THE BRIEF REVIEW ON THE HARVESTING RAINWATER AUTOMATICALLY

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ABSTRACT

This paper is about an Aquaspace rainwater harvesting system. As the world population is increasing day by day the demand for good quality of water also increases(1). *The world faces an increasing change in climate one should be alert to address climate change. The impact of water conservation is a sustainable source of environment wherein groundwater is the primary source to freshwater that provides for the demand of the environment, wherein Aquaspace is one of the decorative water features with a sub-surface rainwater harvesting storage system. Aquaspace provides access to clean, clear, and usable water along with decorative water features. Locating and storing rainwater underground maintains the integrity and beauty of home and landscapes.*

KEYWORDS: *ARM7 (Advanced Reduced Instruction Set Computer), LCD (Liquid Crystal Display), Harvesting, Rainwater, ROM (Read-only Memory).*

1. INTRODUCTION

About ⅔ of the earth surface is covered with water. However, the amount of usable water is very small. The growing population and growing industries and agricultural practices needs lots of water. The huge consumption of water is causing reduction of available water. We need to think about various ways to save and conserve water resources(2). One of the very important inventive measures for conservation of water is rain water harvesting. Basically water comes on the surface with rain, however it gets collected in the rivers which ultimately flows into the ocean. Which means that the usable water is lost in the ocean. We can catch the rainwater and prevent it from flowing into the ocean, this is rainwater harvesting(1).

There are mainly two methods for rainwater harvesting i.e.

1. Rooftop rainwater harvesting: during raining rain water gets collected on the rooftop. It can be transferred to a storage tank through a pipe. Often water contains soil particles and other impurities in such case water should be filtered to remove these impurities. Water stored in this storage tank can be used to fulfill our water needs. Instead of storage tank water can also be transferred to a pit in the ground from where it saves into the soil. The saved water gets added to ground water and so the level of water increases. In both ways we can prevent water from flowing away(3).

2. Roadside drains: Rainwater falling on the road gets collected in the drains. The drains can be modified so that the water entering in them get seeped into the soil or this water can be collected in a storage structure as well(4).

Apart from the above methods Aquaspace rainwater harvesting is one of the larger rainwater harvesting systems which can be constructed using a sub-surface rainwater exchange system(5). This system is a revolutionary design that combines a recirculating decorative water feature with a sub-surface rain water harvesting storage system(6). The clean, filtered water that is stored in the sub-surface can be stored for irrigation or to maintain the water level in the decorative water

feature. To make this Aquaspace rainwater more effective an LPC2148 controller which is an ARM7 based microcontroller with high performance of 32-bit RISC microcontroller with thumb extensions 512KB on-chip flash ROM with in-system programming and in-application programming, 32KB+8KB of data memory is used along with a raindrop sensor, LCD and an alarm, wherein the raindrop sensor will sense the rain water moisture, LCD is attached to the sensor to display whether the droplets is rain drop or not(7). An alarm to alert the presence of rain. Once the presence of rain is detected an input is sent to the controller and the controller makes the motor to open the valve of the pump. Then the water passes through the pump and we can further proceed to the harvesting process(8).

Rainwater collecting was first used only for irrigation. It is now used for irrigation, drinking, and household uses in many nations throughout the globe. It was usually taken from a rooftop. Harvested rainwater was utilized for drinking, household, and irrigation purposes in Texas and California, the Philippines, Germany, and Japan. Up to 50% of collected water in Canada was utilized for lawn and irrigation purposes. In both steep and flat regions, several water collecting methods were employed(9). Many indigenous methods, such as the Jhurjhuri, Phor, and Thagalok-kum systems, were utilized in mountainous regions for domestic needs. In Kaptai and Banderban, indigenous cross-dams and retention ponds were utilized for irrigation. In various regions of the Chittagong Hill Tracts, the Godha technique was utilized for navigating. Flatlanders have utilized a variety of water collecting methods on a local and big scale(10). Bacteria are almost non-existent in rainwater. Rainwater has a higher consistency of quality before it is intercepted than other water sources, with a few exceptions. A cloth catchment was fastened over the storage tank after the building was finished. Because of its non-toxic nature, the parachute cloth catchment was chosen. At the storage tank's intake, an initial flushing mechanism and a plastic net were installed. Dirt, bird droppings, and other debris may fall into the catchment, contaminating the water.

Small ditches in agricultural areas, pond harvesting, and other techniques were used. Rainwater was collected in tiny ditches, haors, and beels for supplemental irrigation. In Bangladesh, there were about 1.76 million ponds where water was gathered from rainfall and surface runoff. In certain regions where there is a significant salt issue, approximately 36% of families have been observed to collect rainwater for drinking purposes during the rainy season(11). In this respect, this study looked at the potential of collecting rainwater utilizing simple and low-cost technologies in Bangladesh's rural villages as well as highly populated cities like Dhaka. Rainwater was experimentally harvested during the monsoon at Bangladesh University of Engineering and Technology (BUET) using a small coverage area (15' x 15') created of water resistant cloth and a ferro-cement storage tank with an ability of 3200 liters for a family of 05 participants, and the rainwater was saved for 04 months(12).

Rainwater was much more cost-effective. The quality of rainfall was better without it, and by using it, the health of family members was managed to improve, medical costs were reduced, heavy objects for water collection from afar were reduced, water carriers were freed for productive activity, and if the water tank was on the ground surface, no energy cost was required to operate the system, and so on. Given the aforementioned considerations, it was apparent that a rainwater collecting system was possible(13).

Colors, soluble solids, total suspended solids, lead, clarity, roughness, acidity, pH, nitrate, fluoride, total coliform, fecal coliform, COD, and BOD were all examined as well as the quality of the collected rainwater. The kept rainwater had a marginally higher pH value (8.1 to 8.3) and the existence of coliform bacteria (when water is held for more than three months) was also discovered, according to preliminary test findings. The conventional filtration method fully eliminated pollutants, with coliforms accounting for up to 60% of the total(14).

An lpc2148 microcontroller is interfacing with a raindrop sensor which will detect the rain, an

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LED to display whether the moisture is rain drop or not and an alarm attached to make an alert. The rain water detector is used in the irrigation field, home automation, communication, automobiles etc. The drawback of this literature is it just detects the raindrop not showing the method of harvesting(15). This paper disclose creates a truly sustainable water feature using all rain water. The underground reservoirs comprise of the aqua box storage units, this are made from recyclable plastic and the modular nature of this unit allows it to put together in such configuration to meet the sight requirements for any size projects(16). The best thing about this system is we can drive heavy equipment over the top of the system once it is buried under the ground, it is very useful for commercial application. Aquaspace snorkel vault and centipede has a high efficiency pumping system and provides a convenient access point for inspection and maintenance(17). The rain exchange comes in free packets, easy to use kits and can also be customized for the larger or more unit projects. This entire process helps us to capture, filter and reuse rainwater(18).
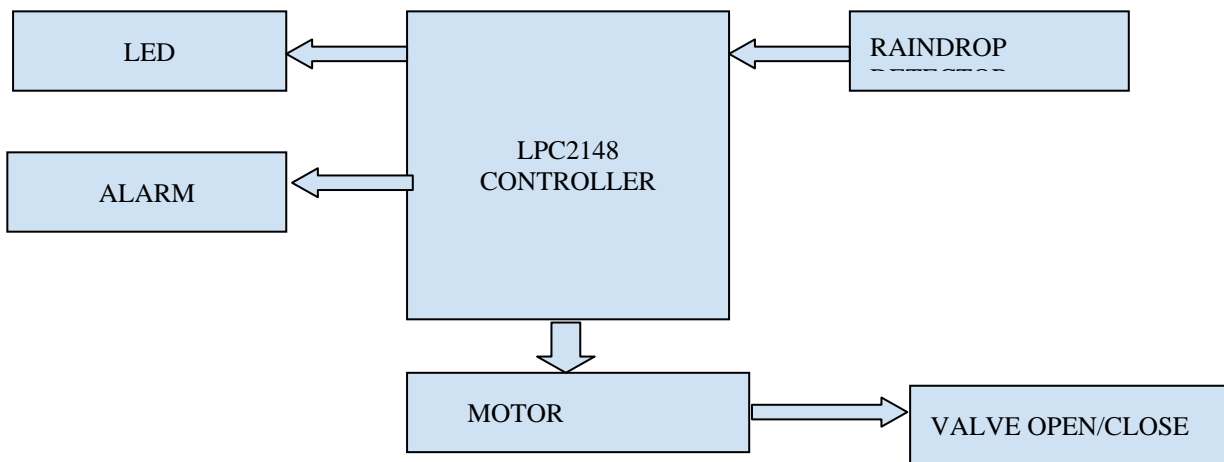
DESIGN

Figure 4: **This figure shows the block diagram of rainwater detection and storage process wherein a LPC2148 controls the entire process of rainwater detection system. Once the detector detects the rainwater the motor opens the valve to store the water for further use**(19).

This are the component used in my research paper to complete the Aquaspace rainwater harvesting system using ARM7 comptroller:

1. Lpc2148
2. Raindrop sensor
3. Led
4. Alarm(20).

2. DISCUSSION

Rainwater collecting was a highly helpful and accepted as low cost rainwater gathering methods in water limited regions and arsenic polluted areas. This supply of water may be a viable alternative in arsenic-contaminated regions. It may also be extremely helpful in places where clean drinking water is limited, such as Dhaka(21). The water quality was accepted as drinkable water in Dhaka regions for up to 4 months, and it was only relevant to this area since the air quality in those other cities may vary, and thus the rainwater quality may change. For the study's future growth, more care should be taken when the water is available in the storage tank, and the tank's inlet should be cautiously closed so that total coliform bacteria cannot encounter and grow in the tank for an entire year, or the water can be used as safe drinking water for an entire year(22). The first consideration in evaluating the reliability of a rainwater harvesting was the supply of water versus

its use or demand. The system's supply is determined by the amount of rain that falls during the year and the unpredictability of rainfall. The amount of demand placed on the system is determined by how much water is used**.**

Rooftop rainwater harvesting: rainwater is collected on the rooftop when it rains. A pipe may be used to transport it to a storage tank. When water includes dirt particles and other pollutants, it should be filtered to eliminate these contaminants(23). The water in this storage tank may be utilized to meet our water requirements. Instead of storing water in a tank, it may be sent to a hole in the ground, where it will be absorbed by the soil. The conserved water is added to underground, which raises the water level. We can stop water from going away in both directions. Drains along the roadside: Rainwater that falls on the road is collected in the drains. The drains may be changed so that the water that flows through them seeps into the soil or is collected in a storage facility. Aquaspace rainwater harvesting is one of the bigger rainwater harvesting systems that may be built utilizing a sub-surface rainwater exchange system, in addition to the techniques mentioned above(24). This is a ground-breaking device that blends a recirculating ornamental water feature with a subsurface rain water collecting storage system. The filtered, pure water kept in the subsurface may be used for irrigation or to keep the water level in the ornamental water feature at a constant level. The presence of rain is signaled by an alarm. When rain is detected, an input is given to the controller, and the controller instructs the motor to open the pump's valve. After the water has passed through the pump, we may begin the harvesting procedure.

3. CONCLUSION

Water is a basic need in everyday life. So saving water and using it in a proper manner is very important. Here is a project by which we can check the rainwater status, so that if the water status is confirmed motor valves get activated and rain water gets harvested. One of the beautiful and easy technique is used in this project to harvest rainwater i.e. Aquaspace rain water harvesting. By this technique we can capture, filter and reuse rainwater. The best thing about Aquaspace rainwater storage system is it adds beauty to our home. If each and every home follows this technique, we can give rise to a green environment as green earth is degrading day by day also we will be able to store large amounts of water for our daily use.In this research paper Aqua space rainwater harvesting is successfully done using an ARM7 controller. The process starts with the detection of rainwater, once the rain water is detected an input signal to the LPC2148 controller.

Then the controller converts the received input analog signal to digital signal. An output from the controller allows the LED to display the status whether the moisture is rainwater or not. If the detected moisture is rain water, then an alarm gives an alert to the authorized person and the controller sends a signal to the motor to open the valve. The open valve allows the rainwater to flow through the pipe and passes through the filtering process called Aqua space downspout filter. This filter is located at the base of the downspout and has a 300-micron bag located inside of it. It is made for the easy removal and capture of all the leaves, twigs, sediments and seeds that are generated from the roof. From here the water goes through a pipe system into the underground modular reservoir. The revolutionary design of a rain change system combines the modular underground reservoir with a decorated water feature. The benefit of that is we get the sight and sound of the water feature combined with aeration and filtration aspects of the moving water also gives us more usable water. Beneath there are thousands more reservoirs for capturing all the water, the water gets through into the modular and underground reservoirs. From this can circulate it to a decorated water feature. This creates a truly sustainable water feature using all rain water(25). The underground reservoirs comprise of the aquablox storage units, this are made from recyclable plastic and the modular nature of this unit allows it to put together in such configuration to meet the sight requirements for any size projects. The best thing about this system is we can drive heavy equipment over the top of the system once it is buried under the ground, it is very useful for commercial application. Aquaspace snorkel vault and centipede has a high efficiency

pumping system and provides a convenient access point for inspection and maintenance. The rain exchange comes in free packets, easy to use kits and can also be customized for the larger or more unit projects. This entire process helps us to capture, filter and reuse rainwater.

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