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REVIEW ARTICLE

DRINKING WATER QUALITY MANAGEMENT AND MONITORING – A STUDY

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ABSTRACT

Water is one of the natural resources used by all living beings. The quality of water is very important for survival. Water is contaminated knowingly or unknowingly. In developing countries it is estimated around 80% of people are affected by water-borne disease due to water contamination. This paper presents an overview of water resources, water management system and water quality monitoring.

INTRODUCTION

Water is one of the rich natural resources used by all human beings, animals, plants and other living beings. Water resources include fresh water from aquifers, ground water, rivers, lakes and a marine body includes ocean and sea. Water is used in different field agriculture, scientific treatment, drinking, washing, transportation, chemicals dilutes, heat swap, water industry, industrial application and food processing unit. Human or animal waste, industrial waste, pharmaceuticals and other pollutants knowingly or unknowingly mixed in the river, lakes, underground aquifers and other sources. This kind of polluted water is called as water contamination. According to water quality standards, water must satisfy the standard parameter value which is given by the World Health Organization (WHO). Contamination will be varied according to the climate change. The different groups of contamination are microbial pathogens, organics, inorganic, and radioactive elements (http://www. hindustanti mes.com/StoryPage/Print/1011753.aspx). To overcome this problem there is a need of strong water quality management and monitoring system. Water quality refers combination of characteristics of water. Water Management system is concerned about the quality, quantity and timing of water which is produced (Jamie Bartram., and Richard 1996). It has several tasks such as analysis, protection, development, operation and maintenance of water resources. The hierarchy of Water Management System functions in water conservation, reuse/recycle, water outsourcing, and treatment of wastewater and distributing the fresh water to the public. The WHO standard is used to assess the water quality. For developing such an effective and efficient system, data mining plays a major role for extracting the hidden patterns in water and analyzes it in the light of particles quality parameters and helps to predict the future value to take the necessary action before affecting human being (organism). Contamination of drinking water is detected with the help of anomaly detection tool. Anomalies/outliers are the set of data points which are considerably different from the behavior of the data. Some of the water qualities monitoring systems are Early Warning System, Event Detection System, Canary tool, Supervisory Control and Data Acquisition (SCADA) System and Contamination Warning System. Water quality monitoring helps to determine the changes in water condition. The change of water states leads to increase in water borne disease. Water Quality Agencies monitor water and take precautions before affecting human being. The paper tells about the water quality monitoring and management process. Section II concise about water management system. Section III tells about water quality monitoring and Section IV concludes the paper.

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Water Management System (WMS)

WMS intend to provide Quality and Quantity Auditing in Drinking Water Systems. Drinking Water Quality Management procedures normally consists of four main stages: Knowledge about water supply scheme, investigate the

water quality preliminary, examine the process of operation, management team and responsibility all needed for the implementation of monitoring process (http://en.wikipedia.org/wiki/Drinking_water_quality_standards). The below Figure-1, tells about the process of water. Water coming from different sources combines into main station of treatment plant for purification. Purified water will be pumped to all substations for distribution. When water pumping to substation there is a chance of raise in contamination either accidently or intentionally (NPHPC, 2004). To provide pure drinking water there is a need of Water Management and Monitoring System (WM and MS). Water Quality Management (WQM) defines the condition of environmental health of a water body or resource. The main purpose of WQM is to provide quality water to human beings.

Example: Contaminated water stunting growth of Indian kids, UNICEF: "Half of the Indians will use open space for shitting**.** They face one and a half each day; contaminate food and water, causing frequent illness. In our country, 43% (in million) of children below 5 years are underweight and 48% (in million) are exploit because of under nutrition. Apart from death and disease, inadequate sanitation also causes economic losses equivalent to 6.4% of the country's GDP (US$53.8) (http://www.hindustantimes.com/StoryPage/Print/1011753.aspx). The existing standards given be other bodies are: Bureau of Indian Standards: IS–10500, Uniform Drinking Water Quality Monitoring protocol, Environment Protection Agencies, Safe Drinking Water Act, United States Environmental Protection Agency (EPA), U.S. Food & Drug Administration (FDA) and World Health Organization (WHO). The quality of water flow includes location size, collection and analysis of water samples

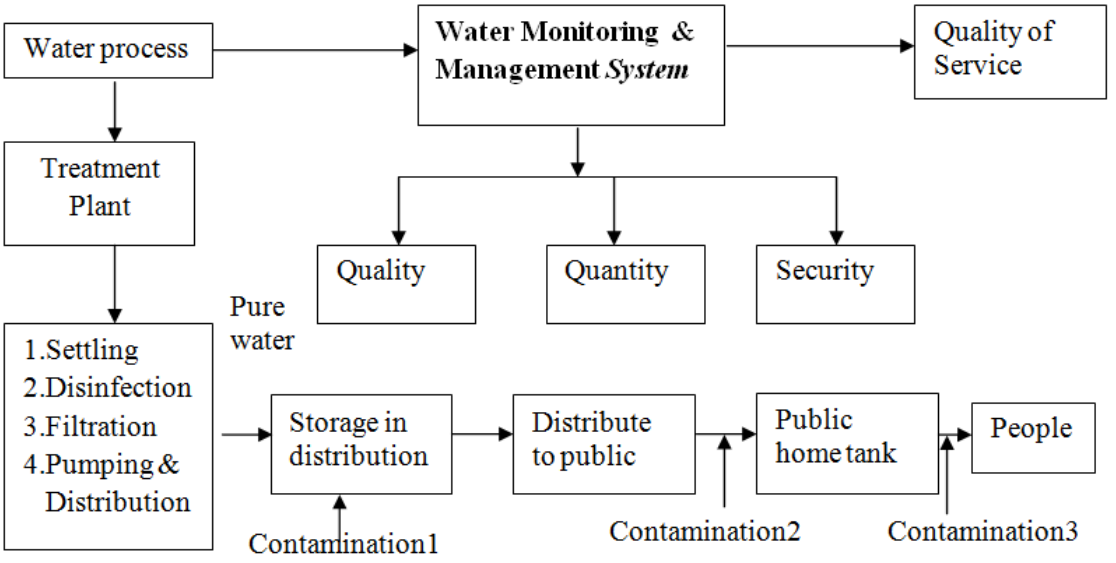

Figure 1. Water Processing

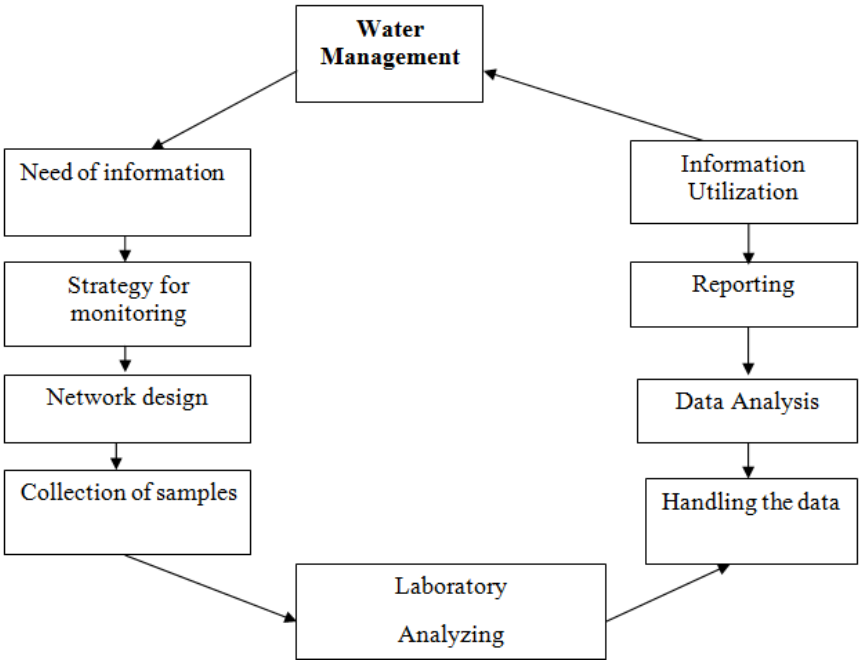

Figure 2. Water Monitoring Cycle

regularly and evaluates it with the results; finally report of the findings from the real time data (http://water.epa.gov/ drink/contaminants/index.cfm). The water quality parameter will vary in each distribution system due to normal changes in operation of tanks, pump, valves and changes based on climate changes. The quality of water will also change according to climate change and places. Some of the event profiles of water include Anomaly Detection, Misuse detection, Intrusion Detection, Hydraulic Faults etc. Due to continuous change in water, the need of Water Quality Monitoring and Management System is increased.

Water Quality Monitoring (WQM)

The need of Water Quality Monitoring is to monitor and manage all physical water and collect the information to manage the resource in an integrated manner in accordance of National Water Act and Water Service Act. The water quality is used to express the physical, chemical or biological state of water. The quality of water is described by collection of physical, chemical and biological parameters. The contamination of water will get differ depends upon the climate change, natural and human influences (John Fawell., 2003). This system allows monitoring multiple water quality parameters. The WQM experts examine all the chemical condition and physical condition of water. Monitoring should be conducted at regular intervals and in some site randomly. The purpose of monitoring is to:

- To describe water characteristics and identify any change in water quality over time.
- To categorize existing or emerging water quality problems.
- To gather information for preparing the solution for water problems.
- To give awareness if there is any change in water quality before they are drinking contaminated water.

Water Quality Monitoring includes network design, preliminary survey, estimate the resource, field work, analyzing the quality assurance, laboratory work and finally data management and reporting (http://en.wikipedia.org/wiki/ Drinking_water_quality_standards and Carl, 2005). The Water Quality Monitoring cycle is given below in Figure 2.

To manage water quality efficiently, need of separate Water Management System is more vital. Water Monitoring System seeks information from the main station to check any quality changes based upon the standard specified. Once the samples are collected, it is to be sent to laboratory for analyzing and report will be prepared based on the analysis process. The quality will be analyzed with the help of WHO standard.

Conclusion

This paper gives an overview of water, resources and contamination. It provides different types of contamination present in water. It insists the need of Water Quality Monitoring and Water Quality Management systems. The WHO standard value is followed for accessing water quality. The water quality and monitoring system helps to detect the contamination as early as possible which leads to reduce water borne diseases.

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