



How To Squeeze Out The Last Drop

Roger Davey, of independent irrigation consultants Irritech, works closely with Toro. He discusses how good water management can help golf courses to avoid running dry in times of drought

With all this talk of drought, there is a real danger that sprinklers will be banned on golf courses, but by putting good water management programmes in place, greenkeepers and golf course managers can ensure water supply continuity for the foreseeable future.

The volume of water used by golf courses varies immensely from course to course. Factors such as construction of greens or tees, the area to be irrigated, aspect of the site (altitude/links course, etc), management techniques (and manager!), as well as the age, type and efficiency of the irrigation products that apply the water, all have a bearing and are crucial in water management.

So where can we get water from? Sources of water for irrigation can be generally classified as follows:

Mains potable supply

Supplied by the water company or water provider. Costs vary throughout the UK, but average approximately £1 per cu m (220 gallons is 1 cu m of water). This is generally a good quality supply of water. However, in times of water shortage the first casualties are those that are not 'essential' users - and that means those with sports turf areas and golf courses.

Borehole supply

Water is abstracted from below ground via a borehole pump either during the summer, the winter, or all year round. This is subject to an abstraction licence issued by the Environment Agency. Water quality needs to be monitored regularly and costs can be a fraction of mains water (water taken during the winter months is stored in a water storage reservoir for summer use).

Surface water abstraction - streams or rivers

As with the borehole, a licence is required. Costs are minimal and, when abstracted in the winter, water is taken at times of excess to be stored in a winter storage reservoir for summer use.

Treated sewage effluent (TSE)

Recycled water from sewage treatment works or the golf club's own treated sewage system. This must be solids-filtered and passed through an ultra violet filter prior to irrigation system use. The water must be tested regularly and a detailed management risk assessment undertaken (this applies to the storage and use of all water).

Grey water, roof run-off and surface run-off

Ecologically a very 'friendly' way to catch and utilise water. However, large water storage areas are required as water can be obtained only when it rains - when irrigation is required surface run-off is not available, because it has not been raining - again the topic of winter storage looms!

Of the above sources (specifically mains water, borehole and surface water abstraction) permission must be granted by the provider and the Environment Agency for the use of water for spray irrigation. However, if, for example, usage is less than 20cu m per day from a borehole, an abstraction licence is not required. In many cases 20cu m will be enough for emergency irrigation if the end user, and irrigation system, is efficient. Prior to drilling a borehole for this flow, permission must be sought and granted from the Environment Agency.

Winter storage reservoir

This is the term often used to define the site used to store water gathered from sources such as surface run-off and boreholes during winter months. The correct siting of water storage resources is paramount. For example they should not be an integral part of the 18th hole, as by the end of August, having served its purpose, the reservoir will become an eyesore as levels will have fully dropped.

Winter storage should ideally be sited at or in an area that is not in play, can be easily accessed, allows the supply of power effectively and easily, and can provide an area large enough to store the required volume. Always design a reservoir based upon seasonal usage and not total storage volume, but effective storage volume! Many reservoirs will require lining, and all will require planning permission and Environment Agency approval for filling. But once constructed, it will provide the club with a reliable source of water throughout the irrigation season.

So, now that we have it, or know where to get it, how do we make the most effective use of it?

The approach is multi-faceted and no one rule is golden. However all good irrigation systems depend upon:



- Accurate and effective application of water through evenly and accurately-spaced sprinklers that produce a uniform coverage. In simple terms - sprinklers that place water where you want it, when you want it.

As always technology helps - today's sprinklers have cutting-edge nozzle technology and nozzle angle adjustment. However, even the best sprinkler selection will not work effectively and provide a high coefficient of uniformity unless correctly spaced. This means head-to-head coverage - a sprinkler with a radius of throw should be spaced at no more than 20m from the opposing units when on a square spacing.

- Know your water requirements - ask 100 turf managers how much water they put on during a night and 80 will tell you eight minutes! Minutes means nothing - millimetres means everything.

The calculation of required water per night is simple and based upon the volume of water lost during the previous 24 hours. This can be measured either by practical means (evaporation pan) by formulae calculation, or by automatic means, such as a weather station linked to a PC-based control system.

This water application calculation is vital in conserving water and ensuring that water is not wasted, and, when used in conjunction with a water balance sheet, considerable savings are made.

- Control your water application - water automatically during the hours of darkness when water can percolate before it is evaporated; use multiple programmes to allow water to infiltrate and prevent run-off; use a PC-based control system which is essential as it allows multiple starts each cycle and water volume can be recorded.

- Prevent wastage or leakage, repair all pipeline leaks and weeps, and isolate areas that are problematic. Upgrade the mainline pipe network to provide a trouble-free supply.
- Ensure that all sprinklers are pressure regulated, either as electric valve-in-head units, or that the solenoid valves controlling the sprinklers are installed with a pressure regulator.
- Audit and appraise your sprinklers (or have the system audited and appraised), calculate actual run times and application rates according to the actual sprinkler spacings and nozzle flows and pressures.
- Seek to plan water usage; predetermined irrigation strategies rarely fail. This means a known volume of water over a known period at a known application rate.
- Emergency sourcing of water - in theory if the irrigation strategy has been executed, this should not be required. However if an emergency supply of water is required the irrigation system water usage calculations and run time and evapotranspiration calculations per area will be invaluable to determine how much water is required, and when.

Emergency sources of water may be those such as imported tankers of treated sewage effluent, or water purchased from other users (such as farmers) whose irrigation cycles are somewhat different to golf course requirements. For some agricultural enterprises, the irrigation system is finished by mid to end of July. All sources of water should be tested upon delivery or be delivered with a test certificate. This can and will affect the fine turf management regime and the operating risk assessments.

Other regimes, including adjusting cutting heights, the use of wetting agents, prioritising irrigated areas, and informing the end user (the golfer) are also paramount.

Asking questions internally often helps to appraise the issue. How much water do I need per area, per day, per week, per annum? Can the infrastructure then apply this when I really need it to? How can I purchase extra water if the volume required or used by the system is not known?

In order to have a reliable irrigation strategy, the end user must have in place the above items. When developing and/or upgrading an irrigation system, this can take up to two years to put in place, but the ability to apply water when it is required accurately and efficiently is a huge management tool and, as with most other things in life, you only get out that which you put in - or in this case, on!

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