Using Collected Rainwater for Irrigation

By: Robert Drew, Founder Ecovie Environmental LLC

Abstract:

Rainwater collection is a proven water source for irrigation. Applying some basic principles, some of the pitfalls of rainwater collection can be avoided. Following water collection guidelines of ARCSA and some basic guidelines for pumping controls and city/well water back up, avoids many of these pitfalls. This paper is based on in the field experience integrating residential and commercial scale rainwater systems.

Experience troubleshooting poorly designed rainwater systems shows that the most likely culprit leading to unreliable performance is pre-filtration. If pre-filtration is non-existent or done in a way that passes debris, then issues arise with irrigation valves plugging over time and with pumping. Sometimes, filters blind over with debris which limits water capture. The answer to this is either more frequent cleaning or installation of self cleaning filters (usually preferred).

Pump selection can be an important consideration. If there is an existing irrigation system, flow while running should be checked along with an estimate of water flow. This gives a specification for pump selection in PSI and flow, which in turn can be matched with pump curves. For new installation, the expected flow and PSI should also me estimated to choose the correct rainwater pump.

Back up can take many formats. This paper presents three common methods. First, dual irrigation master valves are used, one for city water and the other for rainwater. A float switch in the rainwater tank tells which valve to open for an irrigation cycle. The second uses various forms of pressure reduction valves. The third employs a three way valve to switch between two water sources based on rainwater tank level.

Keywords: Rainwater Harvesting, Pump Controls, Water Filtration, Backflow Preventers

Rainwater collection is growing as a means of irrigating landscapes. While the concept is fairly straightforward, there are a number of considerations that are often overlooked, especially by those that are integrating rainwater collection systems to irrigation systems for the first time.

This paper doesn't dwell upon the basics of sound rainwater collection system design. The main focus of the paper will be the integration with existing and new irrigation systems, covering topics such as:

1. Water filtration requirements for rainwater systems feeding to irrigation.
2. Pipe and pump sizing to match city water flow along with pump control and reliability issues.
3. Reliable city water back up systems using the irrigation controls and other methods. The pros and cons of each type of method will be covered as well as the scenarios where one back up method might be preferred over another.

Pre-Filtration:

While we have come across a large number of issues with rainwater system design, by far the most common issue relates to filtration that is done before water goes to the storage tank. Pre-pritration arguably is the most important step to assure adequate water quality in a rainwater system. Good pre-filtration in turn leads to increased pump reliability and water capture efficiency. Poor pre-filtration can lead to clogged or poorly functioning irrigation valves.

To achieve good pre-filtration, follow ARCSA guidelines of around 350 microns screening. Self cleaning pre-filters seems to be preferred and definitely improve up time and reduce maintenance, although they cost more.

Pump Selection:

Pump selection seems like a very straightforward exercise but can prove a point of pain between the rainwater collection installer and irrigation designer. The most important way to avoid issues is good communication regarding this interface. Clearly defining specifications and expectations goes a long way to avoid issues. Having said that, it is important to have the best possible information to be able to match rainwater flow and pressure with that of back up water and with the requirements of the system. In many cases, the easy way out is to over specify pump size for rainwater and not worry. The can lead to excess capital cost and possibly over complication of the system, which leads to maintenance and reliability issues.

Also, if there is a large discrepancy between the rainwater and alternate water supply pressure, then the irrigation system should be designed to the lower flow.

Back Up Water:

Most serious rainwater systems have a back up water supply. Usually this will be a municipal water source. There are quite a large number of ways to provide back up water. Here, we will go in depth on three proven ways that actually work well. First, a dual master valve set up can be installed on the irrigation system. This is done by having one master valve on the rainwater and another on the city water. When it is time for an irrigation cycle to begin, a float switch in the rainwater tank tells which valve to open to provide water for irrigation. If there is water in the rainwater tank, rainwater is used. Otherwise, back up water is used. This may be the lowest cost solution depending upon location of the various valves and the rainwater tank.

The second method involves using a form of pressure reduction valve to initiate the use of back up water. If rainwater flow and pressure is not sufficient for any reason, the PRV allows back up water to flow. There are some valves specially designed for this purpose. The biggest benefit of this solution is that back up water is provided for any reason that rainwater is not available including low tanks level and pump not running. Installation is also fairly straightforward.

The third method is to use a 3 way valve which is positioned using a level switch or level indicator in the rainwater tank. When there is water, the valve positions for rainwater use. If not, it is positioned for

back up water use. This method is commonly used in commercial applications and fairly widely for residences as well.

Another method we have seen used is to put a small amount of back up water in the rainwater tank when it empties. This is typically done using a solenoid valve receiving a signal from a float switch or tank level indicator or from a simple float valve set up. In either case, there can be serious issues with reliability and with high water use in the event of valve or control failure. Float valves in particular can fail open to cause a very high water use until the problem is found. Another consideration is to always design a manual back up for the purposes of trouble shooting and to provide back up water in the event of a power outage or other type of system failure.