



# A REVIEW ON CONCEPT OF WIRELESS SENSOR BASED MONITORING OF WATER DISTRIBUTION SYSTEM

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**ABSTRACT**

Water distribution systems present a significant challenge for structural monitoring. They comprise a complex network of pipelines buried underground that are relatively inaccessible. Maintaining the integrity of these networks is vital for providing clean drinking water to the general public. There is a need for in-situ, on-line monitoring of water distribution systems in order to facilitate efficient management and operation. An approach of wireless sensor network application to do real time data collection at the water supply sources such as water tanks, valves/outlets and etc., to obtain proper required parameters measuring to optimize water resources management. This concept helps to detect and localize pipe failures soon after they occur, and pre-emptively identify hotspot, or areas of the distribution network that are more likely to be susceptible to structural failure. Major technical challenges of the system are sensor selection and control over wireless networks may arise and for that appropriate algorithms are adopted based on system design requirement.

**KEYWORDS**

Water Distribution system, sensor based wireless network, quality and quantity measurement.

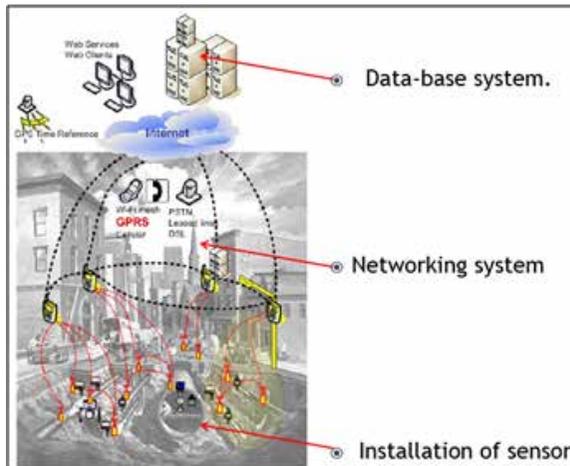
**INTRODUCTION**

Water supply system carry potable water from sources (reservoirs, water tanks) to industrial, commercial and residential consumers through complex pipe networks. Major components of water distribution system is sources of water, intake works like pumps, purification plant, storage and last is distribution system. While during the distribution of water, system face some problems: (1) Challenge for structural monitoring, (2) Comprise a complex network of pipelines, (3) Disruption growth adds to the planned maintenance, (4) Leaks and rupture in water supply pipelines and blockages and overflow in sewer collectors. Due to these problems water quality is decrease, demand of water is increase, health of the people is decrease and also cause loss of money and waste of time. According to one survey, at least 1.8 million people every year die from water borne diseases, 90% are children under the age of five and mostly in developing countries affected due to lack of safe drinking water(WHO/UNICEF 2005). Around 30% of water is wasted due to leakage, burst, theft, rupture, etc. Realizing these facts, this paper present a concept of the wireless sensor based monitoring of water distribution system to minimize the problem related water supply and distribution. This system provides a complete product line of water supply analyzers and divide in to two types: (1) For long term, unattended monitoring and analysis, (2) For short term and spot analysis of water quality.

**APPLICATION OF SENSOR BASED MONITORING OF WATER DISTRIBUTION SYSTEM:**

- For the water quality parameter monitoring like PH, temperature, Dissolved oxygen, salinity, turbidity etc.
- Water pressure monitoring of system.
- Water level/ water depth of water supply system.
- For remote acoustic leak detection including remote cross-correlation.

**ARCHITECTURE OF WIRELESS NETWORK SYSTEM**



**Figure-1: Components of wireless network system**

There are mainly three components of wireless networking system: Installation of sensor, networking system and Data-base system. A typical wireless sensor network is composed of sensor nodes often referred to as motes which sense their environment and a wireless sensor base station that collect information sensed by the motes for local and/or remote processing. Such networks have been proposed and/or are being developed for a variety of environmental application, but their deployment to measure water quality is still in its infancy.

**WORKING PROCEDURE:**

Working procedure of sensor based monitoring of water distribution system includes following steps:

- All nodes including their sensors, radios and loggers are commercially manufactured and are designed to be water proof and located on underground within the manholes.
- Physical sensor sense in analog form
- Then analog to digital convertor is required
- For transmission of digital data we need processing unit
- Processor process the digital data into the required form which can be transmitted with the help of physical data communication equipment like antenna, etc.
- Transmitted data is received by network management tools like IEEE 802.11 supported routers, switches, etc which are connected to servers via internet or intranet.
- Received data can be stored in databases at central server.
- Database systems stores the data in organized form i.e. table as well as graphical form

**High response time (Minutes):** Electric power, water level in tank, dissolved oxygen.

**Medium response time (Hours):** Temperature, Carbon dioxide.

**Low response time (Days):** PH, Alkalinity, Ammonia-nitrogen, nitrite nitrogen, etc.

Response or output of the system is in tabular form as well as in graphical form as shown in below.

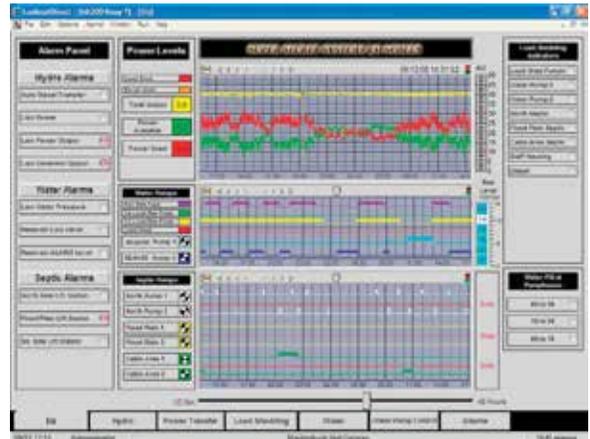


Figure-3: Output of the system

**CONCLUSION:**

Recent advanced in communication technology, especially wireless sensor networks have inspired numerous remote sensing and control application. This type of system is helps in smart water network monitoring, collect and analyse standard water quality data, visualization and detection of problems, for remedial action / intervention plan of the problem and restoring the services of water supply and distribution. Major technical challenges of the system are sensor selection and control over wireless networks may arise and for that appropriate algorithms are adopted based on system design requirement.



Figure-2: Working procedure of sensor based wireless networking system

**DETAILS OF SENSORS:**

There are mainly two types of sensors: (1) Single parameter which measure the reading of one single parameter of the water quality, (2) Multi parameter sensor measures more than one parameter of water quality.

Each sensor node consumes 0.036W when in sleep mode, 0.75W when sampling and 4.5W transmitting data over 3G. Each sensor node in the Water Wise network is based around a 72MHz ARM Cortex M3 CPU with 64KB of RAM, a 2GB SD card for storage, a GPS with pulse-per-second functionality for time synchronization, and a 3G modem for data transmission.

**RESPONSE TIME OF THE SYSTEM:**

Response time of the sensor is different for different parameters. Response time of the system may be in minutes, hours or in days also.

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