

Liquid Level Monitoring System Using IOT

S. Ravichandran*

ABSTRACT

This paper describes leak detection in liquid transmission system to detect and avoid the unnecessary loss of liquid such as water, milk and oils. In order to detect the leakage in the water tank, volumetric sensors are kept in the water tank for the detection of the leakage and further a reserved tank is present underneath the main tank to store the leaked liquid with the assistance of electric valve.

Keywords: Liquid Level Monitoring, Internet of Things, Water Tank, Leakage, Electric Valve, Milk, Oils, Volumetric Sensors

1. INTRODUCTION

The present invention relates to the field of Internet of things (IOT) in Liquid Level Monitoring.

The goal of this research is to develop a smart device for estimating accurately the liquid level and prevent overflowing and leakage.

The recent advancements in the area of IoT has provided solutions to measure the quantity and level of liquid in liquid transmission system using sensor based wireless technology.

Our research team has developed a smart system that challenges the current system and provides the following advantages for detecting the liquid level in transmission system.

1. A number of sensors present in each compartment of the tank to sense the parameters to indicate the leakage in the compartments of the said water tank;
2. An electric valve to allow the transmission of liquid after getting leakage intimation from above said sensor;
3. A reserved tank to store the leakage liquid, once the electric valve allows the leakage liquid to transfer;
4. A microcontroller, interfaced with GSM module, volumetric sensor and GPS which whenever receives the input regarding the leakage will alert the electric valve to allow the liquid to transfer to the reserved tank; inform the user and admin regarding leakage and location using GSM and GPS module respectively
5. A load sensor present in the reserved tank to measure the quantity of transferred liquid.

The implementation and description of the intelligent liquid monitoring system would be discussed in the preceding sections of this paper

2. DESCRIPTION

The paper discusses in detail on a smartsystem that detects the leakages in the pipelines, tanks, water vessels, containers of the industry. There are different techniques present that identify the leakage in the overhead water

* Research Scholar, Vice Chancellor, St. Peter's Institute of Higher Education and Research, Avadi, Chennai, India. Email: drravis@gmail.com

tank, vessel, boiler etc. In this present disclosure we are focusing the leakage detection in the liquid transmission system using volumetric technique.

The system proposes an IOT-enabled liquid monitoring system for all vehicles that are connected to a government body or a private company. The liquid monitoring system monitors the level of the liquid by detecting the leakage in the tank during the transfer of the liquid such as water, oil, milk etc.

The leakage in the tanks or the vessels are due to pitting or rusting, corrosion and some time the leakage in the water tanker is because of the slackening of the pipe or the top gate of the container remained open. It's not possible for driver to recognize the spillage of liquid from the container during the travel. So the present disclosure provides the system that will assist the driver to detect the leakage.

In this present disclosure to detect the leakage in the mobile vehicle a water leakage detector 101 is placed inside the liquid storage tank 100 as shown in the fig. 1. The storage tank 100 is further divided into four equivalent chambers such as zone 1 102, zone 2 103, zone 3 104 and zone 5 105 which will be helpful in leakage detection in each of the compartment of the tank. There is another tank present underneath of the main tank 100 which termed as reserved tank 108 which can store the liquid in case of any emergency.

There are four leakage detectors present in that four different chambers which will detect the leakage and it will send information to the microcontroller with the help of zigbee transceiver. As soon as the microcontroller gets the information of leakage, it will send electrical signal to the electric valve 107 of respective zone. The microcontroller is interfaced with the leakage detectors, zigbee, load sensor and GSM communication module.

There are also four electric valves 107 present for the respective four zones. After getting the electrical signal from the microcontroller, the respective valve will open immediately to allow the transmission of liquid to the reserved tank 108 from the zone that has the leakage. Further a load sensor is placed in the reserved tank to measure the volume of the transferred liquid and the microcontroller which is in the interface with the load sensor 109 will send the information regarding the quantity of liquid transferred. If further, there is any leakage in the reserved tank the alarm system will indicate the driver.

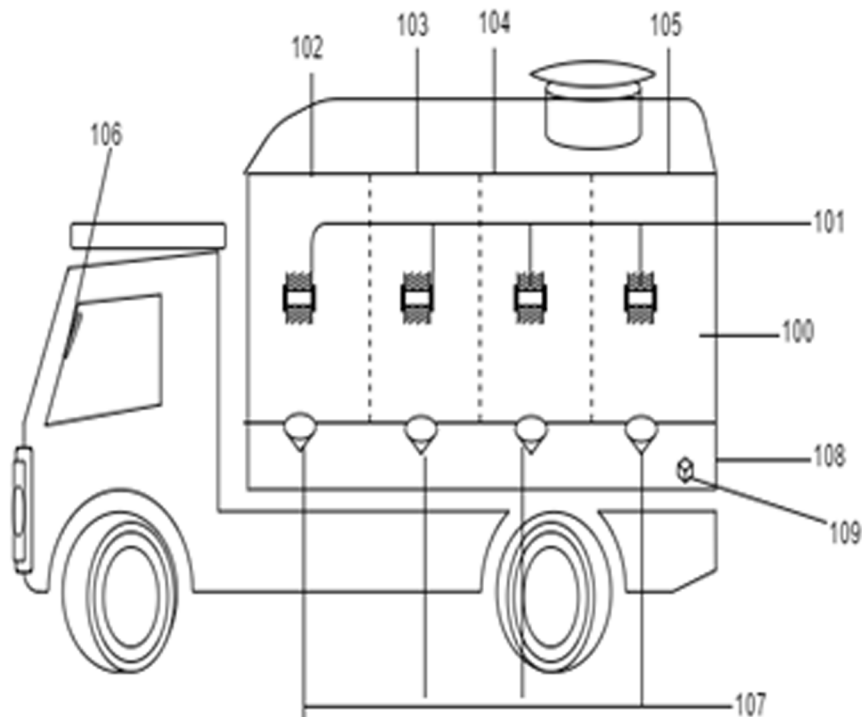


Figure 1: Liquid Storage Tank

While delivering the liquid from the mobile water tank the liquid present in the reserved tank will be delivered first following by the other four zones.

The water leakage detectors 101 present in the storage tank 100 work on the volumetric testing technique. This technique involves measurement of liquid volume which must be added or expelled from system to maintain constant pressure; volume changes indicate either leaks or thermal expansion/contraction of liquid. Based upon this technique the leakage detector will identify the leakage and inform to the microcontroller. The water leakage detector is nothing but the volumetric sensors which are placed in each of the four compartment of the tank to sense the liquid volume which is added or removed from system.

Further there is a GPS system 106 which is placed in a safe housing that provides information regarding the present location of the vehicle. Whenever the leakage detector 101 detects the leakage in the water tank the microcontroller will get information by zigbee and microcontroller will send an alerting signal to the electric valve 107 to transmit the liquid as well as to the GPS system 106 to send the location of the vehicle to the admin.

In one of the embodiment RFID can be used in place of GPS system which provides resistance to internal or external conditions depending on the placement of the RFID tag. The liquid transmission system is equipped with RFID reader that is capable of reading the information stored on the RFID device placed in each vehicle as it comes within the range of the RFID device on the vehicle. The information generated includes the details of the driver, his identity, the company to which the vehicle belongs, details of the payments between the donor and the acceptor etc. By using the RFID the admin can keep track on the vehicle and can get information anytime he wants.

Fig. 2 explains the whole scenario that takes place in the liquid transmitting system. Whenever a leakage detector 101 detects the leakage 202, a transceiver called zigbee 203 will transmit the information to the microcontroller 204. Then microcontroller will send electrical signal to the electric valve to open immediately for the transmission of liquid 208 from leak detecting zone to fill the reserved tank 207. At the same time the microcontroller will send the information 206 to the driver and admin with the help of GSM communication module 205.

3. IMPLEMENTATION

The present invention and its advantages can be implemented as described below. The research paper discusses on optimizing the flow of liquid and to detect the leakage of liquid in a liquid transmission system.

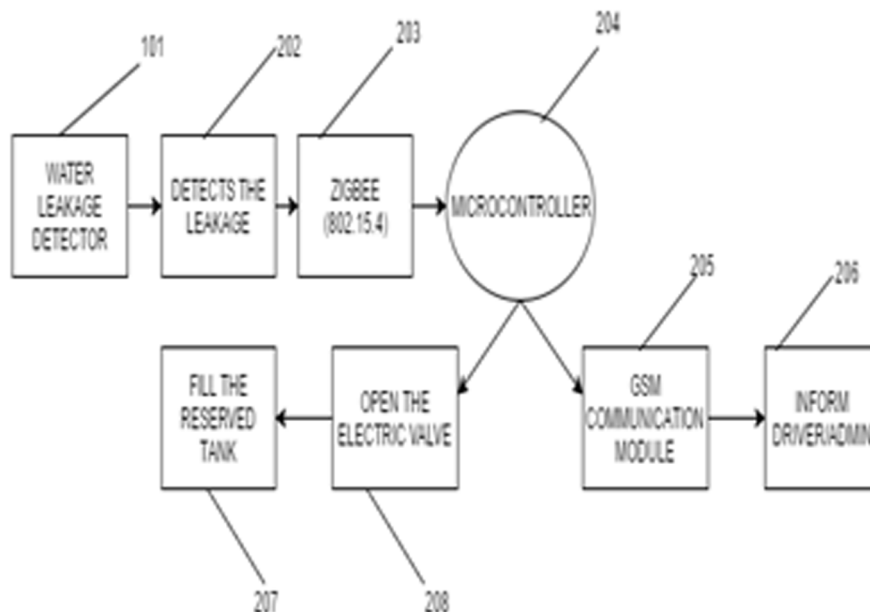


Figure 2: Scenario that takes place in Liquid Transmitting System

The liquid transmission system includes any mobile vehicle that are connected to a government body or a private company which carries liquid such as milk, water, oil etc.

The mobile vehicle which transfers the water, oil, milk and the likes from the source to the destination area has the chance of leakage amid the journey, so to get rid of this problem researchers accompanied distinctive arrangement with various strategies

In this present invention the vehicle that carries the liquid is provided with leakage detector that detects the leakage with volumetric technique.

Further the liquid container is divided with four equivalent chamber and a reserved chamber present underneath the main container to transfer the liquid from main container in the event of any leakage identification in any of the four chamber of main container with the assistance of electric valve.

Whenever the leakage detector detects any leakage then it will send data to the driver and the administrator with the assistance of the correspondence module to intimate them regarding the leakage as well as the transfer of liquid to the reserved container.

A GPS module is present so that whenever leakage detector detects the leak in the water tank, GPS system will send the exact location of the vehicle to inform the admin.

4. APPLICATIONS

The invention as described in the drawing finds applications in Construction, Mining, Agriculture, Railroads, Forestry, Power Utilities, Pipelines and Private Lands

5. CONCLUSION

The present invention provides a better and improved system to keep monitoring the liquid level in the moving vehicle to avoid the important economic loss.

REFERENCES

- [1] Yixin Ma, Zhichu Zheng, Ling-an Xu, Xiaoping Liu, Yingxiang Wu “Application of electrical resistance tomography system to monitor gas/liquid two-phase flow in a horizontal pipe”, Volume 12, Issue 4, August 2001, Pages 259–265.
- [2] Hossein Golnabi, “Design and operation of a fiber optic sensor for liquid level detection”, Volume 41, Issue 5, May 2004, Pages 801–812.