1. TITLE OF THE INVENTION

MULTI-TANK WATER LEVEL MANAGEMENT AND AUTOMATION SYSTEM

2. APPLICANTS (S)

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2. PREAMBLE TO THE DESCRIPTION

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in whichit is to be performed

MULTI-TANK WATER LEVEL MANAGEMENT AND AUTOMATION SYSTEM

FIELD OF THE INVENTION

The invention relates to the water management system. In various embodiments, the present disclosure relates to water level management in water tanks, water pump automation, and more particularly, to manage water level of multiple tanks and automatically controlling the state of water pumps to fill the water tanks.

BACKGROUND OF THE INVENTION

Water is an important fundamental for the rural and urban atmosphere and vital for all living creature, particularly for human life. The availability of water on earth for human consumption is very less (1%). Considerable amount of water is wasted during the water tank filling process. At least one person needs to supervise the water tank level and look after the water pump to turn ON/OFF. For multiple water tanks this becomes an important task to prevent wastage of water & protect water pump from dry run (running water pump in absence of water).

The prior art and NPL search related to this invention are mentioned below.

US20110035063A1, 2010, Some embodiments provide for water consumption monitoring and control system comprising of display and a data entry device, link to water meters, pressure sensors, temperature sensors, flush toilet vibration. In addition, the base unit has access to the Internet and can access a server which holds a database of water conservation information. The utility model focuses more on water monitoring & data collection part .

US10088852B2, 2016, discloses the claimed subject matter provides a system for multi-tank water heating system, which in some embodiments contain water heater system

including two or more water storage tanks plumbed in series, parallel or a combination thereof and methods of controlling said water heater systems.

The main objective of the present invention is to develop a system for automatically maintaining the water level in multiple water tanks & eliminating the need of human intervention to supervise the water tanks & water pumps during water filling process.

Therefore, the present disclosure overcomes the above-mentioned problem associated with the earlier available methods, system is needed. In the present invention, a solution for automatically filling the empty water tank. Invention also focuses preventing water wastage & dry run of water pump. The sensors & actuators utilized are standard sensors such as float sensor and solid-state relay.

The information disclosed in this background of the disclosure section is only for enhancement of understanding of the general background of the invention and should not be taken as an acknowledgement or any form of suggestion that this information forms the prior art already known to a person skilled in the art.

OBJECT OF THE INVENTION

The principal object of the present invention is to develop a multi-tank water level management and automation system.

Another object of present invention is to maintain the water level in multiple tanks by automatically turning water pump ON/OFF using solid-state relay.

Yet Another object of present invention is to automatically detect the arrival of municipal corporation water and turn on the water pump to fill the water tank.

Yet Another object of present invention is to prevent dry run of water pump while maintaining required water level in multiple tanks.

Yet Another object of present invention is to prevent wastage of water by closing the solenoid valve once water tank is filled up to its maximum capacity.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description taken in conjunction with the accompanying drawings in which a preferred form of the present invention is illustrated.

SUMMARY OF THE INVENTION

One or more drawbacks of conventional system/method for filling multiple water tanks and to overcome wastage of water and additional advantages are provided through the system in the present disclosure. Additional features and advantages are realized through the technicalities of the present disclosure. Other embodiments and aspects of the disclosure are described in detail herein and are considered to be part of the claimed disclosure.

The present disclosure relates to the water management system for household multi-tank water system, comprising of float sensors, solid state relays & microcontroller. The invention focuses on completely automating the process of water tank filling and eliminating the need to supervise water tank and water pump to prevent wastage of water.

In some embodiments of the present invention, multi-tank water level management refers to, maintaining the full capacity of water level in tank automatically. This is achieved by providing 2 float sensors at top and bottom of every water tank for detecting the water level and sending data to microcontroller. Multiple tanks water level data is sent to microcontroller through wired connection between microcontroller & sensor. Based on sensor reading, microcontroller process and takes action as programmed.

In some embodiments of the present invention, automation refers to automatically turning ON/OFF water pump, based on the water level in tank. If the water level in tanks falls to lowest level, the water pump associated to tank should automatically turn ON to fill the tank.

In some embodiments of the present invention, wherein the incoming water from

municipal corporation tap is detected by small container (102) arrangement and based on water level of tank (107), turning ON/OFF the solenoid connected in series, saves the water from wastage. In an aspect of the present disclosure, a central microcontroller collects the data from all the sensor and process it with a programmed logic, after that the microcontroller takes the required action of filling the tanks using solid state relays.

It is to be understood that the aspects and embodiments of the disclosure described above may be used in any combination with each other. Several of the aspects and embodiments may be combined to form a further embodiment of the disclosure.

One should appreciate that although the present disclosure has been explained for a defined, an overview of the multi-tank water level management and automation system all of which are also completely within the scope of the present disclosure. Various objects, features, aspects, and advantages of the inventive subject matter will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like components.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawing is included to provide a further understanding of the present disclosure and is incorporated in and constitutes a part of this specification. The above and still further features and advantages of embodiments of the present invention will become apparent upon consideration of the following detailed description of embodiments thereof, especially when taken in conjunction with the accompanying drawings.

Fig. 1 illustrates a schematic illustration of model of multi-tank water level management and automation system. The illustration comprises of the position of sensors, actuators, water pumps & pipe connection of multiple tanks, for better understanding of position of components, according to embodiments of the present invention.

Fig. 2 illustrates the block diagram of wiring connection of microcontroller, sensors, actuators & water pump, according to embodiments of the present invention.

Fig. 3 illustrates the multi-tank water level management logic flowchart, according to embodiments of the present invention.

Fig. 4 illustrates the municipal corporation water arrival detection logic flowchart, according to embodiments of the present invention.

It should be noted that the figure is not drawn to scale, and the elements of similar structure and functions are generally represented by like reference numerals for illustrative purposes throughout the figure. It should be noted that the figure does not illustrate every aspect of the described embodiments and does not limit the scope of the present disclosure. A person skilled in the art will easily recognize from the following description.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, numerous specific details are set forth in order to provide a thorough understanding of the embodiments of the present invention. It will be apparent to one skilled in the art that embodiments of the present invention may be practiced without some of these specific details. As the detailed description is concerned various stages are included in embodiments of the present invention, which will be detailed below. The stages can be carried out along with flowchart and by machine-executable instructions, which can be used to direct a general-purpose or special-purpose processor to carry out the procedures. If the specification states a component or feature "may", "can", "could", or "might" be included or have a characteristic, that component or feature is not required to be included or have the characteristic.

In any embodiment described herein, the open-ended terms "comprising," "comprises," and the like (which are synonymous with "including," "having" and "characterized by") may be replaced by the respective partially closed phrases "consisting essentially of," consists essentially of," and the like or the respective closed phrases "consisting of," "consists of, the like.

As used herein, the singular forms "a", "an", and "the" designate both the singular and the plural, unless expressly stated to designate the singular only. Moreover, all statements herein reciting principles, aspects, and embodiments of the present disclosure, as well as specific examples, are intended to encompass equivalents thereof.

In an embodiment of the present disclosure, Fig. 1 multi-tank water level management and automation system (100), a system comprising of water level float sensor (103), detects the water level in different water tanks and are used to send the float sensor data to microcontroller. Solid-state relay (105) is used to turn water pumps (106) ON/OFF

based on the programmed logic condition. The tap of municipal corporation water (101) is used to fill the tank 1 (107) in present disclosure. The small water container (102) in conjunction with float sensor (103) is used to detect the arrival of municipal corporation water. Details about detection of arrival of municipal corporation water are described below.

In an aspect of the present disclosure a central microcontroller (115), collects the data from the sensor network and communicates the action to solid-state relay (105) based on the logic program executed in microcontroller.

In the embodiment of the present invention, fig. 1 illustrates a block diagram of the whole system, the present invention system has an arrangement of tanks such that:

- tank 1 (107) is filled by the municipal corporation water tap (101);
- tank 2 (112) is filled by the previous tank1(107);
- similarly, any further tank will be filled by its previous tank.

In the embodiment of the present invention, fig. 2 illustrates the wiring connection between sensors, solid-state relays (105) & water pumps (106). The solid-state relays are connected to water pumps, to turn ON/OFF the water pump based on the logic programmed executed in microcontroller. The data obtained from sensor is processed in real-time to produce the output to solid-state relays.

In the embodiment of the present invention, fig. 3 illustrates the multi-tank water level management logic flowchart. In the following flowchart, whenever the tank2(108) is empty, the down float sensor (114) of tank2(108) will send low signal to microcontroller (115). As show in fig 3, step 3, microcontroller will check if previous tank1 (107) has water to fill tank2(112), this is done by checking the down sensor (109) status of tank1(107).

This process of checking the water level of previous tank will help to protect the water pump from dry run. If tank1 (107) has water, water pump (111) will be turned ON by

solid-state relay (110) and remain ON till tank2(112) is fully filled with water. In aspect of preventing the wastage of water while filling the water tank, the water pump automatically turns OFF, once the tank2(112) is filled up to its maximum capacity. In this way multi-tank water level is maintained automatically and it also prevents wastage of water and dry run of water pump.

In the embodiment of the present invention, Fig. 4 illustrates the municipal corporation water arrival detection logic flowchart. In the following flowchart, Municipal corporation water tap is always ON, whenever municipal corporation water arrives, the water is first filled in small container and then, float sensor (103) sends high signal to microcontroller.

As shown in fig 4, step 3, microcontroller will check, if tank1 (107) is empty to fill it with municipal corporation water, by checking status of up float sensor (108).

If tank 1(107) is empty the solenoid valve (104) will open and water pump (106) will be turned ON by solid-state relay (105) and remain ON till tank1(107) is fully filled with water.

When tank1(107) is filled up to its maximum capacity, solid-state relay (105) will turn OFF. Solenoid valve is also drained & turned OFF, this will save the wastage of municipal corporation water, as water will not overflow after tank is filled up to its maximum capacity.

Embodiments of the present invention are intended to include and/or otherwise cover any type of relay (105) and water level sensor (103) known to a person skilled in the art.

In some embodiments, the microcontroller (115) may include, but is not limited to, an application-specific integrated circuit (ASIC) processor, a reduced instruction set computing (RISC) processor, a complex instruction set computing (CISC) processor, a field-programmable gate array (FPGA), a Programmable Logic Control unit (PLC),

and the like. Embodiments of the present disclosure are intended to include or otherwise cover any type of the processor including known, related art, and/or later developed technologies.

ADVANTAGES OF INVENTION:

In the given embodiment of the invention, wherein the process of water level is automatically maintained by the system. It eliminates the need of supervision of water tanks by humans, and all the process regarding water system are performed automatically.

In the given embodiment of the invention, wherein the cost to implement this system in existing household water system, is very low as compared to any other automation alternatives. The operating cost of installed system is zero rupees.

In the given embodiment of the invention, wherein the model does not require any internet connection for its operation, system works on minimal energy (12vDc).
The system is tried and tested with prototype model.

These and few advantages of the present subject matter would be described in greater detail with reference to the following figures. It should be noted that the description merely illustrates the principles of the present subject matter. It will thus be appreciated that those skilled in the art will be able to devise various arrangements that, although not explicitly described herein, embody the principles of the present subject matter and are included within its scope.

SOFTWARE REQUIREMENT:

The software requirement for the proposed system is "Arduino Integrated Design Environment" for developing the code in C++ programming language. The code can easily be developed by basic knowledge of programming and referring the fig 3 & 4.

DETAILS OF COMPONENTS USED:

Float sensor: A water level float sensor is a type of level sensor, a device used to detect the level of liquid within a tank. It uses a reed switch mounted in a tube; a float, containing a magnet, surrounds the tube and is guided by it. A float switch works to detect the level of liquid in a tank by using a float, magnet, and reed switch system that automatically opens and closes when water levels rise and fall inside the tank. Once the dry contacts are opened or closed, they will send an electrical signal to microcontroller.

Solid state relay: This is DC To AC SSR-60DA Solid State Relay Module 3-32VDC/24-380VAC 60A. A solid-state relay (SSR) allows to control high-current AC load of water pump from lower voltage DC generated from microcontroller. Solid state relays have several advantages over mechanical relays. One such advantage is that they can be switched by a much lower voltage and at a much lower current than most mechanical relays. Also, because there are no moving contacts, solid state relays can be switched much faster and for much longer periods without wearing out. This particular solid-state relay can switch current loads of up to 60A.

Solenoid: This is 12V DC Electric Solenoid Water Air Valve Switch (Normally Closed). A solenoid valve is an electrically controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core (plunger) in its center. In the rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field. The magnetic field exerts an upwards force on the plunger opening the orifice. This is the basic principle that is used to open and close solenoid valves.

Microcontroller: The proposed invention has ESP8266 as microcontroller. ESP8266 has powerful on-board processing and storage capabilities that allow it to be integrated with the sensors and other application-specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, for the entire solution.

DESCRIPTION OF REFERENCE NUMERALS IN ACCOMPANYING DRAWING

100   MULTI-TANK WATER LEVEL MANAGEMENT AND AUTOMATION SYSTEM

101   MUNICIPAL CORPORATION WATER SOURCE TAP

102   SMALL WATER CONTAINER

103   CONATINER FLOAT SENSOR

104   SOLENOID VALVE

105   SOLID-STATE RELAY 1

106   PUMP 1

107   TANK 1

108   TANK 1 - UP FLOAT SENSOR

109   TANK 1 - DOWN FLOAT SENSOR

110   SOLID-STATE RELAY 2

111   PUMP 2

112   TANK 2

113   TANK 2 - UP FLOAT SENSOR

114   TANK 2 - DOWN FLOAT SENSOR

115   MICROCONTROLLERS

116   MULTIPLE TANKS ILLUSTRATION

CLAIMS:

We claim:

1. The system for multi-tank water level management and automation system comprising of;

    Float sensors (108) detects the water level in multiple tanks & provides the signal to Esp8266 microcontroller (115);

    Solid-state relays (105) are ON/OFF switches, that can turn ON/OFF the water pump for filling the water tank automatically.

2. The system for multi-tank water level management and automation (100) as claimed in claim 1, wherein microcontroller (115) is further configured to: Receive the signals from float sensor and produce the output to solid state relays.

3. The system for multi-tank water level management and automation (100) as claimed in claim 1, wherein microcontroller (115) is further configured to: Prevent dry run of water pump & wastage of water while maintaining required water level in multiple tanks.

4. The system for multi-tank water level management and automation (100) as claimed in claim 1, wherein microcontroller (115) is further configured to: Detect the arrival of municipal corporation water using small container (102) & float sensor (103).

5. The system for multi-tank water level management and automation (100) as claimed in claim 1, wherein microcontroller (115) is further configured to: prevent the wastage of municipal corporation water by closing the solenoid valve connected in series with pipe, once water tank is filled up to its maximum capacity.

ABSTRACT

MULTI-TANK WATER LEVEL MANAGEMENT AND AUTOMATION SYSTEM

The disclosed invention relates to a system for multi-tank water level management and automation (100). The disclosed invention comprises of float sensors (103) microcontroller (115) & solid-state relays (105) configured to maintained the water level in multiple tanks. When the water level in tanks falls to the lowest level, float sensor sends the low signal to microcontroller, after processing the signal, automatically water pump is turned ON using solid state relays to the fill respective tank.

In an aspect, microcontroller is configured to fill the tank only if the source tank has water to fill the destination tank, this prevents the dry run of water pump (running water pump in absence of water). In aspect of preventing the wastage of water while filling the multiple water tanks, the water pump automatically turns OFF, once the tank is filled up to its full capacity. The disclosed invention also detects the arrival of municipal corporation water and automatically takes all the actions required to fill and maintain all water tanks to their full capacity. No water is wasted while performing this automatic process, eliminating the need of human supervision mainly in household water system.