

## ADOPTION OF IMPROVED TECHNIQUES FOR WATER MANAGEMENT IN BUILDINGS

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**Abstract :** Less than 1% of fresh water is available for human use, and as a result of that, 31 countries face chronic drinking water shortages today. We know that as a part of any building, water usage plays an important role. As water cannot be created, we have to use the available one, and as the sources are depleting at an alarming rate, we have to use it wisely. Therefore, it becomes our duty to see that our building consumes minimum amount of water, which can be done by implementing many techniques. This paper discusses the importance of making our building more water efficient, and the methods and techniques to achieve this goal. It also includes case studies of some buildings which have implemented these techniques and are now saving 30-40% more water than the usual buildings of the same capacity.

**Keywords :** Water Management, STP, Low Flow Fixtures, IAPMO, WEP-I.

### INTRODUCTION

According to the United Nations environmental program, buildings consume 20 percent of the world's available water, a resource that becomes scarcer each year. In the upcoming years, water efficiency and conservation will become critical factors in green design, construction and product selection. Conservation of water calls for urgent and immediate measures. Increasing population, high rate of urbanization and associated changes in lifestyles, etc. are all contributing towards rising water demand. The concept of water efficiency is to "do more with less" without sacrificing comfort or performance<sup>[1]</sup>. In India, non-profit organizations such as IAPMO-India and IPA, work towards the management and conservation of water through many techniques. They have also designed codes such as 'Uniform Plumbing Code' and 'Green Plumbing Code Supplement', which if followed properly, can account for 35% or more savings in water consumption<sup>[2]</sup>. This paper not only paints you a clear picture of the problem, it also offers you the solution. If we talk about buildings, there are many things, which if modified a little bit, can account for a high amount of water saving. Now I accept

that there are some purposes, like drinking, which would always require fresh water. But, for other parts of the building, we can always use recycled water, and if that is not enough, we can also save about 40% of water by changing the bathroom fixtures. Constructing an STP in the premises is a good way to start saving, as the water from STP can be used in landscaping, chilling towers, urinals, and the sludge can be used as manure. Now, as part of this research, we have included case studies of buildings in which a lot of measures have been taken to make them "water efficient".

### PRESENT SCENARIO

Up until now, energy conservation had been the area of primary focus for all engineers, and water management had always been the most overlooked portion of the whole building design strategy. But, now the situation has changed, and developers all over the world are considering water efficiency in a building, a major part, and not just something to increase their ratings (for a green building certification). As the water resources keep depleting at an alarming rate, and water scarcity hits the globe dramatically, water conservation does not

remain an "option" anymore, it has become a necessity. Presently the techniques used for water management in a building are

**Water Reuse and Recycling<sup>[3]</sup>**- Recycling and reusing waste water is always a good way to reduce fresh water consumption. It can be achieved by installing an STP(Sewage Treatment Plant) in the premises and using the effluent for purposes like landscaping, flushing, cooling tower makeup water, and also, the sludge from STP can be used as manure.

**Rain Water Harvesting<sup>[3]</sup>**- One of the oldest and the most commonly adopted techniques for water conservation is capturing and storing the rain water. The rain water from the entire catchment can be collected and directed towards either an artificial cistern created inside the premises, or to recharge the ground water table.

**Plumbing Fixtures<sup>[1]</sup>**- Installing low flow plumbing fixtures and dual flush toilets can also amount to a great deal of water saving. It is a very planned and challenging thing and cannot be easily achieved in existing buildings. So in India, this technique is not usually practiced in existing buildings.

**Water Efficient Landscaping<sup>[1]</sup>**- Landscaping accounts for one of the major water consumption areas. By adopting simple measures like reducing the amount of turf, planting native, climate appropriate plants, and designing an efficient irrigation system, it can be converted into one of the key areas of water saving.

## CASE STUDY STATISTICS

### DLF Cybercity- Gurgaon<sup>[4]</sup>

In a place like Gurgaon, where 70-230 million litres of ground water was taken every day by over 30,000 tubewells, DLF realized the importance of water conservation, and invested heavily in its project, Cybercity, to recycle waste water and to build a rain water harvesting network, to ensure that we do not run out of our resources in an early time. Some of the key water management features of DLF Cybercity, Gurgaon, are-  
During peak summer, DLF Cybercity

consumes about 9.5 MLD(million litres per day) of water. The local authority supplies only about 3-3.2 MLD of water which is used for drinking, pantry and wash basins purposes. To fulfill their requirements, DLF has installed an STP with a capacity of 7 MLD, which recycles 100% of waste water, which is used for flushing and horticulture needs. Further, 100% of STP sludge is used as manure for horticulture.

To help in increasing the ground water level, DLF has installed 33 rain water harvesting pits in various areas to recharge storm water across the entire Cybercity. In July-Oct,13, during a period of 3 months, it was noted that the ground water level had gone up by 5%. The STP inside the premises caters to 60% of water requirement at Cybercity. It conserves our precious resource, water, by recycling 6.5 million litres per day. It saves over Rs. 50 lakh per month on private water supply rates, because the remaining need is met by their STP only.

**Hotel Holiday Inn, San Antonia, Texas<sup>[5]</sup>** As water demand grew more and more in Texas, the San Antonia Water System developed its Water Saver Hotel program, in 2007, to retrofit bathroom fittings and fixtures of select hotels. The Holiday Inn, San Antonia, a 236,000 sq. feet hotel with 397 guest rooms, was one of the first to participate. Through the program, the hotel upgraded bathroom fixtures in all 397 rooms to high efficiency toilets, showerheads, and faucets. For details related to number of fixtures replaced, please see the Table-1

Table 1. No. of Fixtures Replaced

Fixture Replaced	Original Efficiency	Retrofit Efficiency	No. of units replaced
Toilets	3.5 gallons per flush (gpf)	1.1 gpf	297
Toilets	5 gpf	1.1 gpf	100
Faucet Aerators	2.2 gallons per minute (gpm)	1.5 gpm	397
Showerheads	2.5 gpm	1.75 gpm	397

Earlier the hotel used 202 gallons of water per occupied room per day. After the retrofitting, water usage dropped 35% to 132 gallons per occupied room per day, resulting in a saving of about 580,000 gallons a month, or 7 million gallons of water each year. The hotel saves \$35,000 each year in water and sewer bills from reducing its water use. Because much of the water saved is hot water, the hotel also saves energy from these upgrades. Based upon typical hot water use from showerheads and faucets, the hotel likely saves an estimated 330,000 kilowatt hours of electricity and an additional \$33,000 per year in energy savings, for more than \$68,000 in total savings each year. The hotel recovered its \$100,000 retrofitting the 397 bathrooms in a period of less than 2 years.

#### TECHNOLOGIES AND APPROACH FOR THE FUTURE

Since water scarcity continues to be one of the major concerns among scientists all over the world, they have come up with some technological advancements in this area as well. Some of the new technologies for bathroom fixtures are-

**Toilets with 300 ml flushing**<sup>[6]</sup>- There was a time when toilets were flushed with 10-15 litres of water per flush. Hindware has come up with some excellent advancement in this area with double symphonic toilets, which have an air extractor fitted between pan and cistern, thus helping in removing the waste in a 300 ml flush only.

**Two Step Faucet**<sup>[6]</sup>- Another excellent fixture which can save up to 70% of water with its unique eco click feature. In this, the cartridge provides a slight resistance as it reaches approximately half of its full flow capability, saving water. For increased flow the eco-click feature can be overridden.

**Showerheads with Air Diffusers**<sup>[6]</sup>- Up to 35% of water can be saved with this new innovation in showerheads. It includes little air vents inside the showerheads, which diffuses air with water to make the droplets

bigger so we get the feeling of a large volume of water, even though the actual consumption is less.

**Waterless Urinals**<sup>[7]</sup>- Urine contains a large amount of water, and does not require additional water to flush it out. Flushing is usually done to overcome the odour of the urine. Waterless urinals consist of a trap filled with oil on top of water. When urine passes through this trap, the gases causing odour do not come out because of the oil membrane, and thus reducing the need of flushing. Studies show that on an average, we can save between 56,800 to 1,70,000 litres of water per urinal per year.

#### IDEAS AND APPROACH FOR THE FUTURE

If we make use of such technologies and manage our water usage in a well planned way, we can definitely avert the upcoming danger of water scarcity.

Here are some ideas which can be followed to minimize our water requirements-

**Water Audit and Monitoring**- The first thing a building should do is to check on their current usage and wastage of water. Water audits should be conducted to see where we are wasting more water than required, so that we have a clear view of the areas where water can be saved. This monitoring should be done regularly to check the effectiveness of our practices. Apart from that, regular inspection and maintenance of leaks should also be done.

**Using Water Efficient Products**<sup>[2]</sup>- The International Association of Plumbing and Mechanical Officials(IAPMO), together with the Indian Plumbing Association(IPA), have come up with a rating system for sustainable plumbing in India. Water Efficient Products - India, commonly known as WEP-I, is a set of recommendations related to plumbing products. It gives star rating to various products like water closets, urinals, showerheads, and different types of faucets, and claims that by using 3 star rated products, we can save almost 30-60% water as compared to conventional products.

**Landscaping with native plants-** Native plants are more adaptive to the local climate and thus require less watering and maintenance. It is always a good idea to use local plants, rather than imported ones, for landscaping. Only recycled water should be used for landscaping. Automated sprinkler systems with limited flow should be installed.

**Following the Codes<sup>[2]</sup>-** The IPA and IAPMO have written, and are still writing, several codes for those involved in the design and engineering of water management in buildings. They claim that by following codes like the Uniform Plumbing Code- India(UPC-I), and Green Plumbing Code Supplement-India(GPCS-I), we can save 35% or more on our water consumption.

**Education and Awareness<sup>[8]</sup>-** Implementing water efficient technologies and retrofitting the fixtures alone might not help, unless you have educated the people on the proper use of the device. For example, dual flush toilets may result in more water consumption than traditional ones if people do not know the meaning and purpose of two flushes. Certain steps which can be taken in this direction are-

- Place “How To Use” signs on new equipments;
- Establish a simple system, like a hotline, to report leaks and low maintenance, and spread its awareness among people;
- Provide best water saving tips to people and post water usage statistics of each month, so that occupants take interest and continue practicing the techniques.

**Reclaim-Recycle-Reuse (A set of miscellaneous measures)<sup>[9]</sup>-**

- Install an STP and recycle as much water as possible;
- Use low flow fixtures, 3 star rated products with latest technologies like air vent showerheads, waterless urinals, and sensor faucets;
- While retrofitting, always consult experts, and form a well detailed plan;
- Use only recycled water for flushing, landscaping, and cooling tower management;

- Always look for alternative measures and new technologies and methods to save water, and spread their awareness.

## CONCLUSION

So far we have established the fact that water saving is a must and we have to take prominent measures in this direction, if we do not wish to see our resources depleted. We have also seen cases of buildings which have implemented such measures and are now saving more water than other conventional buildings of same capacity. But these methods alone are not enough, we have to continuously search for alternative means of water saving, to contribute more towards the cause. This paper aimed at providing such measures and their effectiveness. The technologies discussed in this paper are latest, and most efficient ones, and all the methods, if followed properly, can contribute to a huge amount of water saving.

## ACKNOWLEDGMENT

Authors are thankful to the Indian Green Building Council for providing a platform to interact with various experts of the area. They are also thankful to Mr. Amit Grover, National Director, DLF (Offices) for providing their statistical water saving data. They extend their sincere gratitude to Ms. Neeta Sharma, Managing Director, IAPMO India, for discussing various water saving measures, present scenario in India, and their efforts to better the situation. They are also thankful to her for sharing details of the codes and WEP-I. Last, but not the least, authors are most thankful to Mr. V. Krishnamurthy, Vice President, HSIL, for sharing their latest technologies in plumbing fixtures, and explaining their details and working.

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