

Efficient water use

By Brian Hirst of Freewater UK Ltd

I have been involved in rainwater utilisation since the early 1990's. It would appear the obvious way forward in reducing mains water demand and surface water run off.

Water is becoming an increasingly precious natural resource. Whilst we appear to have an abundant water supply 97% of the 1.4 billion cubic kilometres of water on Earth is sea-water. 2.7% of the remaining 3% is permanently bound up in ice at the poles. Leaving only 0.3% of the Earth's water resources is usable fresh water.

This available water moves in a permanent cycle through evaporation and rainfall. There are also problems with the quality of drinking water as increasing water pollution caused by nitrates, phosphates, pesticides and other chemical substances is making purification increasingly difficult and expensive.

Worldwide water conservation devices are being employed and developed to combat water availability problems, the UK is no exception. Surface water, (a large body of unwanted water to be disposed of quickly) is currently causing flooding to unprecedented levels, not previously seen. A little known fact is that for every 10% development of an area, 'Surface Water Runoff' increases by 50%. Therefore to collect and use significant amounts would make storm water a social rather than a weather driven event.

There are distinct water demand, supply and disposal problems facing water companies, developers and home owners alike that may present serious short and long-term challenges for the future. Rainwater utilisation could be employed to help alleviate these challenges.

Germany are World leaders in both rain and greywater technology. Due to their high cost of water systems have been developed and manufactured for more than 20 years. Over this period various related manufacturers have diversified into this market, tank, pump, electronics, filter manufacturers etc, resulting in easy to install, excellent tried and tested, proven products specific to the industry, however not all are UK specific and UK systems are very much in their infancy as this process has only just begun.

The stand alone rainwater system collects rainwater from the roof via gutters and down pipes passing through a gravity type filter into an underground tank. This initial filtration takes out larger particles from the rainwater. The oxygen rich water then flows into the tank through a calmed inlet, where a second biological purification takes place. There are various other components inside the tank necessary to guarantee good water quality. A submersible pump in the tank delivers rainwater to the various applications, the system also incorporates an automatic change over to mains water in times of low rainwater preventing any discomfort to the user.

Most common roof materials are suitable, slate concrete or plastic. A pitched roof is generally better than a flat roof as this reduces evaporation. However both pitched and flat roofs are acceptable. There are minimal traces of contamination in the form of organic material that flow from the roof every time it rains; this material is separated out by a special gravity type filter.

Various filter systems exist but few work in a positive way with rainwater systems. The most important factors to consider are that the filter must not retain any dirt particles, be self-cleaning and dry quickly after rainfall otherwise germination will take place on the filter face. Filters that retain dirt particles such as sand, gravel and basket types require regular cleaning. Pressure type filters, charcoal etc should be avoided as they place an undue load on the pump, reducing longevity.

The latest and most advanced filter designs are integrated into the tank, the best of which is a gravity type two-step cross flow

self-cleaning filter with pressure wash cleaning system, the filter collects almost 100% of the incoming rainwater. The first stage takes out larger particles, leaves and twigs etc; the second takes out smaller particles such as grit etc. Because no wet dirt remains on the stainless steel filter face, the filter dries out quickly after rainfall ensuring that germination cannot occur.

The quality of incoming rainwater is very good; to maintain and improve this we have certain components in the tank. The tank is installed below frost depth where the stored oxygen rich water is kept below 18° C and protected from light, ensuring non-growth of algae.

Rainwater flows into the tank via a calmed inlet, oxygenating the tank water by directing it upwards towards the surface every time it rains and also prevents sediment on the floor of the tank from being disturbed. There is a natural separation of any remaining incoming dirt particles, the heavier particles sink and the lighter particles float on the surface. Studies have shown that sediment on the floor of the tank is minimal, never needing to be cleaned out and causing no risk to water quality. Whilst we have oxygen rich tank water a biological equilibrium exists which further cleans the water.

The floating layer could be a problem and would hinder oxygen circulation. However optimal tank sizing guarantees the tank to overflow a number of times each year through a special bevelled overflow siphon with rodent trap, skimming off this floating layer. The third in-tank component is the submersible pump with floating extraction hose connected to the suction side of the pump extracting the cleanest water from 15 cm below the surface.

In Germany many tank manufacturers produce specialised rainwater tanks (polyethylene and concrete) to meet the demands of this technology. Tanks are cigar shaped, of robust construction, have push fit connections, adjustable access dome to ground level and moulded internals.

The pumps are specific to use and made of high-grade stainless steel and brass with low noise characteristics, maintenance free, corrosion resistant and suitable for continuous operation and of low energy use to ensure water cost savings are not spent on electricity for the pump.

The main problem to overcome is to supply mains water to the system when rainwater is not available as cross connection between the mains and rainwater systems is unlawful. The water industry demands an air gap between the mains and rainwater supply that must be twice the diameter of the mains water pipe and not less than 20 mm. When rainwater is unavailable a small amount of mains water is automatically fed through a special solenoid valve and air gap directly into the rainwater tank.

The water quality in rainwater systems has to fulfil European regulations for bathing water (76/160 EWG). Scientific studies and reports were undertaken to determine the quality of collected rainwater from the roof. There were two main areas of examination. Firstly the rainwater in the tank was microbiologically analysed. The results showed that concentration of pathogen germs in all samples taken were of no hygienic risk for use in toilet flushing, clothes and car washing and garden irrigation.

Secondly studies were carried out comparing the quality of clothes washed in both mains water and rainwater. The results showed that there was no difference in quality between the two. Freewater UK select the latest and best technology from a number of German companies and make systems UK specific, easy to install, maintenance free, (fit and forget) using high quality products for maximum longevity.

Applying the known principles and techniques of a good rainwater system in conjunction with the very best available technology made UK specific ensures that you the customer secure future proof state of the art technology.