

SEWAGE MAINTANANCE SYSTEM USING MOBILE AUTOMATION

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Abstract— *The advancement in the field of robotics have created automation in all the fields. It helps to solve many practical problems that the human encounters in day-to-day activities. But, even today manual scavenging of corporation sewage is practiced in urban areas of India, where a man is supposed to enter in to the manhole to clean the clots that restricts the flow of water in the sewage pipe line without using any equipment. This might be a death causing practice for those person who are involved in this job. The concept of using automation came out of the realm of the virtual for the betterment of human's life. Most of the municipalities in world runs sewers will be different in the length and cross sectional area. A prototype of the manipulator has been developed based on the working environment i.e, various instruction that robot has to do once it enters in to the manhole. It consist of various links and joints. The joints are drive through the various motors.*

Keywords—PLC; DC motor; Ultrasonic Sensor; Arm system; Alert System.

1. INTRODUCTION (HEADING 1)

In olden days, robots were large, slow and were not easy to handle. Fortunately, the advancement in technology have created many automation that helps to protect the human from the harmful activities that need to be practice in day-to-day life. Microprocessor have become cheaper and more powerful, motors are smaller and stronger. This ensures the concept of using a robot is a realm of the virtual world for the betterment

of human lives to protect human from doing dirty, dangerous and other dull jobs like nuclear power plant inspection, sewage cleaning. Most of the municipalities in the world run sewers. Sewer pipelines in India are usually existed from 200 to 2000 millimetre in diameter for sewer transmission from houses to refineries. The hole can be either in circle or rectangular. Normally, our sewer pipes are made of plastic, ceramic and concrete. The sewage pipes get lock due to the waste materials like (shampoo covers, minute hair particles) from every houses and deformation of pipes and change in cross sectional area. Only large cities of India consist of manhole pits each manhole pit is dinged in every 10 meter distance. Each manhole will be connected to the large one

which is directly connected to the sewage collection area. In many dangerous place the vehicles are using autonomous

mobile robots. However, sewer is not an easy place to use robot inside so we do some automation to clean the pipes instead of a manual cleaning. Some people tried to give their solution to this death causing problem. In this paper we can discuss about some of their ideas.

I. LITERACTURE SURVEY

Many Authors have published their view and developed a prototype to give a solution for the death causing practice like scavenging.

Systems and Scientists	Outcome	Drawback
Program Logic and control (JIANG jing and Zhhang Xuesong (2014))	Automatic sewage treatment Cotrol	In this paper the removal of sewage waste is not discussed
Akio Goto and Kazuyuki Yamasaki (2014)	Toxic and Non Toxic gases are separated using micro organism	Effect of Toxic gas will affect the human
Akio Goto and Kazuyuki Yamasaki (2014)	Toxic and Non Toxic gases are separated using micro organism	Effect of Toxic gas will affect the human
Drainage pump monitoring and control system(WU jing CHEN, Guo jie 2014)	The underground drainage pump operation and its startup and shutdown of drainage pump is Automated	This paper does not gave a procedure for problem solving
Wireless real time system Yin Haling Xu Zuxin(2014)	The monitoring of drainage system only described	The removal of sewage and the control of drainage water is not defined
Wireless real time observation syatem Wang Juan (2014)	It shows how to control storm drainage so as to reduce dry weather pump discharging	-
Semi-Automatic drain for sewage water treatment of floating materials	Large amount of Garbage will be collected and can be remanufacturable	Small vibration will occur and the initialization charge will be high

II. HARDWARE DISCRPTION

Corporation Sewage Maintenance system using mobile Automation consist of two modules they are Alert System and Arm system. The Alert system module consist of PLC, ultrasonic sensor, level sensor and GPS. The Arm system consist of Ultrasonic sensor, DPDT switches, DC motors, Power supply. The function of alert system is to give an alert signal to the nearby corporation office once it detect the block in the sewer pipe. The Arm system is attached with the corporation vehicle. The vehicle will move to the spot when it receives signal. The Arm system consist of three Arms. The movement of each Arm is depends on the DC motor and it is controlled by DPDT Switches. The Alert system consist of GPS which will give signal only when the ultrasonic sensor detects the block in the sewer pipe.

A. Alert Systems

The system model consist of two module one is to send alert signal about the overflow of sewage and another one is the arm attached with the vehicle. The alert system consist of PLC, level sensors, ultrasonic sensor and GSM module. The PLC is used to control the overall function of all the components. Level sensor is used here in order to measure the level of sewage in the pipe. If the sewage reaches the height where the level sensor is fixed means the ultrasonic sensor will start its work and detect for block in the sewer pipe. The GPS attached with Alert module which will send the alert Signal with a message which consist of the location of the manhole where the sewage is raising its limit. The location will go to corporation office as a message.

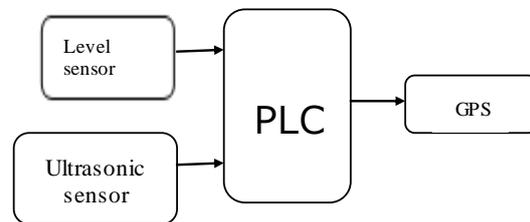


Fig. 3.1. Block diagram for Alert System

Fig 3.1 states the block diagram of the alert system. It consist of the level sensor, ultrasonic sensor, PLC and GSM. It gives the alert signal about the blockage of the waste material to the main office.

The alert system consist of PLC, level sensor and GSM which can send buzzer or text message to the main office or the vehicle which will collect the waste material and safely send them to the government waste collecting bank.

B. Arm System

Arm systems which consist of DC motors, Arms, DPDT switches and power supply. The movement of the motor is depends on the DC motor and that will control by DPDT switches. The handle like structure is attached with the Arm which is fixed to the Vehicle. The Arm is supposed to enter in

to the Manhole. The standard measurement of the Indian sewage system is manhole head is of 3 feet diameter, the height of sewer pipe is 2 feet and the thickness is 8 inches. The Arm will be designed according to the measurement. It will work on the principle of Linear Acceleration. According to the height of the pipe the gripper will be design. The Ultrasonic sensor which is fixed in the gripper will help the arm to detect the direction of the block. The gripper attached with the Arm will collect all the waste from the sewer pipe and come again to the vehicle.

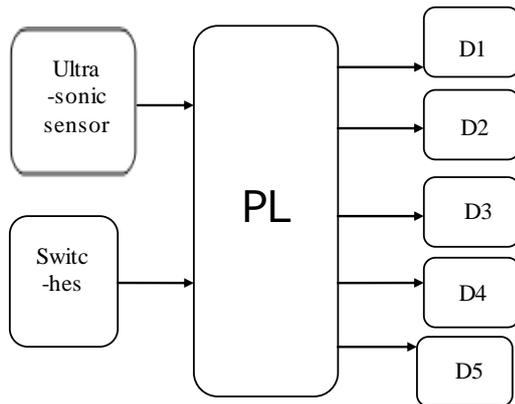


Fig. 3.2. Block diagram for Arm System

III. WORKING

The Working principle of corporation sewage maintenance system using mobile automation which consist of two modules one is Alert System and another is Arm system. The alert system is used to detect the overflow of sewage in the sewerage pipe. The ultrasonic sensor is used to detect the block of the waste materials in the sewer pipe. Once the block is detected by the ultrasonic sensor, the sensor will intimate the GSM to send the signal to the corporation main office regarding the block of the sewerage pipe with the location of Manhole where the block is present.

The vehicle which is attached with the automatic Arm will be supposed to move from the corporation office to the location of the Manhole. The arms are designed according to the measurement of the manhole. The Arm will function using Linear Acceleration. Gripper is connected to the end of the Arm, Ultrasonic sensor is attached with the gripper will helps it to identify the waste which blocks the sewerage. The gripper will remove the waste materials from the sewerage pipe and carefully collect the waste from the pipe to the corporation vehicle, in which the arm is attached. The Waste collected from the sewer pipes can be gathered using the storage tank in the vehicle and will dispatch to the government waste material bank without affecting environment.

IV. RESULTS AND DISCUSSION

A. Initial connections of the system

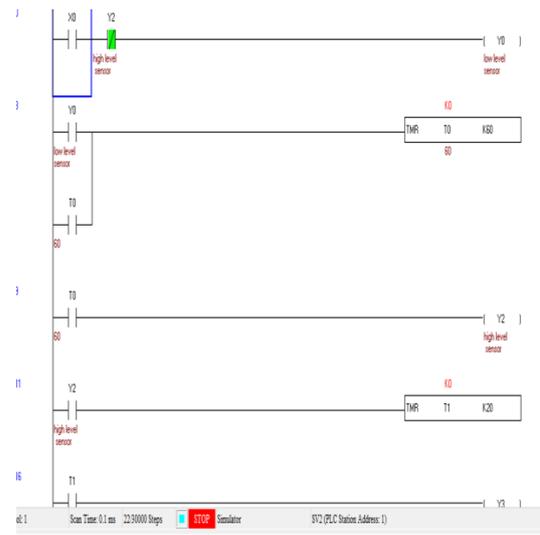


Fig. 5.1. Initial connection of the system

Fig 5.1 states the initial connections are made in the ladder diagram according to our project flow. Here, I have used time delays to view the output clearly

B. Low level sensor

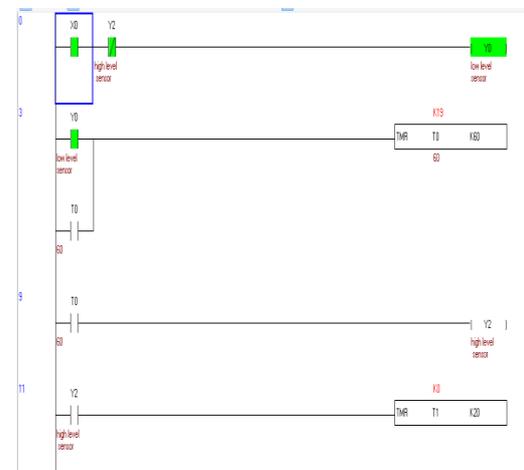


Fig. 5.2. Low level sensor

Fig.5.2 states that the low level sensor will be in ON state always because the presence of water can be found in all the time in the sewer pipe. As we are utilising water regularly the water will be present in all the time in the sewer pipe. So, the

low level sensor will always in the ON state once we switch on the main switch.

C. High level sensor

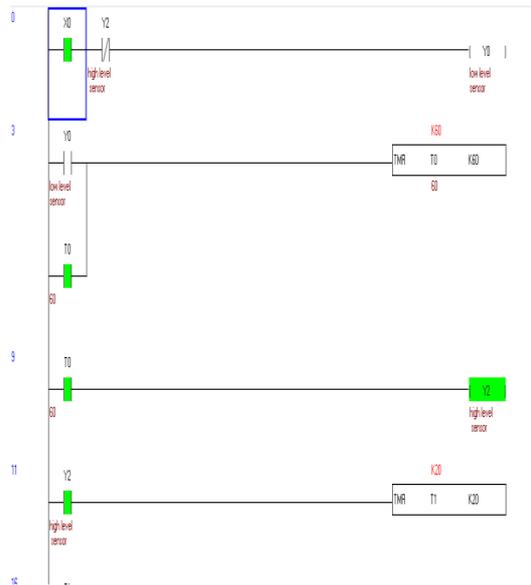


Fig. 5.3. High Level Sensor

Fig. 5.3 states that the high level sensor will sense the water level in two cases one is

- Overflow due to block of waste material
- Overflow because of peak hours

Once the high level sensor ON, the PLC will not blankly report that there is a block. Next to high level sensor the ultrasonic sensor will ON and detect the block.

D. Ultrasonic sensor and buzzer

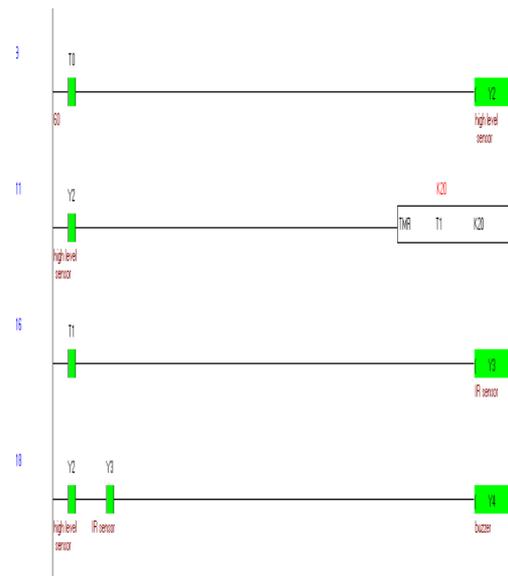


Fig. 5.4 Ultrasonic sensor and buzzer

Fig. 5.4 states that the ultrasonic sensor will sense for the block once it get intimaaton from the high level sensor. If it found the block then it will intimate the PLC. The PLC will give the signal to the buzzer to give alert. The alert can be either buzzer or can be a text signal. It will send through the GSM modem which is attached with the alert system.

ACKNOWLEDGMENT

Corporation sewage maintenance system is developed in order to eliminate manual scavenging which is a death causing practice in our country.

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