

Design of Circular Detachable Fluid Leakage Detection System

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Abstract : *In a developing Country as India there are distribution networks which are in lakhs of kilometers. These networks runs as per topography. It runs from any kind of terrain. It is really hard to examine these water pipelines, when it runs a long distances. Once the construction of pipeline is completed, then a year after year there is a lack of maintenance of pipelines, which also leads to the leakages of these pipelines. So to have a study of leakages and to find the solution over the leakages, design of Circular detachable fluid leakage detection system is important.*

KeyWords: Network, Pipeline, Distribution, Topography, Leakage

I. INTRODUCTION

Actual worldwide Water Leakage Scenario,
There is nothing more important than water. If will go anywhere on this earth, the only important factor will be the water to live and to survive. In a world everywhere there is a scarcity of water. Water is required to carry out all the activities of day to day work.

Why Leakages occurs on a site

(a) Non revenue of water

While as these distribution lines runs from a farming lands, vacant land, forests land and from various such places where there is not possible of monitoring of a pipeline. In such a cases most of the time there is a theft of water, where no one can give a attention. So there is large no of users who uses the water illegally across the country. As this water is get theft, there may be a chances of leakages of water in these pipelines. And this happens only because of non revenue of water.

(b) Improper maintenance of a Pipeline

Pipelines are made of a different material such as HDPE, Galvanised Iron, Cast Iron, Rcc Pipelines. Property of a every material is different, depending on it's type. As once the water pipelines are laid there is no maintenance of a pipeline, till it's repair works get arises. Many times these pipelines may get clogged and may have the leakages problems. But due to the improper maintenance these things are not get noticed on a priority. Many times it may happen like pipelines may runs from the reservation area of a land, where a special permission is require for the work which is to be carry out.

(c) Improper Metering system

In a city like a Pune, there is a metering system at the water distribution end. These metering system helps that how much

water is usually consumed. So that it get easy for the municipal corporations to have a proper attention over to the distribution system at the consumer end.

When there is supply of water is at the distribution end, as there are water meters are installed. But when the supply get shut off, cavities of air pressure get created. And so that this air may leads the water to get spin, which may leads to give a error in a final readings of a water meters

(d) Improper maintenance of a Pressure

As when the water is get supplied from the Elevated Storage Reservoir to the distribution system, pressure should be maintained, so that water get reaches up to the Consumer End. Pressure is depend upon the staging height of the Elevated storage tank. And this height should be in between 7 to 12m. As per the topography of the land this height may get changes. But if this staging height is maintained improperly then there are may chances of variation in pressure. Which leads to the problem of leakages.

II. Material and Methodology

In a market there are various existing systems which detect the leakages in a water pipeline. But they requires a more maintenance. So the system is being developed which detect the leakages across the pipeline.

Components

A plastic ball of a specified size and in a closed volume will content the following sensors ,and this ball will move inside a water pipeline.

To find the Leak Detection in a Pipe

(a) Acoustic Sensor

Basically it is going to be used Leak detection in a pipe. Acoustic wave sensor has a mechanical detection. Acoustic waves passes through the material.

This basically help to find the leak from the pipe with the help of the acoustic signal it finds the leakages in the pipe.

(b) Pressure Sensor

Basically the leak detection is depending on the variation in the pressure of a pipeline. As wherever the leakages will occur, at that place pressure will get change. And pressure sensor will sense it.

To find the Leak Location in a pipe

(c). Accelerometer Sensor/GPS sensor

As the accelerometer installed on a pipe it will obtain the velocity profile with the help of the data which is obtained from the accelerometer on board. As the ball moves ahead across the pipe then the accelerometer will identify the location of leaks of a pipeline .

GPS will allow to find the leakages anywhere in a pipeline. It is basically a Global Positioning System. As by fixing the 3 axis to the center of the sphere ball it will allow the GPS to detect the location in a pipeline.

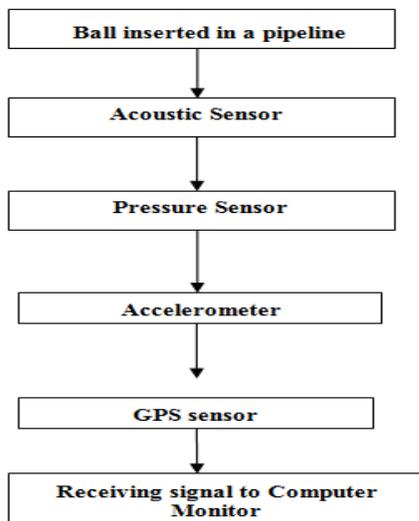


Fig 1.Block Diagram of Fluid Leak Detection System

(a) Component Parts

- 1) A distribution system water pipe
- 2)Acoustic sensor
- 3)Pressure sensor
- 4)Accelerometer Sensor
- 5)GPS sensor

(b) Dimensions

- 1) Ball Dimensions – 450mm
- 2) Diameter of a pipe– More than 450mm
- 3) Material of a Pipe– PVC pipe
- 4) Insertion point –At a place of any air valve

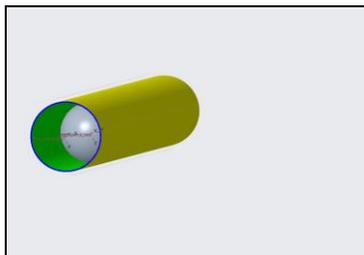


Fig.2 Detachable fluid Leak detection system ball in a pipeline

III. Results

As the ball is inserted in a pipe, it will start moving inside a pipeline. At the same time Acoustic sensor and pressure sensor which are inside in a pipe will find the leak detection in a pipeline and at the same time they will detect the leak location and with the help of the GPS sensor leak location will conveyed to the attached computer monitor.

As the pressure sensor will indicate the change in pressure as per that GPS sensor will gives the results to the monitor,So that we will get understand as leakages are there in that location.

IV. Conclusion

It's a speedy system. Can be use effectively for the all kind of water pipe material. And can be use more effectively over to the Water Audit system and on other technology. It can find out leaks as small as 0.1099 liters/mint..It can use anywhere like over a vacant land or also in a forest zones, where special permission is require. This paper describes the actual problems in a distribution system. The paper also represents the methods for the leak detection. Water losses are more as compare to the energy losses. This circular detachable fluid leakage detection device will help not only find the leakages in a water pipeline, but will also find the leakages in a gas pipeline Purpose of this device is mainly detection of leakages through the distribution mains, where energy and water losses are both more important.

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