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A Study on Repurification in Distribution Network

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Abstract—**The urban water distribution in Kerala is of great concern today. The water at the consumer's premises is found to be unfit for drinking. The presence of undesirable particles including various micro-organisms like E-coli has exascerbated. The main reason behind this increased impurities ,even after the purification from the treatment plant cannot be attributed to a single point. There is a high risk of diseases due to the intake of such impured water. The need of a repuirifier at the consumer's premises is fast increasing. A repurifier, which is compact, handy and cost effective must have to be found, to reduce the negative impacts of improper purification to some extend. Such a repurifier will definitely helps in reducing the extend of water borne diseases to some extent.**

Keywords—Repurification,impurities,distribution

I. INTRODUCTION

The water distribution in urban areas occurs through various pipe lines, purifiers, and treatment plants. Pipe flows in urban distribution systems should be under pressure to prevent contamination from ground waters and to meet various uses and fire protection requirements. All these could be achieved only if a perfect distribution system exists.

In a state like Kerala, where the water distribution system is laid mostly beneath the public roads, there occurs recurring possibilities of breakage of pipes. The reasons can be attributed to the impact of heavy wheel loads, poor quality of pipe materials and lack of proper maintenance. Such cracks lead to the contact of water in the pipe line with the outside environment, where a plethora of impurities are present. This leads to the contamination of water available for domestic purposes. The consumption of such water leads to the spread of epidemics and various water-borne diseases. Such a distribution system is taken under consideration and analyzed

The underlying of pipes, for the proper functioning of the transport and public communication system contributes to the leakage and malfunctioning of the distribution systems in Kerala. There are still other reasons which worsen the scenario. Large scale deforestation in western areas had affected. The laying of roads after the deforestation had considerably affected the distribution system in the local areas especially in the rural areas.
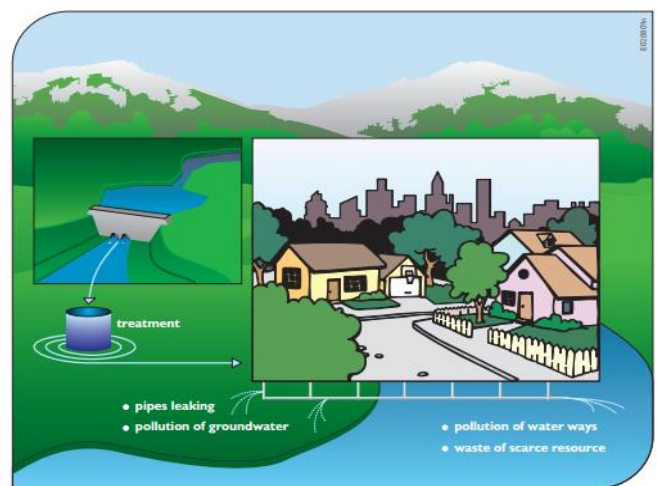

FIGURE I PUBLIC DISTRIBUTION SYSTEM

II. OBJECTIVE AND SCOPE

Today, a simple turn of the tap provides clean water which is a precious resource. With advancement in Engineering in managing these resources with water treatment, supply, and distribution systems life has changed profoundly in the twentieth century, virtually eliminating waterborne diseases in developed nations, and providing clean and abundant water for communities, farms, and industries

The main objective of the project is to determine the present status of water in the distribution network at Manakkad grama panchayath, Thodupuzha. The alkalinity, hardness, p^H , presence of chemicals such as sulphates(SO_4), nitrites(NO_2), chlorides, iron,residual chlorine, free ammonia, saline ammonia, fluorides, total dissolved solids, nitrates(NO_3), coliforms organisms and e-coli content is determined. In case of presence of undesirable contents, a compact repurification system is designed, which can be installed and maintained easily.

Many parts of our state encounter problems with the distribution system like intermittent water supply, stagnant water, corroded pipes, leakage, toxicity in water and so on. The project holds its position under such circumstances, which encounters the presence of undesirable contents in the

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form of elements and micro organisms which may lead to various health hazards.

III. PRE CONTEXT TO THE STUDY

Different sectors of the society are largely dependent on the supply of water. The demand for drinking water depends on:
• The per capita demand by individuals.
• Meteorological and climatic conditions
• The expense of drinking water
• The availability of drinking water
• The moderate use of drinking water at various levels of the society.

A. Contaminents In Water

The water is used for various sectors nowadays.This includes industrial, institutional, medical, domestic, public use and so on.

Since the water consists of various minerals like fluorides,irons,chlorides,potassium,calcium,sodium,magnesium etcetera,its level must have to be checked regularly and the level of these minerals must be ensured for safety.But the presence of undesirable substances including these minerals leads to various water bourne diseases including acute fever,diarrohea,dysentery and jaundice. These diseases are more prominent among the people in rural areas,where the system of public health is really poor.

B. Purification Of Water

Water purification is indeed one of the most important step in the distribution network. The quality of water at the consumer's premises mainly depends upon the purification work. As a matter of fact, the health condition and the level of metabolism achieved by an individual entirely depend upon the condition and status of water supplied. Thus, purification requires greater attention from the part of authorities and must be done with utmost care.

Contaminants in natural water supplies can also include various disease causing microorganisms. The weeds and the pests reduces the suitability of river water as a source of drinking water. Traces of hormonal substances and medicines detected in river water add on to the threats of polluted drinking water. To remove such impurities and pathogens, a typical municipal water purification system must have to be introduced which covers both physical and chemical removal processes.

C. Different Sources Of Water

Water is obtained from different sources. This includes surface water, ground water and runoff.

Surface Water

One of the main source of drinking water is the water which flows through the surface. It comes from the rain fall which is adequate in various parts of India.The rain water after being absorbed to the ground, easily runoff through the ground. This reaches the lakes,rivers,estuaries,ponds and ultimately get collected in the sea and oceans.Evapouration and condensation occurs perodically.This completes one cycle in the hydrological phenomenon.

Ground Water

Water that falls on percolating sand automatically passes through the ground and reaches the water table level.This water is used as a ground water source by using hand pumps,tube wells and various other systems.This ground water also interferes with different types of minerals.This includes minerals like basalt,chlorine,iron,silica.These minerals must have to be properly checked befor the consumption for the safety purpose.

TABLE I COMPARISON OF SURFACE AND GROUND WATER

Characteristic	Surface Water	Ground Water
Turbidity	High	Low
Dissolved minerals	low-moderate	High
Biological content	High	Low
Temporal variability	very high	Low

IV SITES CONSIDERED FOR THE STUDY

The main sites which were considered in the study includes 1.Government Water Treatment Plant, Choondy 2.Latex Treatment Plant ,Malankara,3.Treatment Plant of Wonderla,kakkanad,4. Mini Water Distribution Plant,Aluva. Collected details include the following:

- Collection of water from the ground source.
- Aeration of the collected water.
- Sedimentation, by keeping the water quiescent for a long and fixed period of time.
- Coagulation and addition of chemicals.
- Detailed filtration.
- Addition of chlorine in the prescribed amount.
- Collecting the samples.
- Physical, chemical and biological examination of the samples.
- Double checking the quality of water.
- Distributing the water to the nearby urban and rural areas.
- The method of collection of water from the main plant.
- The way the quality of received water is ensured.
- The chemicals, especially the amount of chlorine added to ensure the amount of E-coli bacteria within the prescribed limit.
- The method used for the control of water from the main distribution center.
- Software technology for the detection of undesirable substances.
- The use of programmes and algorithms for the flow the flow of water.
- The working technique of the spray injector to blow out Chlorine.
- Treating of water in the pools and their repurification.
- The use of activated carbon and sand for the purification purpose.
- The details about the proposed project of using the technology of Reverse Osmosis.
- The time duration and course given for sufficient sedimentation to occur.

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- The use of Alum and other chemicals for the refining of water.
- The technology used for the detection of bacterias, chemicals, and microbial contents.
- The approach used for the eradication of microbial contents.
- The ultimate steps used to ensure 100% pure water for the use in pools and various water rides.

The method of treatment given to the water in different stages was considered in detail which found to be very helpful in the design of our Repurification filter.

A. Survey Conducted

The survey conducted in the rural areas and at the outskirts of Aluva showed a clear picture of the status of water, and its quality at the consumer's premises. The steps adopted include the following.

B. Objectives

- To ensure the quality of water in rural areas.
- To detect the presence of any undesirable contents in the distribution network.
- To detect the presence of E-coli content.
- To record the incidences of any water borne diseases.
- To record the level of chlorine in water used for domestic purpose.
- To record the level of alkalinity, hardness, and p^h.
- To note the amount of Chlorides, Nitrites, Nitrates, Iron, Ammonia and Flouride.
- To note the level of dissolved solids.

A personnel interview was conducted by visiting the rural areas in Aluva regarding the impurities in the drinking water, the level of chlorine reports of acute water borne diseases. Valid responses were collected.

The highlights of the Questionnaire are as follows:

- What is the color of your drinking water?
- How does it taste?
- Is there a taste of Chlorine?
- Are there any reports of frequent water –borne diseases like diarrohea, dysentry, constipation?
- Are there any reports of leakage within the distribution network?
- What are the various pipe materials used?
- Are there any reports of corrosion within the pipelines?
- How is the flow through the pipelines?
- Is the flow continuous or intermittent?
- Does the drinking water have any smell, specially, any pungent smell?
- Are there any reports of micro-organisms detected before?
- Have you seen any visible organisms in the distributed water?
- Do you think the water is up to the level in terms of its quality?
- Are you using boiled water?

- Is there any repurification system installed in the nearby premises?
- Do you feel the water as saline?
- Have you detect the presence of any suspended particles in the water?
- How about the condition of water in rainy season?
- Are there any medicines given from the Public Health Department for the cases of water borne diseases?

The answers for all the above questions and samples were collected. The obtained details were used in the design of a filter by using valid codes .The filter includes a baffle system, followed by an intakesystem, a chamber of filtration which includes sand and activated carbon, followed by a chlorinator and a mixing chamber for the proper turbulence of water.

V.ACKNOWLEDGMENT

VI.CONCLUSION

The content of E-coli bacteria found in the rural areas of Aluva was more than the prescribed limit, which says it should be absent. This leads to many diseases among the people as reported earlier. Chronic diarrohea and acute dysentery were the top in the list of reported diseases. The measures done by the Government to ensure the safety of drinking water was minimal, to our surprise. The co-orperation from the Public Health Department in ensuring the health conditions of the people was not upto the limit.It was found that there is an immediate need of a re-purification system at the consumer's premises before the water is taken for the domestic purpose. That's the point where the project holds its importance.

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