**Paper 1**

A Review on Current Technologies and Future Direction of Water Leakage Detection in Water Distribution Network by MOHAMMED REZWANUL ISLAM 1 , SAMI AZAM 1 , BHARANIDHARAN SHANMUGAM2 , AND DEEPIKA MATHUR 3, IEEE access, October 2022, date of publication 6 October 2022, date of current version **13 October 2022**.

The above paper covers the importance of water pipeline monitoring and the methods followed in recent years to detect leakages and monitor underground pipelines. Most of the work in recent years was focused more on experimental data collection, ML algorithms, and IoT technology. Considering the cost factor most of the researchers have used sensors which based on vibration, acoustic, and flow, as they are cheap and easy to install. There are some applications that use image and optical Fiber sensors.

Data processing was mainly done using ML and threshold-based algorithms and the communication technology was basically WIFI, cellular IoT, and LoRa technology. The above paper also presents the feasibility of using different sensors like listening stick, vibration sensor, Ground Penetrating Radar (GPR), Infrared Cameras, Hydrophone, Noise logger, Flow sensor, Pressure sensor and Optical Fiber under different scenarios. Our concern was to identify a low-cost sensor to monitor the pressure in the range of 0-10bar max as our research work was mainly concentrated on water distribution lines in residual areas.

**Paper 2**

Leak Detection and Location Pinpointing in Water Pipeline Systems using a Wireless Sensor Network, Md Toufikul Islam, Dr. Semih Aslan, **2021 IEEE** International Symposium on Circuits and Systems (ISCAS) | 978-1-7281-9201-7/20/$31.00 ©2021 IEEE | DOI: 10.1109/ISCAS51556.2021.9401106

Though our studies were primarily focused on predicting the amount of water flows through a pipe from the pressure readings, finding an accurate sensor to detect minor variations in pressure was a great challenge. The above paper presents an experimental setup to identify the most accurate location to identify pressure in a pipeline. It also gives an insight into the sensor network design method that uses pressure sensors to measure water pressure inside a pipe in different locations. It demonstrates acceptable accuracy in predicting a leak and leak location under real-world conditions for a given network. Moreover, it advises the acceptable distance between pressure sensors in a pipeline. Once pressure is measured accurately it can be validated with efficient ML algorithms.

**Paper 3**

The Application of IoT-based Water Pressure Monitoring System, Kim-Mey Chew, Siew-Ping Yiiong, Nancy Bundan, Syvester Chiang-Wei Tan, **2021 IEEE** International Conference on Sensors and Nanotechnology (SENNANO)

Presents the simplest IoT architecture to sense pressure especially where the pipe dimension is less than 4 inches.This methodology can be used to detect low water pressure in the residential area or internal area that is away from the main water line. The proposed solution is developed based on the principle of IoT architecture which covers the perception layer, network layer, and application layer. The perception layer is composed of a microcontroller, GSM or WiFi as the communication layer, and a water pressure sensor as a transducer. Wi-Fi and GSM provide communication services within the network layer. For the application layer, an IoT platform was chosen for data analysis and visualization. The water pressure variation is taken at two different places in urban areas. This Paper also gives an insight into the feasibility of using a Piezoelectric differential pressure sensor for our application.

Our system was primarily designed to work on the battery over a long period of time. Considering this, the circuit was made simple with fewer components.

**Paper 4**

Water Pipeline Monitoring on Cloud & Leakage Detection with a Portable Device. Sneha Sapre, J. P. Shinde, 2019 IEEE Pune Section International Conference (PuneCon) MIT World Peace University, Pune, India. Dec 18-20**, 2019**

Another simple and economical way of monitoring the pipelines is suggested in this paper. A flow, pressure, and turbidity sensor are considered as a Node and are placed all over the pipeline which updates the output of sensors on the cloud network and if the level of any of the sensors goes down email is sent to the concerned staff. To pinpoint the exact place of leakage on the pipeline, an acoustic sensor is also used which would be mounted in a portable unit. The presence of a turbidity sensor was primarily focused to check the contamination of water present in the pipelines which is not under the scope of our research work. Here both the flow sensor values and Pressure sensor values are considered together to maintain the proper distribution of water.

**Paper 5**

Leak Detection in Water Pipeline by Means of Pressure Measurements for WSN, Aya Ayadi, Oussama Ghorbel, Abdelfateh Obeid , M. S. Bensaleh and Mohamed Abid, 3rd International Conference on Advanced Technologies for Signal and Image Processing - ATSIP'2017 May 22-24**, 2017**, Fez, Morroco

This study investigates various leakage detection formulations based on WSN in order to identify, locate and estimate the leak size. In addition, a computerized technique based on the analysis of pressure measurement in the water distribution system is presented to find the defective pipe. Two methods are discussed in this paper for data acquisition.

* Monitoring Techniques Based on Sensors Outside Pipelines
* Monitoring Techniques Based on Sensors Inside Pipelines

Analysis was done by means of MATLAB software, and EPANET model. The collected data about pressure are collected from the six sensors. EPANET-This computerized simulation software is used to analyse the hydraulics and quality performance of water distribution systems.

Q. Can we include some papers of David and team regarding the flow meter. Above papers are focussing only on pressure and pipelines.