Water Conservation System for Domestic Area

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Abstract*—Fresh water supplies are diminishing and becoming more expensive in many areas of the country. In such a situation, conserving and purifying water has become more important than ever. All the available solutions for conserving and reusing water have not been able to find their application at every doorstep due to various factors. We have introduced a new idea that can be easily integrated into the present water distribution system of domestic buildings and automatically conserves water without human supervision by forming a closed loop feedback system. The system automatically reuses grey water expelled from kitchen and bathroom by filtering, storing and then supplying it to desired location as per requirement. Apart from this the system automatically harvests rainwater which will be filtered, stored and used for primary use by the residents of the domestic buildings. Since the whole system is automatically operated, hence it was also a challenge to select automation components in such a way that it reduces the installation cost of the system yet increases overall efficiency in conserving water. The water reusing and supplying system has been designed in such a manner that it can easily fit into the present plumbing system of a conventional domestic building with minimum alteration. The problem of removing odour from water for easy storage and longer use has been achieved by the simple use of bleach powder from which the chlorine removes odour and the chlorine from the bleach will vaporize in a couple of days.*

Keyword—Gray Water, Automation Components, Plumbing System, Water Conservation, Rainwater Harvests.

I. INTRODUCTION

1.1 Basic Overview:

The objective of this paper is conserving water by automatically filtering, storing and reusing the gray water for secondary purposes in domestic buildings for flush in toilets, gardening that do not necessarily desire fresh or clean water. Gray water is the water that is drive away from the kitchen and bathroom. In this gray water contain is soap, dirt and pathogens collected from cleaning dishes, washing clothes and bathing. The gray water is normally thrown away because due to lack of consciousness, the gray water is thought of be equally dirty as the sewerage water, but it is not actually like that. In domestic household normally consisting of an average of four members, 10% of water is expelled out from kitchen, water from the laundry is 20% of total water consumption and approximately 35% of the total water consumption in a house is used for showers and baths (1) That means a total approx 65% is expelled out and unused in the form of gray water. Suppose this 65% of water is filtrated and reused for gardening, flushing and other activities because these activities do not need clean or fresh water, as a result significant amount of water can be easily saved. Hence, the design stressed on the conservation and reusing of potable water in domestic and residential areas that are being wasted because of the present water disposal and distribution systems and poor practices of utilization in residential societies as well as individual households.

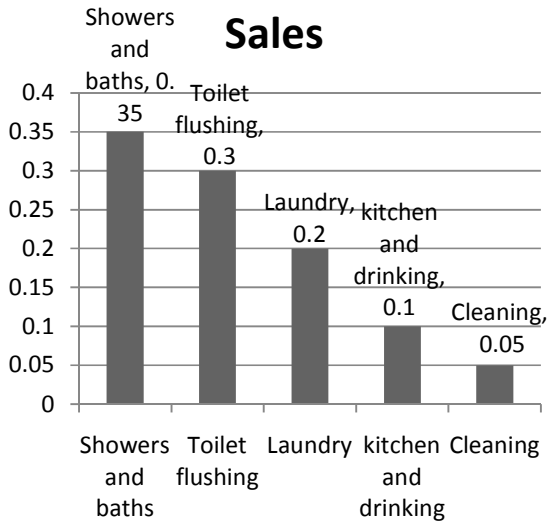

Fig. 1: Water use in the home

Earth's surface is covered by over 70% of water. Although water is seemingly rich but the real problem is quantity of fresh water existing is very less in total water of the earth. On the Earth 97.5% is salt water, prohibition only 2.5% as sweet water. Even approximate 70% of that sweet water is frozen in the icecaps of Antarctica and Greenland; most of

the remainder is present as soil moisture, or lies in deep underground aquifers as groundwater not accessible to human use.

Human uses sweet water is only 1% on the earth. The sweet water available only in lakes, rivers, reservoirs and underground source. Only this quantity is regularly restored by rain and snowfall. Therefore available on a sustainable basis. By conserving water in the unconventional sequence of filtering and reusing the gray water as propose and show by our design, by this we easily save the valuable 1% of the pure water supply and even increase its in the long run.

1.2 SYSTEM OVERVIEW

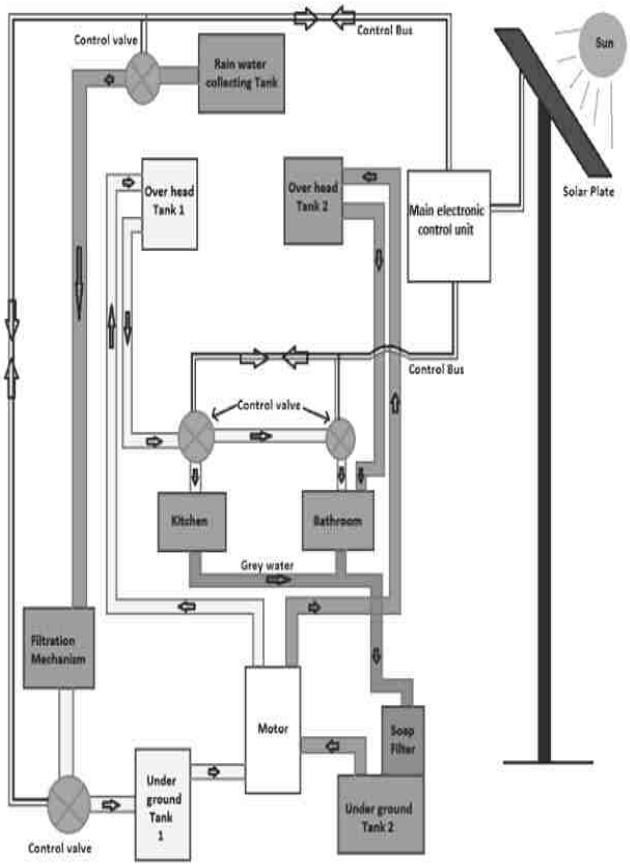

Fig. 2: Water Conservation System for Domestic Area

This water conservation system is automatically controlled by 8051 microcontroller. This is very important part of this system. This controller unit control all the sensors, valves, motor, power supply system and water level indicator. All this component merged and made an automated water conservation unit which is not require any type of human effort. Other main component of this unit is soap filter which is used for filtering the gray water from kitchen and bathroom and stored in underground tank for reusing the water for secondary purposes such as gardening and toilet flushing and other activities.

1.2.1 Main Components

1. 8051 microcontroller—in this design Intel 8051 is an 8-bit microcontroller is use which means that most available operations are limited to 8 bits. There are 3 basic "sizes" of the 8051: Short, Standard, and Extended. The Short and Standard chips are often available in DIP (dual in-line package) from, but the Extended 8051 models often have a different from factor, and are not "drop-in compatible". All these things are called 8051 because they all certain features (Although the different models all have their own special features). This microcontroller is control all the system component which is necessary to run this automated system.

Fig.3: Microcontroller

2. Water level controller—this water level controller monitors the level of the overhead tank and automatically switches on the water pump whenever the level goes below a prest limit. The level of the overhead tank is indicated using 4 LED's and the pump is switched OFF when the overhead tank is full. The pump is not allowed to start if the water level in the sump tank is low and also the pump is switch OFF when the level inside the sump tank goes low during a pumping cycle. The system monitors the water level of the tank and automatically switches ON the motor whenever tank is empty. The motor is switched OFF when the overhead tank or container is full.

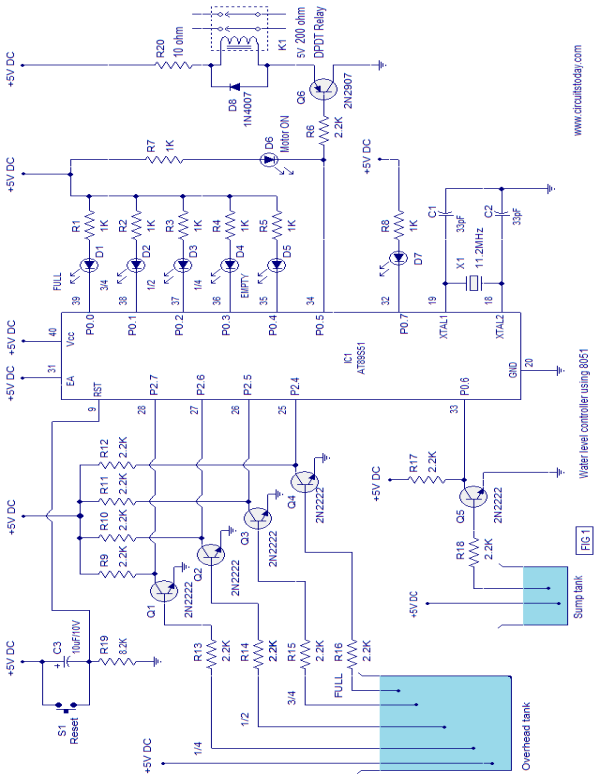

Fig.4: Water level controller

3. Power supply—all the electronic circuits work on DC power and the source of power in houses is AC. First need to power up the controller is an AC to DC conversion unit.

The circuit below, uses two ICs 7812(ICI) and for obtaining the required voltages. The AC mains voltages will be stepped down by the transformer T1, rectified by bridge B1 and filtered by capacitor CI to obtain a steady DC level. The ICI regulated this voltage to obtain a steady 12V DC. The output of the ICI will be regulated by the IC2 to obtain a steady 5V, DC at its output. In this way both 12V and 5V DC are obtained. This circuit is used to power up the electronic circuits and valves.

By arranging all the components in a way as shown in circuit diagram below and soldering them on a zero PVB we made the Power supply unit.

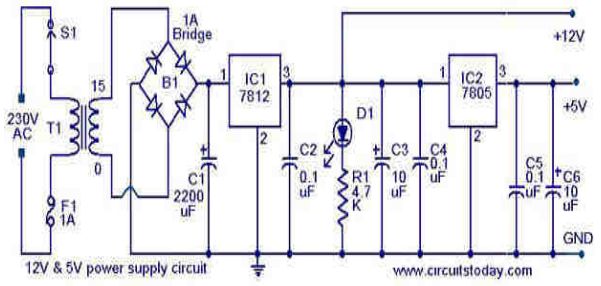

Fig. 5: Power Supply System Circuit

4. Pump—two pumps have used in the system. In order to supply the fresh water from the main underground tank, a pump has been installed. The second pump is of submersible type. Its function is to supply the filtered grey water to the Grade2 water tank for storage and supplying it further per the requirements.
5. Joints—for the purpose of joining two or more pipes at intersections, diverging locations, etc. elbow and T-shaped joints are used in this design. Elbow joints were used at locations where the direction of plumbing system and flow of water is altering. Whereas the T-shaped joints were used where three pipes were intersecting for a diversion of flow of water.

II. THE DESIGN FULFILLS THE FOLLOWING OBJECTIVES

1. Efficient and intelligent system for water utilization and disposal systems in residential areas.
2. Reduction of the human efforts and attention by deploying automated system.
3. Reduction of the wastage of reusable water that is supplied at homes and residential colonies.
4. Stop the rapidly growing menace of drinkable water shortage.

III. ADVANCEMENT IN TECHNOLOGY

1. This is the one of a kind water conservation unit that integrates solar energy, rain water harvesting and reusing of gray water into one single, “easy to implement” system.
2. The whole system works automatically via use of sensors, automatically controlled vales, and automatic water level indicators, etc which requires minimum human supervision.

IV. Utilizations of outcome of the design

1. Water requirement is decrease at the residential areas.
2. The ground water level will be refilled.
3. Rain water cycle will be rejuvenated as a result of above mentioned utilization.
4. The use of drinkable water for other activities like gardening, flushing etc. at houses will be reduced.

V. CONCLUSION

Our system is a new and effective concept that is easily integrated into to the existing water distribution system of domestic buildings and automatically conserves water whiteout human supervision by forming a closed loop

feedback system. The design has fulfilled its objectives, which are as follows:

1. Reduction of the human efforts and attention by deploying automated system.
2. Reduction of the wastage of reusable water that is supplied at homes and residential colonies.
3. Efficient and intelligent system for water utilization and disposal systems in residential areas.
4. Stop the rapidly growing menace of potable water shortage.

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