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WATER CONSERVATION IN RESIDENTIAL BUILDINGS (A CASE STUDY)

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ABSTRACT

Even though it is a well-known fact that we should conserve water as it is a 'sustainable resource' and to protect the water environment is the need of the hour, the efforts initiated by the citizens and others concerned are not sufficient. Out of the many strategies that are there in action towards the conservation of water, this paper highlights the most simple and economical method. That is conserving fresh potable water by using automatic water level controllers. A case study is undertaken to highlight the use of Automatic Water Level Controller in a household and the corresponding benefits are analyzed in depth**.**

KEYWORDS: Water Level Controller, Over Head Tank (OHT), Under Ground Tank (UGT), Pay Back Period (PBP), Programmable Logic Controllers (PLC)

INTRODUCTION

Over the years, increase in population, growing industrialization and expanding agriculture has pushed up the demand for water. To cope with the demand many techniques like rain water harvesting, etc are made mandatory to some extent. Also, recycling and desalinating technologies are adopted which are expensive and complicated often ignoring the simple methods like installing water controllers

INSTALLATION OF AUTOMATIC WATER LEVEL CONTROLLER USED IN THE CASE STUDY

There are many types available in the market. However this paper highlights the most simple and economical type. It consists of 2 simple PLCs one for the OHT and the other for the UGT. These 2 PLCs are din mounted type and occupies around 19 mm ^{3} of space which should be located (for convenience) near the switch which is used for operating the water pump. Then two sets of cables each carrying 3 sensors have to be laid one to the OHT and the other to the UGT. The 3 sensors are immersed in the respective tanks at 3 levels one at the top, one at the middle and one at the bottom.

Just to make the system more efficient, instead of one switch for the pump, 2 switches can be installed in parallel - one for auto mode and the other for manual mode

POWER SUPPLY REQUIREMENT

No special power connection required. The normal 230VAC, 50Hz which is supplying power to the pump through the switch can be used.

WORKING PRINCIPLE OF THE SYSTEM IN AUTO MODE

The switch in auto mode is kept 'on' all the time and the switch in manual mode is kept in 'off' position. When the water level in the OHT is less than half (depending on the position of upper and middle sensor) the respective PLC - Switches the pump 'on' till the OHT is filled to the required level and then, switches off the pump automatically. However this happens only if the water in the UGT is at least till the middle level sensor immersed in water. Otherwise the

respective PLC will show red LED and pump remains in 'off' condition till the water level in the UGT rises to the minimum required level.

Necessity of Manual Switch

Thus we observe that even though there is water still available in the UGT (but at lower level), pump remains in 'off' condition. And the pump will not get switched' on' till the water level raises in the UGT. Under an emergency situation where the municipality water will resume later and water in the OHT is empty, then the minimum available water from the UGT can be pumped by putting the manual switch 'on 'for a short period.

CASE STUDY OF WATER CONSERVATION

Table 1: Data Available

Area of the House with G+2	900 Sq. Ft. Per Floor
No of people residing	08
Capacity of OHT	2000 liters
Capacity of UGT	4000 liters
Rating of pump	½ HP
Height at which OHT is installed	30 ft.
On/off cycle of pump per day	2

Table 2: Calculations Made

Amount of Discharge Per Hour Capacity of Pump	1000 Liters (On Observation)
Amount of discharge	67 liters per minute
Minimum amount of time for which overflow occurs in the absence of level controller	5 minutes per on-off cycle Total 5*2=10 minutes
Amount of water saved from over flowing per day	67*10 minutes=670 liters
Amount of water saved from overflowing per month	670*30 days=20,100 liters
Amount of water saved from over flowing per year	20100*12 months=2,41,200 liters

Table 3: Cost Calculations and PBP

Cost of installation of water controller	Rs 4000
Cost saved per year on water bills @ Rs15 per 1000litres	15*241.2=Rs3618
Payback period	**1.1 year**

Other Benefits

- The saved water can cater to other families. Hence the demand reduces.
- The building maintenance including the painting reduces since the slabs are not getting damped due to no over flow.
- Dependence on building watchman reduces. Many times, the watchman will be sleeping or forgets to switch off the pump and hence the actual amount of water wastage is much more than figured above.
- Pump's thermal life is improved as it is 'on' for lesser required time only along with Electrical Energy Conservation.
- Above all, the most important 'water conservation' is done in one way at least.

CONCLUSIONS

As we have seen in the above analysis, the demand for water reduces. If only the occupants are educated and the most important of all, installation is made mandatory for all the new and existing buildings by the concerned authorities. Also it is achievable at a meager cost and a onetime investment with multiple benefits when lakhs of buildings incorporate the ‘level controllers’

REFERENCES

1. Case study taken from the residence in Navi Mumbai where the water controller is actually installed.