JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

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AUTOMATIC WATER STORAGE, TREATMENT AND MANAGEMENT CONTROL SYSTEM;

APPRAISAL

Abstract

The proposal seeks to develop an automatic control system for water supply and treatment layouts in the household setups. The system makes use of cheap water level sensors, micro controller and relay switches to control the filling of main tanks as well as reserve tanks when the water is available from the source.

The system also automates the supply of water from the reserve tank for use when the water is scarce from the source. The water in main tank and the reserve tanks are also subjected to an automatic and simple water treatment procedure by use of water purifiers and germs killing substances such as chlorine that are introduced in correct levels automatically.

The water supply source under consideration is a borehole and the actuators used are solenoid valves and electric water pumps.

Introduction

Kenya is one of the developing countries that have struggled for many decades to ensure that its citizens have basic needs such as food, shelter and water. However, the objective of ensuring availability of water is not close to achievement.

Kenya has a total population of about 40 million of which 43% of the total population do not have access to clean water (FAO 2014). For decades, water scarcity and outbreaks of waterborne disease in Kenya have been attributed to recurrent droughts in some parts of the country, contamination of available water as well as poor water use and management practices among the citizens.

According to the statistics done by World Bank (2010), less than 45% of the rural population in Kenya have access to water or clean water as opposed to the urban population where 85% of them have access to clean and safe water.

It is therefore important to enhance water management and treatment systems in the rural areas in order to curb the water shortage problem and outbreaks of waterborne diseases caused by use of contaminated water.

In most rural areas, control of water supply to the storage tanks from the various sources is a major problem and the current existing systems are operated manually. Research reveals that most of water shortages in Kenya is as a result of ignorance among the citizens regarding the water catchment and storage techniques. However, the shortage is also as a result of water wastages during use and failure by the users to sparingly utilize the resource.

Automatic water supply systems have been developed by various scholars as well as professionals in the field of systems and instrumentation. Such systems are incorporated in a kit that can be installed in any water supply systems to automate filling of water tanks by automatic switching on and off of water pumps depending on level of water in the tank.

However, existing systems are very expensive as compared to the financial capabilities of most of the homesteads especially in rural homes. Moreover, such existing systems majorly control supply of water into a main tank but do not incorporate control of water supply to both the main tank as well as the reserve tank. The existing systems also do not have a provision to ensure that the water in the storage tanks is clean and safe for use.

Problem Statement

Water shortage is majorly caused by inability of households to store excess water during abundance. The art of storing of excess water for later use when such resource is scarce is considered a good practice that helps to minimize water shortage.

Moreover, poor control of filling of storage tanks from the main supply leads to a lot of wastage especially when the tanks are filled up unnoticed and excess water overflows to waste. Such uncontrolled circumstances contributes to a huge percentage of water loss and in most cases, attempt to control such wastage by manual means are futile.

Although the problem can be addressed by administering civic education on the citizens on the effective use and treatment of water, reaching the entire population poses a bigger challenge. The process of accomplishing such a task is time consuming and requires a lot of resources including finances.

Objectives

Global Objective

To develop an automatic system that will control water supply, storage, treatment and its effective management.

Specific Objectives

- To study and analyze the level and causes of water wastage in most homes or house hold setups.

- To carry out the cost analysis of the existing water supply systems that have been developed and their viability in solving the water shortage problem.

- To come up with a cheaper, easy to use automatic water control systems that automatically controls water supply to the main tanks as well as ensuring water storage in reserve tanks when there is abundant water.

- To carry out a detailed research on the best and simplest water treatment practice that can be used to ensure that the water stored is safe for use.

- To automate the water treatment process and restrict the user from using untreated water by automatically closing all supply valves when the level of water purifiers levels goes down.

Justification

Every day in rural communities and poor urban centers throughout sub-Saharan Africa, hundreds of millions of people suffer from a lack of access to clean, safe water. However, there is a more importance in improving the water management practices and implementation of automatic systems in rural area than in urban areas.

Water demand in Kenya is gradually rising as shown by the statistics taken from the past 5 years.

Table 1.1: Estimated Water Demand

Category	Demand (1,000 m^3/day)	
	1995	2010
Residential urban	747.8	1,642.8
Residential rural	468.2	932.6
Sub-Total	1,216.0	2,575.4
Non-residential, health facilities, schools, industry and commerce	593.9	986.3
Total	1,809.9	3,561.7
Livestock water	376.6	621.4
Irrigation	3.9M	8.1M
Grand Total	2,186.6	4,183.2
Source: *Ministry of Water and Irrigation*		

Kenya is considered a water stressed country and therefore, there is great need for the country to enhance water storage systems in areas where there is plenty existence of water for use when the resource becomes scarce.

According to water availability statistics done between 1969 – 1999, it is evident that there is a drastic drop in water storage available per capita. This indicates that there is lack of construction of new water storage facilities to match the rising population.
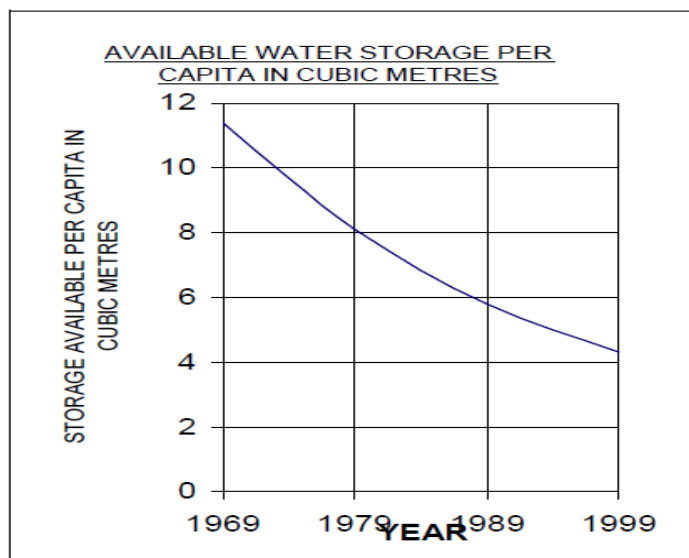

Fig 1.2: Available water storage per capita.

Therefore, it is important to develop systems that would ensure that water storage is done in the most effective manner possible. The systems should be cheap and easy to operate (Preferably Automatic).

References

ASAL Development Policy (February, 2002)

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