada, 138 (54%) lost consciousness and 7 (2.8%) died. After syncope, the next most common symptoms were headache (26%), nausea or vomiting (25%), dyspnea (23%), and disequilibrium (22%). Hydrogen sulfide has a “rotten egg” odor that is detectable at concentrations as low as 0.02 ppm. This odor becomes intense and unpleasant at 20 ppm. Exposure to hydrogen sulfide at concentrations above 50 ppm may cause keratoconjunctivitis. With continued exposure, reversible ulcers, a condition known as *gas eye*, developed.

Corneal scarring and permanently impaired vision may occur with severe exposure. Exposure to hydrogen sulfide at concentrations greater than 700 ppm causes immediate collapse with respiratory paralysis, cardiac arrhythmias, and death. Workers who are exposed to hydrogen sulfide and do not die at the scene generally recover completely. Of 243 survivors in one study, only 13 subsequently missed more than 2 weeks of work. In another study of 221 workers exposed to hydrogen sulfide, the authors stated that there was no evidence of permanent neurologic sequelae in the survivors. These studies were retrospective, with poor follow-up, and other authors have reported permanent sequelae after hydrogen sulfide exposure. Symptoms in this setting may include neuropsychiatric sequelae such as prolonged coma, dementia, incontinence, memory and learning lesions. One victim with severe cognitive and motor Sanitation and Sewer Workers deficits following hydrogen sulfide exposure had normal computed tomography and magnetic resonance imaging scans of his brain, but a positron emission tomography scan showed markedly decreased metabolism in the thalamus and basal ganglia, as well as in the temporal and parietal lobes.
Sensory abnormalities may include loss of hearing, loss of vision, and anosmia.
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II.MATERIALS AND METHODS

A.conception

In India ,urban sewer management based on RTC is still in the initial stage .In this sewer water goes to a over pollution due to blockade in flow of system or fully occurred in sewer system where human beings are gone inside to release or remove the blockade in system. It brings different disability for sanitation workers.
The Conception of our system is to reduce the blockade occurred in sewer system by automatically fixing the motor inside the storage of pipe segment. When the sensor senses the level of water is attaining a maximum it switches the motor it cuts the larger particle into powder.

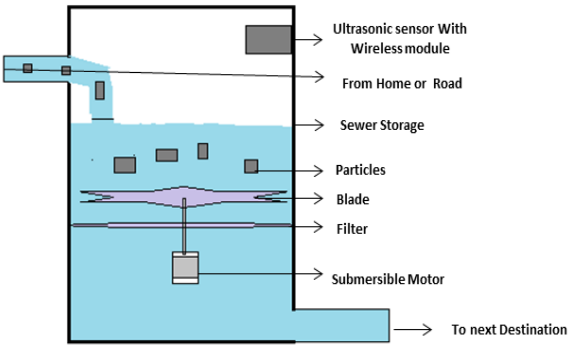


Fig 1: An example of pipe segment design

Fig 2:ultrasonic sensor with the wirelessmodule.

The storage of sewer water is expressed as follows

$$V = \sum_{i=1}^{n} V(d, h)_i \qquad (1)$$

Where v is the total storage of sewer water system; n is the total storm pipe segments;$V_i$is the storage of segment i, d relating to pipe diameter and water depth h.

Based on the above equations the Key parameter to decide dynamic storage pipe is water depth, obtained by wireless monitor system. Where pipe storage water depth is monitored whether its crossing the level of minimum or maximum by looking equation is expressed as follows

$$h_i = h_{ma} - h_w \qquad (2)$$

where, h_i is the depth of pipe segment ; h_{ma} is the level of maximum sewer water can be stored ;h_w is the present sewer water level in pipe segment

b)Sensing and Controlling system

The ultrasonic sensor was placed in above of the pipe segment as shown in fig 2:

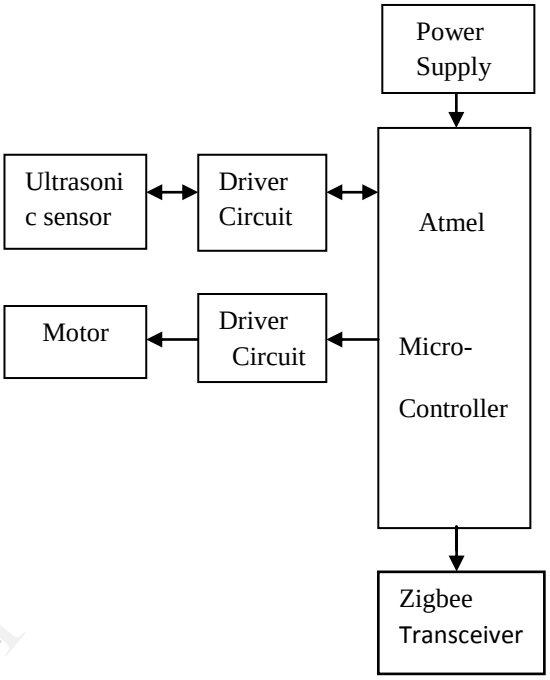


Fig 3: Block Diagram of Transmitter Side

From the Fig.3, The data is passed to the controller for processing to the next level. It acts accordingly to the condition it switches the motor when the water level is maximum or minimum, it cuts the larger particles into tiny or powder.The data are passed through the wireless and stored in server.

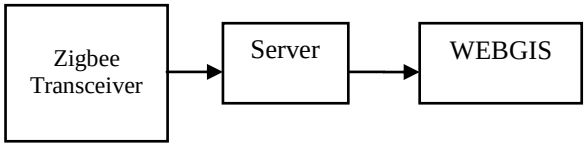


Fig 4: Block Diagram of Receiver Side

c) Design of wireless system

Wireless sensor networks(WSNs) areSuitable for distributed sensing with lot of sensors, because they are cheap and easy to install since no wiring is required.

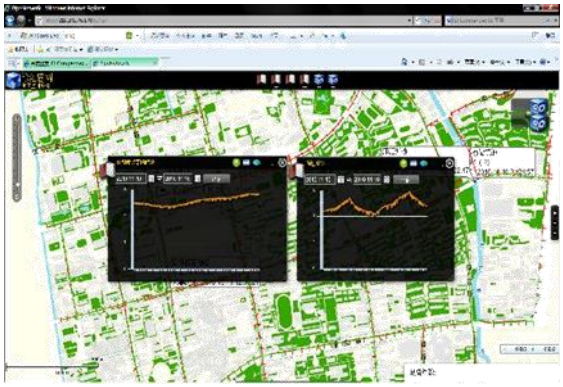
In this system,water elevation ofstorm pipes is observed by ultrasonic gauge and when the motor is on and off , the duration is transmitted by wireless communication technology, a WEBGIS is developed to process the received real-time data and finally the real-time storage of each storm pipe segment and the whole storm drainage system is shown in fig 1.

WSNs are fixed from a infrastructure nodes which has star topology and ring topology are communicated to the destination system.

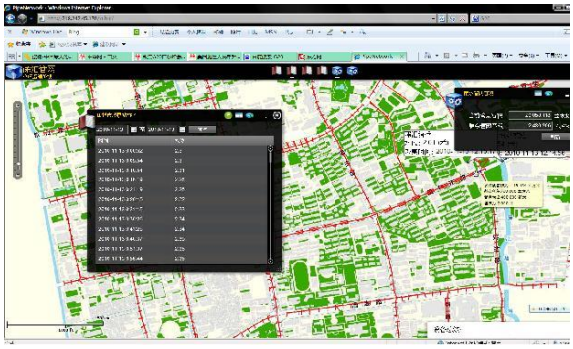
d) Experimental Setup

In our developed system at transmitter side is analyzed by the sensor o/p and according to the o/p of sensor .the motor is used to control the level of situation, data is passed through wireless communication as shown in fig 3: block diagram

In receiver side the data is received and stored in server and seen through the WEBGIS from anywhere in the world.



(a)



(b)

Fig5:Wireless monitoring system of study area: (a) real-time water elevation of study area; (b) real-time storm drainage storage of study area

In this fig 5: The screen shows all the informationwhen the mouse click the respected places in WEBGIS. The information contains when the motor is on or off and the level of water at different time.

III.CONCLUSION

We described about our developed new sewer system for the government. The sanitation workers need not to go every places for cleaning process. It performs automatically and we need to change the blade at regular intervals.

This system reduces the death rate of sanitation workers and also overflow pollution. Therefore, we concluded that our system will be a valuable for sanitation workers and brings cleanness to the society.

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