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**Ramkrishna Jana**  
Assistant Professor,  
Amity University, Kolkata,  
West Bengal, India

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### Rainwater harvesting in hotel industry

**Ramkrishna Jana**

#### Abstract

Rainwater which is a very important natural source & can be utilized by even the hotel industry in numerous ways. Recent developments have shown that rainwater should be utilized for toilets, washing, cleaning purposes, etc. Rainwater if stored properly after treatment can be used for laundry, kitchen for cleaning, bathrooms, and other places. It saves lot of expenses for the management as well as environment friendly. Hotel industry also uses it for harvesting herbs & small plants required for kitchen. Hotel industry with the various recent trends including reduce, reuse, and recycle process have reinvented the rainwater in its all purposes.

**Keywords:** Flushing, disinfection, cooling towers, potable

#### Introduction

In the twenty-first century, clean water is a scarce resource. Rainwater collection is becoming such a significant concern as a result. It can be broadly characterized as the collection and storage of rainwater for a range of purposes, such as livestock irrigation, household cleaning, indoor heating, etc. This gathered water can potentially be made into drinking water with the right technological equipment. Rainwater harvesting has a lot of promise in the hotel business because of its many possible applications.

Rainwater harvesting is one of the most effective water management and conservation methods. It entails collecting and storing rainwater on the surface or in a subsurface aquifer before it runs off as surface runoff. In times of need, the augmented resource can be harvested. Artificial recharge to ground water is a process that augments the ground water reservoir at a rate faster than natural replenishment. The collected water is stored and distributed via a separate pipe system. This is a very useful method for lowering the cost and demand for treated water as well as lowering the operation, maintenance, and distribution costs of treatment plants.

#### Methods utilized

The method utilized is mainly qualitative & information noted from the hotels using various recent trends adopted for the utilization of the rainwater its proper storage & various other new developmental approaches through which the hotel are benefitted. Few questionnaires was also circulated to analyze the requirement.

#### Toilet flushing

The most common application of collected rainwater in lodging facilities is for toilet flushing. This makes sense given that the aforementioned water performs its function adequately without the need for additional processing or disinfection. Every day, a large number of people travel through hotels and lodges; the administration must provide for them correctly. But considering how valuable and scarce drinking water has become, flushing it down the toilet is definitely a waste. As a result, several environmentally conscious companies are pushing for the adoption of rainwater harvesting in the hotel sector.

#### Cooling towers

Unbelievably, the cooling towers are the main users of water on the property. The tests will reveal a startling fact: during the summer, cooling towers use around 40 litres of water every square metre of an air-conditioned space. This information is quite unsettling if the cooling towers are using potable water.

**Corresponding Author:**  
**Ramkrishna Jana**  
Assistant Professor,  
Amity University, Kolkata,  
West Bengal, India

It makes considerably more sense to attach a rainwater harvesting system to the cooling towers of a hotel with more than five stories and use the gathered water for refrigeration.

### **UV Water disinfection**

UVGI, or ultraviolet germicidal irradiation, is a very efficient technique that can be used to disinfect water. It employs short-wavelength UV radiation to kill or at least harm a variety of harmful microorganisms, including moulds and other pathogens in addition to bacteria and viruses, that reside in the collected rainwater. A property involved in the hotel industry can invest a little money today to save a lot of money later thanks to this use of contemporary commercial UV water treatment systems, which opens the door to a far larger variety of uses for collected water.

### **Irrigation**

UVGI, or ultraviolet germicidal irradiation, is a very efficient technique that can be used to disinfect water. It employs short-wavelength UV radiation to kill or at least harm a variety of harmful microorganisms, including moulds and other pathogens in addition to bacteria and viruses, that reside in the collected rainwater. A property involved in the hotel industry can invest a little money today to save a lot of money later thanks to this use of contemporary commercial UV water treatment systems, which opens the door to a far larger variety of uses for collected water. These canals are linked to the reservoir created to catch dew and rainwater rather than the river. These irrigation systems can be used in the hotel industry to water the vast green fields and gardens that are often present for cosmetic purposes.

In addition, this independent water source can be used for irrigation as a backup water source during severe droughts. The application of such techniques can help preserve the lovely flowers and plants that adorn hotel facades, especially if a filtering system is included.

### **Washing machines**

Washing machines come in second place to cooling towers in terms of water waste, although they are not by much. In reality, based on statistical averages, a household wastes about 35 litres of water per night in washing machines! Hotels are among the biggest users of washing machines since they need to wash clothes constantly. In order to combine this with rainwater harvesting, hotels need to invest in the right treatment technology. For a longer lifespan of the washing machine, heavy metal and limescale filtering systems take precedence over microbial disinfection. Since most of these machines wash with hot water, the disinfection issue will mostly be handled by themselves.

The current state of rainwater harvesting is far from perfect; the promise of its potential is not being completely realised, but innovative technology and green thinking can herald in a new era of water recycling. The majority of commercial buildings in the western world can only currently use harvested water for non-potable purposes. However, the current level of rainwater harvesting's usefulness indicates a lot of intriguing potential for usage in the hotel business that are both practical and cost-effective.

The viability (and popularity) of rainwater harvesting is growing as a result of a number of causes.

All manufactured goods are growing more affordable, superior, and intelligent. Complex controls that formerly needed human interaction can now be automated, failsafe, and viewable online.

The cost of water is rising. Water departments have switched from charging high users less per gallon to charging them more. Raising water prices can be less divisive politically than raising taxes because water agencies are frequently governed entities. Water departments still don't assign a price to the cost of the water they sell as of this writing. only overhead costs.

### **Cooling tower makeup**

The biggest water user on the property is typically cooling towers. During the summer, cooling towers typically utilise one gallon of water per month for every square foot of air-conditioned area. Therefore, a hotel with a cooling tower and seven or more floors will use all of the water available for cooling tower makeup.

### **Toilet flushing**

This is a common use of water, but it may not be as cost effective. Many toilet flushing treatment systems clean the water to the point where it is safe to drink, and we joke about making it safe for people to drink from the toilet. We all know it's not necessary, but customers expect toilet water to be clean and odor-free right away. Many west coast engineers and owners, particularly in the Pacific Northwest, have progressed past this and only filter the sediment out. Another cost associated with using rainwater to flush toilets is the requirement to run both potable and nonpotable piping to each bathroom in the building.

### **Potable**

Because we don't have to run separate piping, full potable rainwater harvesting may actually be less expensive than toilet flushing alone. Negotiating compliance regulations, on the other hand, is beyond the scope of this article.

Returning to our D.C. example, if this is a 15-story luxury hotel, there is a good chance that a water-cooled chiller and cooling tower will be used. All of the roof's rainwater can be used to fill the cooling tower.

Sizing the tank is a combination of science, art, and a 20-year weather forecast. We rainwater experts have heated debates over which method is best: monthly average, daily history, and so on. Consider two facts: we can't use more than we have, and collecting everything available is usually not cost-effective. Returning to our project's purpose, the most cost-effective solution means that we will most likely waste some water during floods and run out during droughts. Because tanks are the most expensive component, getting agreement from the owner is critical.

A crucial factor to take into account is the type of tank, whether it is underground or above ground. In general, above-ground tanks cost \$1 per gallon cheaper than below-ground tanks. When the tank capacity is 10,000 gallons or less, plastic tanks are by far the most economical. Concrete is resilient and affordable, particularly when used as part of the foundation. Concrete also lessens the naturally acidic nature of rain. Steel tanks are most frequently used for business installations that are above ground since they are less expensive and make conservation efforts more visible. Aeration and recirculation are sufficient in all but the

harshest areas for freeze prevention, proving that it is not as difficult as some people believe.

Treatment is another large expense. It's a multi-step process in some cases. Most important is the prefilter that keeps leaves and larger debris out of the collection tank. These filters have coarse screens, and are installed in the downspouts or other conveyance piping prior to the tank. The first of these products use a vortex action, but other manufacturers use a cascading or "jump" action. While we suppliers have great debates about our technology versus others, especially efficiency and maintenance requirements, the important message is that all the water that reaches the tank is quite clean. Left alone, the water actually gets cleaner as it sits in the tank. A biofilm will grow on the tank surface, and those organisms clean the water naturally.

Another significant cost is treatment. In some cases, it is a multi-step process. The prefilter is crucial in keeping leaves and larger debris out of the collection tank. These coarse-screen filters are installed in downspouts or other conveyance piping prior to the tank. The first of these products employs a vortex action, whereas others employ a cascading or "jump" action. While we suppliers debate our technology versus others, particularly in terms of efficiency and maintenance requirements, the important message is that all of the water that reaches the tank is quite clean. When left alone, the water in the tank becomes cleaner. A biofilm will form on the tank's surface, and the organisms will naturally clean the water.

On sometimes, we come across designs that continuously treat collection tanks. In our experience, this is rarely necessary. Designing the intake and overflow to prevent stagnation, using regular prefiltration, and allowing the biofilm to form will naturally maintain the water clean.

The water in the tank is pure and secure enough to use without additional treatment for our irrigation and cooling tower makeup applications. It's almost sure cleaner than cooling tower water, which very certainly already has a treatment system. To safeguard any drip emitters, you could want to add a sediment filter to irrigation systems; alternatively, it might already be included in the irrigation design. Eliminate duplication by working together.

Sediment filtration is unquestionably required for toilet flushing applications in order to keep flush valves operating properly. To clear the water, use a carbon filter for jobs under 20 gpm or a UV light for larger jobs. When using UV, match the size of the sediment filter screen to the UV requirements. One UV sizing tip is to use a day tank. As we all know, toilets come in a wide range of styles. We can fill the day tank once and turn off the UV for the rest of the day if we size it for expected daily use. The filters and transfer pump can be significantly downsized from peak demand without affecting service.

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Here as well, we occasionally observe ongoing UV treatment. Again, treated water will stay that way for weeks in the majority of applications. Let's try to conserve energy and bulb life. Drain the day tank before usage if the water quality is an issue following a seasonal shutdown. Experience is helpful in other situations, such as when sizing sediment filtration. Although rainwater is not always crystal pure, it is unquestionably far clearer than water from a river or a creek. Because of the tiny screen perforations (often 25 or even 5 micron), filter manufacturers may advise using larger filters than is actually necessary. Find a trustworthy application expert. This is sound advice for many of the goods you mention.

We occasionally see continuous UV treatment here as well. Again, treated water will remain so for weeks in most applications. If possible, let us save energy and bulb life. If you're concerned about water quality after a seasonal shutdown, drain the day tank before using it.

Another situation in which experience is useful is when sizing sediment filtration. Rainwater is not always crystal clear, but it is far clearer than creek or river water. Because of the small screen perforations (typically 25 or even 5 micron), filter manufacturers may recommend larger filters than necessary. Find an application expert you can rely on. This is sound advice for many of the products you specify.

## Conclusion

The standby connection is the last element to be covered. Even in times of drought, we Americans will want to run the air conditioning, flush the toilets, and possibly irrigate the yard. As a result, we frequently have a standby connection to the city's water system. An air gap connection into the collection tank is dependable and affordable for cooling tower and irrigation applications. More advanced techniques that are outside the purview of this paper can help with toilet flushing applications.

Standby connection is the final element to go over. Even during a drought, we want to keep the building air conditioned, flush the toilets, and sometimes irrigate the yard. Therefore, we typically have a backup link to the city's water system. An air gap connection into the collecting tank for cooling tower and irrigation applications is dependable and reasonably priced. More complex techniques that are outside the purview of this paper can be advantageous for toilet flushing applications.

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