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Leakage Detection in Underground Gas Pipeline

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***Abstract*—** The pipeline system is the most important part in media transport in order to deliver fluid to another station. The weak maintenance and poor safety will directly lead to financial losses in term of fluid waste, destruction of human race, animals, birds and causing environmental impacts by leaving large amount of unwanted gases in the ecosystem. There are many classifications of techniques to make it easier to show their specific method and application. In this paper we will discuss about the problem faced by Maharashtra Natural gas Ltd (MNGL) and Mahanagar Gas. The motive is to find the leakage is at what percent as these Navratna"s uses Compressed natural gas (CNG), Liquefied petroleum gas (LPG) and Piped Gas and what is the flow rate of Leakage as well as we can monitor the health of the system. We have developed a system wherein Flow Rate, Temperature, Fire, Gas are the parameters of Inspection. A design is developed using Slave 1 and 2 for demonstration purpose on LCD display also using Internet of Things platform for easy receving data formats, and a html webpage is prepared to read the values in Tabular context. Discoveries dependent on the this IOT strategy can be utilized for near investigation in the future. It"s the best technique to recognize spill in gas pipelines. More analysis and reproduction should be completed to get the quick consequence of spilling and estimation of their area.

***Keywords*—**Arduino Uno, IOT, DHT22, Flame sensor, MQ6, Flowsensor.

I. INTRODUCTION

Everything from water to raw petroleum even strong liquid or gas container is being transported through a great many miles of pipelines everywhere throughout the world. Transport and dispersion organize is exceptionally detailed and constantly developing. This system is inclined to numerous dangers. The pipelines are helpless against losing their usefulness by inner and outside erosion, breaking, outsider harm and assembling flaws. Anyway pipelines are among most secure methods for transportation[1]. The real danger that happens in pipelines is spillage. The impacts of spillage go unrecoverable cost and cost of lost oil or gas, it too altogether influences the human lives and condition. To hinder these gigantic expenses, structuring a dependable whole identification system is pivotal. Notwithstanding, more data is required so as to accomplish a dependable framework. Prior to settling on any remedial activity the area and size of spillage ought to be known. Numerous investigates have been finished amid a decades ago to discover the area and size of the spillage with high precision and accuracy [2-3].

The Internet of Things is a rising subject of specialized, social, and monetary criticalness. Purchaser items, sturdy merchandise, vehicles and trucks, modern and utility parts, sensors, and other regular articles are being joined with Internet network and incredible information systematic capacities that guarantee to change the manner in which we work, live, and play. This innovation is encapsulated in a wide range of arranged items, frameworks, and sensors, which exploit headways in registering power, gadgets scaling down, and organize interconnections to offer new abilities not already conceivable.

The enormous scale execution of IoT gadgets guarantees to change numerous parts of the manner in which we live[4].

For shoppers, new IoT items like Internet-empowered apparatuses, home robotization segments the board gadgets are pushing us toward a dream of the "brilliant home", offering greater security effectiveness. Other individual IoT gadgets like wearable wellness and wellbeing checking gadgets and system empowered restorative gadgets are changing the manner in which human services administrations are conveyed. This innovation guarantees to be valuable for individuals with incapacities and the old, empowering improved dimensions of freedom and personal satisfaction at a sensible cost [5-7].

Now blending these two things up together, we have designed a compact system which is liable, effortless, efficient and very accurate. This system is a prototype model for the industrial work.

In section II we will discuss about the related work up till now, how it was performed and how the process are done by the guided references. In section III we will learn about the proposed methodology that how the system works which is followed by a block diagram of the schema with flowchart and working, Then the results are shown in tabular as well as the software format. After the test results, the conclusion is stated with the references in the sections IV and V respectively.

II. RELATED WORK

Uptill now all the work is done for a prototype without the problem statement of the industry, here we have to work on it so as to improve the time being setting of the system. As we have learnt from Mr. Mahesh Podar and team has designed a system for the cylinder booking and controlling system with

help of gps[1]. Also Sharmad Pasha, V.NAren and Deepthi did Sensing and Monitoring and controllong System for IoT, here this software o.r the sector used was Internet of Things thought which we can run the prototype in real time and get all the reading and values of our datasame time, through which it was more efficient in working of an ESPian model[2][6-7]. From all this we have incorporated and designed our system for the industry purpose, which can be calibrated on a very alrge scale and implemented together for better results.

III. PROPOSED METHODOLOGY

The proposed methodology consists of the block diagram, flowchart, and complete overview of the system designed.

A. *Block Diagram*

The block diagram of the every system will indicates the specific interfacing modules to be connected.

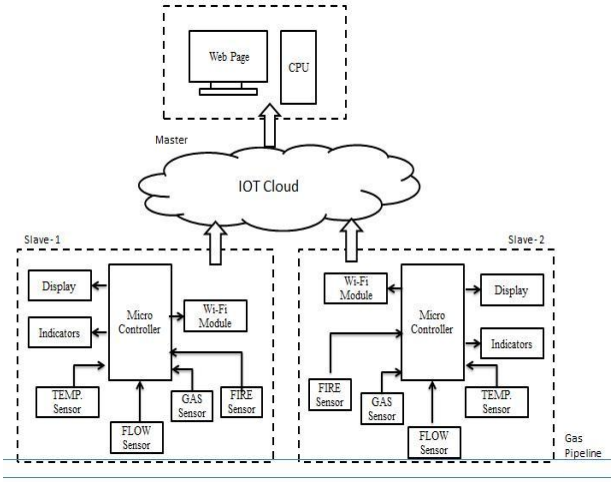

Fig. 1. Gas leak detection Model block diagram

B. Flowchart

The flow chart is a design flow or an algorithm which indicates complete process.

Algorithm for the flow chart shown it fig: 2

1. Start
2. Include required files for LCD and UART interface. i.e. LiquidCrystal.h and SofwareSerial.h
3. Initialize all constant variable fields like Hostname, API ID, PORT and Password
4. Set pin configuration mode
5. Initialize and set the Wi-Fi (esp8266) module
6. Calibrate MQ Sensor and Add ISR for Flow sensor
7. Call DHT function to get "Temperature" data value
8. Validate temperature data value to check DHT sensor is working proper
9. Call MQ function to get „Gas Level" value
10. Call an ISR function to get „Flow Rate" Value
11. Display all the data on LCD and the Serial Monitor
12. Generate the GET queries for each of the sensor values
13. Execute those queries to update the data on thingspeak channel.
14. Repeat all the process from step-7

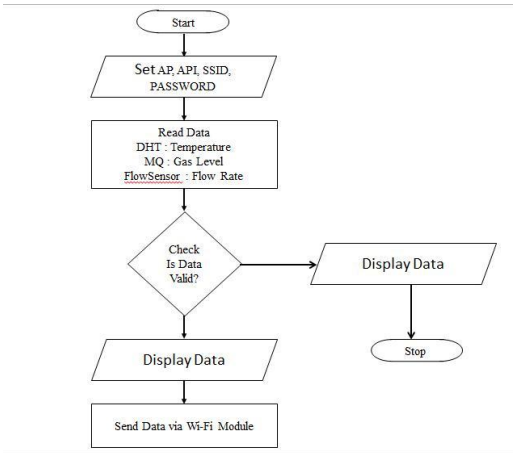

Fig. 2. Gas leak detection Flowchart algorithm Block Diagram.

C. Working of the Project

This is divided in two slaves as directed under. Slave 1 consists of no error and Slave 2 consists of error, this setting is made just for demonstration purpose to show the leakage of the gas. This is interfaced with the microprocessor Aurdino Uno which is linked with the IOT platform and Send all the data read from the Thinkspeak to the Webpage in Tabular format, for comparison purpose, this is the master computer which commands the client or the operator. Both the slaves consist of same components as we can see. There are four sensors used in this project. They are

(1) Temperature and humidity sensor (DHT 22)
(2) Gas Sensor (MQ6): This sensor can detect LPG, CNG and PNG all these gases.
(3) Flow sensor: It measures the flow rate of the gases or fluids present in the inlet and outlet chambers of the pipeline, also throughout the pipeline.
(4) Flame sensor : Keeps a check on fire, as the pipeline or surrounding catches fire, it will display as well as blow the alarm. These all are read and all the values of the sensors are fetched on the LCD display which is sent to the Thinkspeak for further Detailed process in fetching the data in the graphical manner all differently showing their values of the readings.

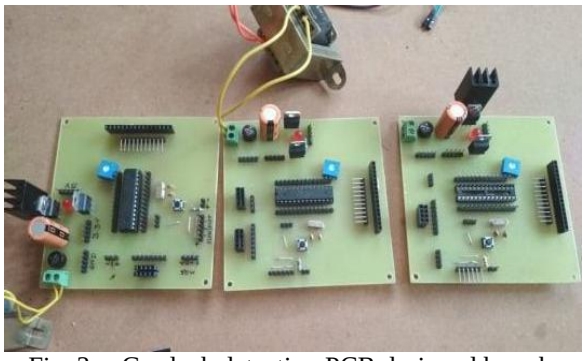

Fig. 3. Gas leak detection PCB designed by schema

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IV. EXPERIMENT AND RESULT

The test set for this evaluation id graded under Salve 1 and Slave 2 with both with for all four sensor values. This is also available on the application available on playstore and applet inlet. This application is called as Things View, here all the readings are explained graphically with respect to date and time. In a tabular format, all readings are mentioned as on the web page designed in HTML.

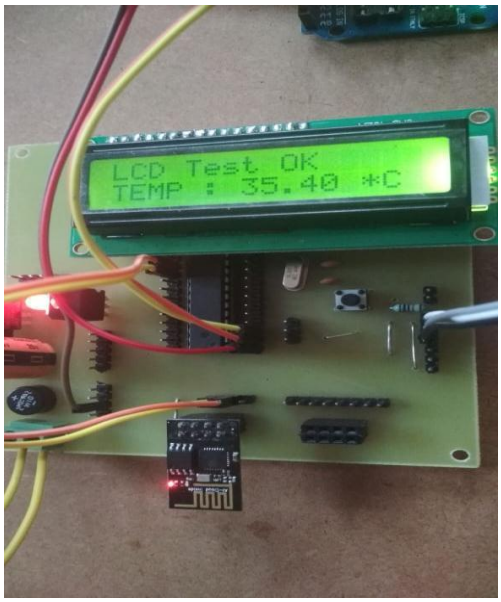


Fig: 4 Test result of Temperature Sensor

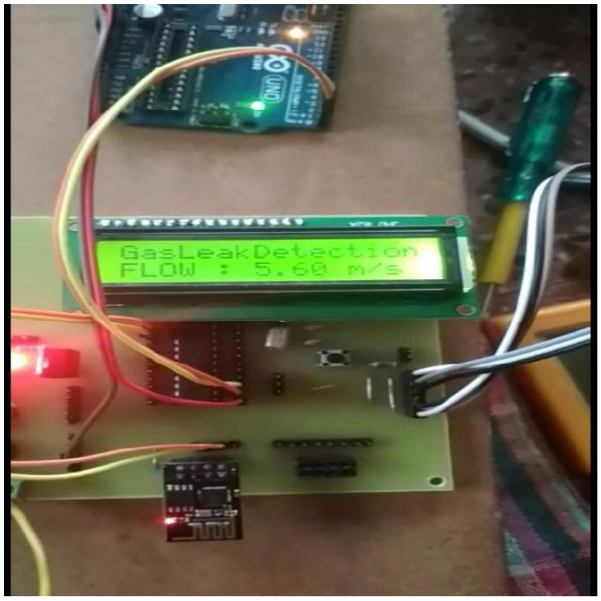


Fig: 5 Test result of FlowSensor

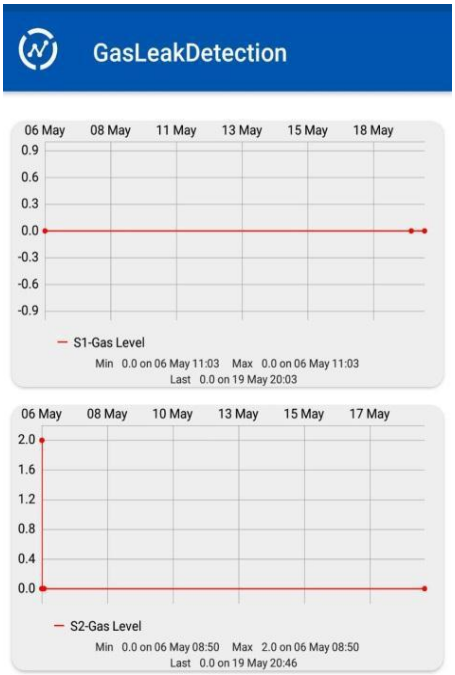
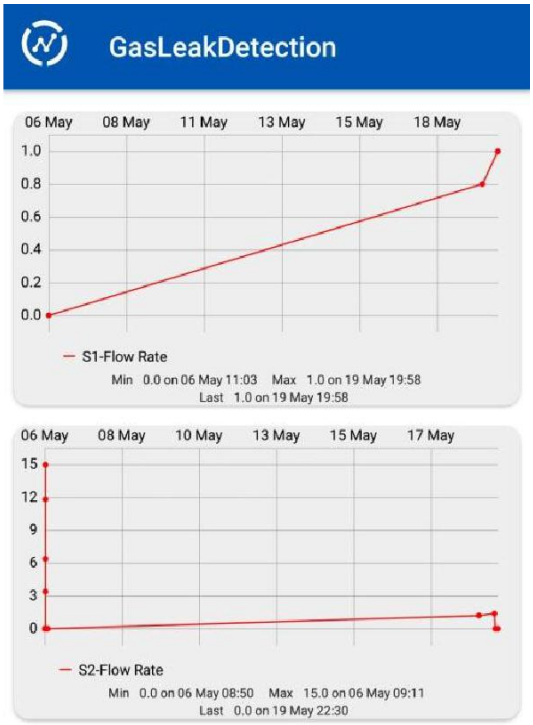


Fig. 6. The graphical representation from the ThingsView application for Slave 1 and 2 for Gas level as well as flow rate.



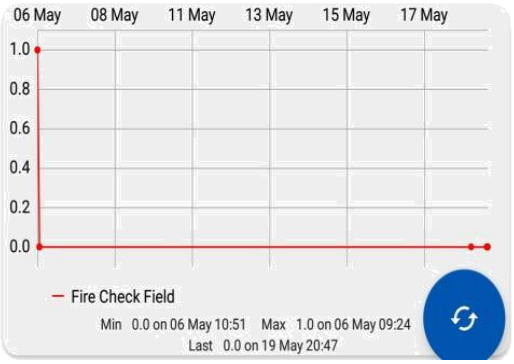


Fig. 7. The graphical representation from the ThingsView application for Slave 1 and 2 for Temperature level as well as flame rate (no fire is detected so readings are nil).

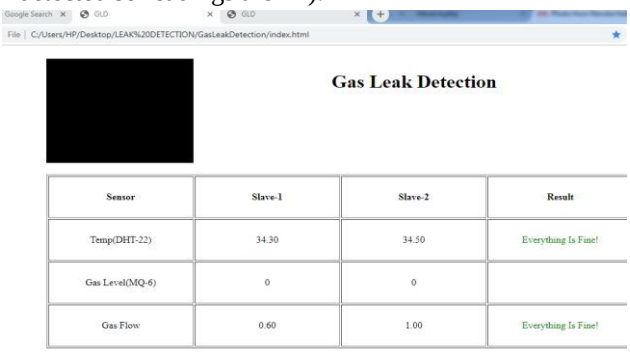


Fig. 8. Gas leak detection webpage showing all the readings for comparison in tabular format.

Fig. 9. Demonstration of the Gas leak detection set up.

V. CONCLUSION

The experimental results are published successfully and very accurately. It seems like this is the best method developed to track the leakage and monitor the system efficiently. This is cost effective and all the procedure is executed only with the price of sensors. These can be calibrated according to the length of the pipeline shut down beneath i.e. underground. The results are very accurate and through this we can save the environment and minimize the efforts taken by mankind. This can be given to the industry directly, as this was a prototype shown.

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