

**MODERN CONCEPT OF RAINWATER HARVESTING SYSTEM WHICH CAN
ENSURE THE WATER QUALITY FOR LONGER DURATION FOR DOMESTIC AND
INDUSTRIAL PURPOSES**

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ABSTRACT

Water is becoming a scarce commodity of the 21st century and the demand of water for human is increasing day by day. Global increase in population, resulting in urbanization and industrialization has put additional stress on water management. The reason is that no sincere attempt is made to replenish the ground water table with rainwater during the monsoon. Rainwater harvesting is capable to combat water crisis and serves as an alternative water resources during the water shortage period [3]. The efficient and high-quality rainwater harvesting systems with proper guidelines and technologies assemble all the needs of water and can conserve the water for our future. In this regards, the present article proposed an effective method of complete rainwater harvesting conservation system which can meet the several objectives which includes a self cleaning primary filtration system, to ensure the quality of water inside the storage system by proposing standardized protocols for rainwater storing, a system to provide oxygenation to maintain the quality of water for a longer duration in storage tanks, a provision of outlet having the purpose of removing floaters, groundwater recharging and an effective extraction system for collecting water from the cleanest part of the storing system. In the past, precise need for rainwater harvesting is only confined to regions where no potable ground and surface water are available, which includes deserts, dry lands and islands. Current scenario has entirely changed, due to several reasons like saltwater intrusion in coastal areas, contamination of agricultural and domestic wastes in ground and surface water, pathogenic contaminants in potable water etc., which demands the application of effective rainwater harvesting in the majority parts of the world. The Rain water harvesting is the need of the hour and an effective method of Modern Rainwater harvesting system which can successfully harvest rainwater by using self cleaning filtration units which can handle maximum rainfall with provision for maintaining the quality of water for a longer duration i.e., mainly meant for using in dry periods is indispensable. The rain water harvesting system discussed in the present article is widely accepted all over the world and it is a solution for the problems facing by the conventional rain water harvesting systems.

INTRODUCTION

Water is considered as the source from where life began and hence it is one of the most commonly used and precious substances in our earth. Water bodies of every form – oceans, seas, rivers, marshes or ponds –have been the niche for thousands of species of flora and fauna. Water is indispensable for Human and nature.

It is obvious that not only the increase in global population but the usage of water for human needs like agriculture and industry also increases the concern about potable water to meet our needs. It is imperative to take adequate measures to meet all the water needs of the living beings in the world. Rainwater, which is the freshest form of water, would be an immediate source to augment the existing water supply by "**Harvest Water While it Rains**".

Rainwater harvesting (RWH) and recharging of groundwater is emerging as a sustainable strategy to cope with the increasing pressure on insufficient freshwater resources. Rainwater harvesting is the “Conscious collection and storage of rainwater to cater demands of water, for drinking, domestic purpose & irrigation”[1]. In the world, lots of rainwater harvesting systems are present. But many of the systems are reported as failure due to lack of better systems and technologies. It was well reported that harvested rainwater can meet almost all our daily needs and enables water conservation [2].

A German company for complete rainwater harvesting system solutions, WISY AG has been a global provider for high quality rainwater harvesting systems since last 25 years. **Mr. Norbert Winkler, “The man who conquered the rain”** found the WISY AG in 1989. To protect and conserve water was Norbert Winkler's great mission. WISY is now securely established as a global provider of rainwater harvesting products with partners in over 40 countries as a result of its unique filtering concept. WISY is a founder member of the German Association for Rainwater Harvesting and also participated in the DIN committees which drew up the currently applicable standards. The durability and the reliability of its products is the distinctive feature of the WISY brand.

METHODS & MATERIALS

WISY 4 STEP WATER CONSERVATION SYSTEM METHODOLOGY:-

Figure: WISY Water Conservation System

STEP-1:- Fine filtration and oxygenation of harvested rainwater either by using Downpipe Filter Collector / Filter Collector or by Vortex Fine Filter.

STEP-2:- Stable Sedimentation and Oxygenation of filtered water in the storage by using Smoothing inlet.

STEP-3:- Extraction of water within the cleanest level of the tank with Floating Suction Filter.

STEP-4:- Multifunctional overflow control by Multisiphon.



GENERAL STEPS

A high-quality and modern technologies of Rainwater Harvesting Systems pursue some of the procedures and guidelines. They are as follows

1. COLLECTION OF RAINWATER

For harvesting, rainwater can be collected from roof surface by gutter and downpipe or by surface water intake in case of flat roofs. The quality of the water collected depends in part on the roofing material. All roof like surfaces are perfect for harvesting the rainwater.

2. FILTRATION

For the water quality and the failure free operation of rainwater utilization plant the most critical component is the filter. The rainwater from the roof should generally be filtered with a Vortex filter before entering the storage tank (for orientation: mesh size is 0.3 mm). Simple physical filtration is sufficient for removing the suspended particles from harvested water.

The best way to filter the water is at the source. Most all filters work on an efficiency principle, which means that depending on flow rate, all or a portion of the water is filtered before entering the storage tank. Vortex type of filters, designed to create a highly efficient rainwater harvesting system that cannot be blocked because of its construction should be used.

Vortex filtration system should consist of vertical cylindrical type of filter. By the adhesion and principle of free flow, the filtered water will be collected to one side of the chamber and dirt or filtered particles are flushed away into the sewage/soak away pipe without clogging the filter or without having to be disposed. This results in high efficiency and long servile life, i.e. high water yield, good cleaning performance and long clearing intervals.

The type of the filter should be varied according to the roof catchment area. Based on the catchment area WISY filters are broadly classified into three categories.

1. DOWNPIPE / DOWNSPOUT FILTER COLLECTOR FOR DOMESTIC USE.
2. WFF VORTEX FINE FILTER FOR DOMESTIC / INDUSTRIAL PURPOSES

3. *STORAGE*

Rainwater storage tanks serve both for the storage and the sedimentation of the rainwater. The amount of cleaning is thereby directly dependent upon the flow of the water in the storage vessel (inlet, overflow, suction). This applies both to storage vessels inside as well as outside. The storage tank can be above or below the ground depending upon the user requirement. Despite the extra installation effort, tank placed below ground have some benefits. The most important fact that the average temperature inside the tank is low. This maintains good quality of water for longer duration. They are hidden from view and are easier to incorporate into the landscape.

WISY WATER CONSERVATION SYSTEM MATERIALS

1. DOWNPIPE / DOWNSPOUT FILTER COLLECTOR

These filter collectors are designed for simple and easy installation in rainwater downpipes. Water is drawn through the vertically orientated stainless steel filter insert by adhesion forces. Filtered water falls into the collection channel and is fed via the outlet connection to the storage tank. Remaining water washes debris and particles larger than 0.44 mm through the filter collector into the drain or soaks away in the normal manner.

FEATURES:-

- Suitable for the roof area of maximum size 2000 SQ.FT.
- Compact design for simple installation in round vertical rainwater downpipes.
- More than 90% of rainwater collected.
- Low / Nil maintenance. Corrosion and frost proof

2. WFF VORTEX FINE FILTER

WFF filters can be used where rainwater from the roof is channeled through a horizontal underground pipe. Rainwater enters the inlet connection in the side of the WFF unit. The inlet is designed to swirl the water in a vortex-like action around the surface of the stainless steel filter below. The rainwater is drawn through the vertical mesh walls of the fine filter by adhesion, then collected and fed through the outlet to the storage tank. Debris and particles too large for the filter are flushed through to the drain outlet by the action of water flowing down the surface of the filter. More than 95% of the rainwater entering the WFF is filtered and collected by this principle.

FEATURES:-

- Filtration with 0,28 mm mesh Size
- Self cleaning and automatic transport of dirt
- No energy consumption
- Oxygenation of filtered water
- Low / Nil maintenance with more than 95% efficient

a) *VORTEX FINE FILTER WFF 100*- Catchment areas from 1000 SQ.FT. to 2100 SQ.FT.

b) *VORTEX FINE FILTER WFF 150*- Catchment areas from 2000 SQ.FT. to 5300 SQ.FT.

- c) *VORTEX FINE FILTER WFF 300*- Catchment areas from 5000 SQ.FT. to 32000 SQ.FT.

SMOOTHING INLET

The unit is designed to eliminate turbulence of the incoming water as it enters the tank. It is fitted to the open end of the inlet pipe at the base of the tank. The water thus gently percolates up from the base, causing no disturbance of the beneficial sediment layer in the base of the tank. This reduces easy settlements of suspended solids.

FEATURES:-

- Distribution of the fresh water In an upward direction.
- Slows down speed of fresh water.
- Allows new particles to settle and keeps old sediment undisturbed.
- Spreads the oxygen from fresh water in the tank.

FLOATING FINE SUCTION FILTERS (SAFF)

The SAFF types of Floating Suction Filters are suitable for domestic and commercial rainwater harvesting systems. The unit consists of a polyethylene ball float and a fine mesh filter, with an integral non return valve. The mesh size of the filter is 0.23mm and thus prevents the suction of large particles into the pump. A floating ball allows the suction point to rise and fall with the water level. This ensures that the water is extracted from the cleanest part; just below (10-15 cm), to ensure the water taken is most oxygen enriched.

FEATURES:-

- Protects the pump against drawing up sediment
- Extracts water from the cleanest point
- Ensures the quality of the rainwater system
- Integral non-return valve with high quality stainless steel construction

MULTI-SIPHON

The Multi-siphon overflow unit has been designed specifically for use in rainwater storage tanks. The unit is effectively a 'U' bend, providing a water seal. This acts as a barrier to unpleasant smells from the drain that connects to the overflow, which could otherwise taint the water. The unit also performs the important function within the tank of removing the floating debris from

the surface of the water. This is achieved by the design of the units' inlet, which is so shaped that when overflow conditions occur the water is 'skimmed' rapidly into the horizontal opening.

FEATURES:-

- Multifunctional overflow unit
- Removes surface debris and prevents rodents from entering into the tank.
- No drain smells. Optional anti-backflow & anti-vermin device.
- Horizontal opening maximizes skimming effects.

RESULTS

WORLD WIDE PROJECTS OF WISY SYSTEM

1. GERMANY: CHAMBER OF COMMERCE IN BERLIN

The rainwater is collected from 2000 m² glass roof area and filtered by 2 WISY Vortex fine Filter WFF 300 which is mainly used for 30 toilets and 70m³ reserved for fire sprinkler system.

2. BRAZIL: MARACANA STADIUM

Maracanà Stadium be selected for the soccer World championship in 2014 and Olympia 2016 in Rio de Janeiro. Maracana Stadium consists of 18 WISY Vortex Filter WFF 300 for the application of Rainwater for Irrigation and Toilet Area.

3. USA: HOUSING AREA IN SALEM, VA, 6TH STREET

Rainwater harvesting for the irrigation of community garden by using WISY Downpipe Filter Collector.

4. MALAYSIA: CLUB HOUSE -MAH SING HIJAUAN

The Club House has 300 m² roof catchment area. The rainwater is collected from the tile roof area and filtered by WISY Filter Collector, which is mainly used for irrigation.

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