

Drip Irrigation System

Shruti Bhargava Choubey, Abhishek Choubey, D. Richitha, N. Sahithi

Sreenidhi Institute of Science and Technology

Abstract— *In the present environment preservation of water is one of the most important problem for everyone. while agriculture is the sector where water is the only resource and at present wastage of water is the most important thing that we are facing today this is because there is no proper method to save and control the wastage of water. we also know that the agriculture sector is the better usage of Irrigation system. in the current scenario the farmers should have a particular level in order to supply the water to their respective firms and it is very difficult to follow. since the process such as Drip Irrigation system makes our process better easy and automatic with the use of a simple circuitry which is of low cost i.e., sensors and amplifiers which can implemented even by poor farmers. this project focuses on using the required amount of water at perfect time in farms and nurseries.*

Keywords—*Drip Irrigation, LM3S5T36 Microcontroller, Soil Moisture Sensor, Wireless sensor Nodes.*

I. INTRODUCTION

The world population is increasing in the rapid rate and the requirement of food is also made difficult for everyone even the availability of firms and agriculture field requires a lot of water to provide such production of food. There by a new technology is required in order to reduce the use of more water for the irrigation system and the new technology was implemented to reduce the wastage of water i.e., Drip Irrigation System. Period removing of water from the earth is making the land which cannot be useful for irrigation. In the Drip Irrigation system water is supplied directly to the roots of the plants by drip by drip process. This technique was implemented even in India through Sprinkler Irrigation system and Drip Irrigation system. Tools used in Drip Irrigation system are pipes, plastic hose, valves, fertilizer tanks, pressure gauges, fertilizer injectors etc.

Temperature, Carbon Dioxide, humidity, groundwater and the light intensity are respective things to be considered for the process of drip irrigation. Components used in Drip system are IC LM3S5T36 (32 bit), LCD module, timer (32 bits), analogy to digital converter, sensors and amplifiers.

Here timer is used to automate the irrigation system. Sensors are allocated at the roots of plants. Soil moisture sensors are used to measure to measure the soil content. When the temperature changes the sensors won't be damaged. These sensors are used to reduce the 50% usage of water and it is allotted whenever the soil moisture is less it is measured using the Tensiometer. Sensors are placed

inside and the field at particular distance up to 0.5-1 metre. These sensors passes a signal to the microcontroller when the soil moisture is better up to a certain level then the microcontroller switches off the valves.

II. MODERN IRRIGATION SYSTEM

For growing the crops Irrigation is the only application and it is done with the water and soil. Usually Irrigation is the use of the economic resources and it helps us to increase the crop production over any Farms.

There is different Irrigation process that we can use in our Fields. They are as follows

- Localized Irrigation
- Drip Irrigation
- Surface Irrigation
- Sprinkler Irrigation

Localized Irrigation: In Localized Irrigation system water is supplied only at a particular part of the roots that is making only a small area moist.

Drip Irrigation: Drip Irrigation is one of the most popular Irrigation processes of all the other systems. It is process of supplying water only at the root zone in a drip by drip manner through pipes, emitters and valves which reduces the more usage of water and it is implemented in most of the field regions. It is also named as trickle irrigation or micro irrigation system. Drip irrigation system is shown in the below figure.

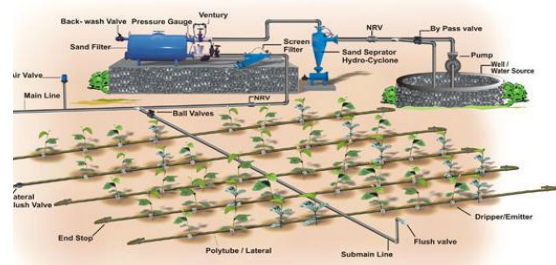


Figure 1: Drip Irrigation System

Surface Irrigation: Surface Irrigation provides water to the surface of soil and it is specified as the flood irrigation. Here is water is supplied uncontrollably irrespective of the type of field and the amount of water required.

Sprinkler irrigation:

Sprinkler irrigation system is implemented through the sprays, sprinklers etc... Here the sprinklers are placed in the respective places of the farm and water is sprinkled on the plants. It is mostly applied in parks and golf areas.

III. COMPONENTS REQUIRED FOR MICROCONTROLLER DRIP IRRIGATION SYSTEM

Components required for Microcontroller based drip Irrigation system are given below [1]:

- Water Filter
- Control Valve
- Pump
- Chemical Injection Unit
- Flow Meter
- Drip lines with Emitters.
- Micro controller Unit (The brain of the system).
- Moisture and Temperature Sensors.

Water Filter - It is advice used to filter out contaminants.

Control valve - It is used to control water to flow in the farm.

Pump - It is a device used to force a liquid to flow in a required direction

Chemical Injection Unit - It is the block that adds fertilizers, pesticides along with water and sprays whenever it is required.

Flow Meter - It is used to measure the volume or mass of a liquid.

Drip lines with Emitters - Drip Emitters are the devices that connect to the drip line or hose. These are essentially small, plastic nozzles that can be punched through the wall of main water line.

Microcontroller Unit - It is a small computer on a single integrated chip.

Moisture and Temperature sensors - It measures and reports both Moisture and Temperature at a particular stage.

Any drip irrigation based system requires the following parameters to be measured- sensor temperature, humidity, moisture in soil. For this various sensors are used. The field is divided into parts and each part is given a moisture sensor and temperature sensor. The sensors are placed inside the ground at required distance from the surface of the ground. As soon as the soil has enough moisture content, the sensors signal the microcontroller to turn off the system. The sensor output is first amplified at various stages before it is fed to the ADC to obtain digital reading. A LCD display is used to display the sensor reading and the status of valves. A chemical unit oversees the mixing of fertilizers, pesticides and nutrients with water and spray whenever required. A flow meter measures the total water used. All the readings obtained are sent to a central computer for analysis through the microcontroller unit. The microcontroller also uses its timer to turn off valves in case of sensor failure and sends a warning with the help of flow meter.

IV. ADVANTAGES AND CHALLENGES

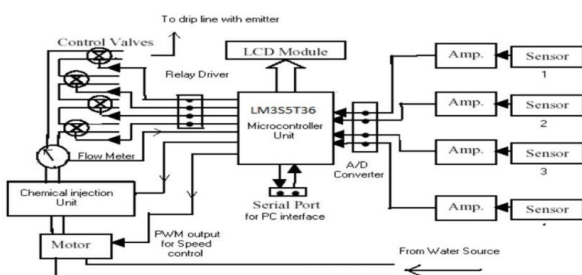
The following are the advantages for using Microcontroller based System for Drip Irrigation:

- Easy to Design and Install - As per the Block diagram the system is quite easy to design and implement. It doesn't require much expertise.
- Low cost - Since it is a microcontroller based system cost is less.
- Saves Water - Since it is drip irrigation based System only 30-50% of water is required when compared to conventional Systems.
- Control fungal diseases - If there is more than required water there will be chances of fungal diseases as fungus grows in moist conditions and it also reduces the crop production.
- Improves growth - Small amount of water improves growth as the water is provided at the root directly and it provides enough water to be absorbed properly.
- Versatile in nature - It is used in different climatic conditions and is pocket friendly.

Although there are several advantages but there are still some challenges that needs to be addressed:

- Limited to Large Farms - In future there should be a way through which it can be adopted even for small Farm's, so that more people can utilize it.
- Requires frequent maintenance - It is necessary to have continuous maintenance over the over the system and its operation.

III. BLOCK DIAGRAM & WORKING



- Limited lifetime – Its life is limited as the plastic components meteorite when exposed to long term up rays

V. CONCLUSION

It is a very innovative system and if the challenges are met the system could help lots of farmer's to improve the food production and helps to preserve the ecosystem. This Drip Irrigation System is the best technique used to improve the crop production with a limited use of water and with use of the simplest things such as a Microcontroller, Amplifier, sensors and the valves which supplies water directly to the roots itself by measuring soil moisture and Temperature etc..By the usage of the present technology we can still modify the challenges and save our Ecology which would be helpful for our next generations.

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