

REAL WORLD TEST

Irrigation Equipment

GREENKEEPER INTERNATIONAL

Hugh Tilly looks at a range of irrigation equipment on the market.

Past seasons have put "automatic" irrigation to the forefront of most greenkeeper's minds and although there are still some, particularly on links courses, who believe that drying out is a natural phenomena which should be part of the game, most recognise that water is essential to maintaining a playable and attractive surface – not to mention sustaining the grass.

How far you go in irrigating depends upon a number of factors including any requirements for "a pretty course". The norm is for greens, tees and approaches to be watered, however some clubs have watering on specific banks and some surrounds while others have found a need for water on some or all fairways. One of the controlling factors in selecting an automatic irrigation system is the availability and cost of water, and while many clubs are still linked into mains water and thus pay through a meter there are a growing number which have installed a reservoir or borehole – and still pay. A valid point made by one Course Manager was that it was logic, even essential, to consider irrigation as an integral part of overall design – and to consider where the water would be sourced. Obviously the most satisfactory answer for the environment is to save winter rainfall, however, this needs a large reservoir which can be a major capital expense if the terrain is not water retentive. Boreholes are another option however often these cannot always be relied on to provide the volume required when it is most needed – much depends on the sub-strata. Which ever way you acquire water you will have to pay – the important point is that water should be sourced economically and reliably, this latter being as vital as the source itself.

While it was once common to find portable hose and sprinkler systems which connect to hydrants around the course, such systems are labour intensive and have become increasingly rare. Nevertheless most courses still find a need for some manual



The Oxfordshire's Martin Jones at their weather station

watering. Some fairways can be watered using travellers irrigators but these are only semi automatic and need good hydrant around the course. The most favoured system for today is fully automatic with an electronic controller to operate remote valves and pop-up sprinklers. Modern systems, and all in this survey, are of the pressure type which keep pressure in the line using a pressure vessel with a switch to activate a pump when pressure goes below a pre-determined minimum. Modifications can be used to improve response and control.

Perhaps the most important

factor for successful installation and operation is the ability of the designer and installer. There have been some horrendous tales of poor installation, of underground lines which are always failing, and of valves and pop-ups which jamb regularly, however, there are now several specialists who have the experience to "get it right" and to rectify the inevitable glitches fast and with minimum fuss. While most modern systems are very versatile, getting them set up to put water where you want it, when you want it and in the right amount is not always quick nor simple – especially as

most irrigation is carried on overnight. A growing body of opinion says that setting and operation of irrigation is a specialist task and perhaps a full time one – particularly in the early years of use. A mixture of imperial and metric units are used in this feature, usually those in most common use in irrigation. There are about 225 gallons in a cubic metre of water or 1000 litres.

The Oxfordshire Golf Club

Designed to championship standard by Rees Jones, the 18 hole Oxfordshire at Thame, this year hosted the Benson and Hedges International Open on the European Tour. It has irrigation installed by Turf Irrigation Services on all greens, tees and surrounds plus watering of part fairways as well as "feature roughs" and other important clubhouse turf. The installation was put in when the course was built – it opened in July '93, which enabled TIS to trench all pipework and control cabling. There are some 1400 individual sprinklers, all Toro gear driven pop-ups in five models, full or part circle, and spaced to water head to head – varying nozzle and model sizes ensures that output met the specification. Control is by a Toro Network 8000 with 46 satellite stations which operate the sprinklers and most have individual control. There are three pumps, of differing sizes from 25 to 60 hp to give it the ability to output up to about 1050 gals/min – and these are automatically selected to suit demand. What is radically different to many other systems is that the Oxfordshire has a weather station which provides input into the system. Course Manager, Martin Jones, says that it is most revealing how conditions can vary day by day. He, or the computer, uses an index of 'evaporation/transpiration' – (E/T) to assess water need and this can vary dramatically when objectively measured. He is totally convinced about the efficiency and effectiveness of this method and has altered his thinking to E/T rather than minutes of application.

Fixed parameters such as soil type, aspect, exposure to sun and

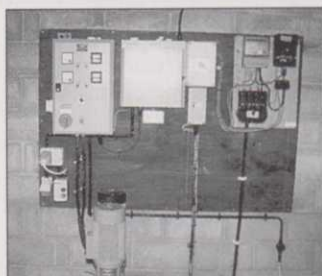


wind and slope as well as location and use are all fed into the computer – and these can be reprogrammed if they are altered. This programming was initially mainly done by the supplier, and it controls output from each head. Martin says that he does not think in terms of length of watering allowed as the program is based on E/T and automatically allows for these variables. The critical measurement used is millimetres/week which is processed to a specific formula to interact with the settings and demands of the Toro controller. The Network 8000 can be programmed to operate on daily, alternate, three day or weekly cycles and Martin programmes it to apply water as a percentage of the 'E/T' rate. He programmes sprinklers into four types according to location, i.e. greens, surrounds, tees, and other and normally applies from 35% to 48% of the E/T figure provided by the weather station. He commented that as a rough guide 40% is maintenance level while over 45% gives lush grass, when taken over a period. The controller has the ability to apply from 1% to 900% of set rate. Double normal rate – i.e. 80+% is used for watering in feeds etc.

Asked about the overall performance of the system Martin said he was very pleased with it, there is little maintenance required, it can be drained down with the existing drain points without needing compressed air to clear the lines and frost has not caused any damage to lines or sprinklers – the pump house and control electronics have automatic frost heating. And there have been very few stuck sprinklers.

The Oxfordshire takes all its irrigation water from two lakes which collect rainfall from the course – the entire course is drained, either with ditches or underdrains. These lakes have pvc linings – at the instance of the NRA – with clay on top and hold 200,000m3. Use in 1996 equalled about half of this. Location for the weather station is all important and the supplier provides some critical requirements which have to be met for it to give accurate and representative readings. On the Oxfordshire it is placed well away from trees or other disturb-

ing features, about 100m from the course manager's office which houses the controller. The lakes and pumps are some distance from the controller. Control cables carry 240 volts to the satellite stations which decode and relay 110 volts to individual valves. All pipework is uPVC with solvent welded joints and has been leek free – the few problems have been caused by subsequent ground settlement or heavy traffic over uncompacted ground.



Pump controls at Cumberwell Park

Cumberwell Park at Bradford on Avon

This new private parkland 18 hole course has an Ocmis designed irrigation system which Course Manager, Marc Haring, says performs extremely well with minimum problems. First opened in 1994 the irrigation was installed while the course was being built. Installing contractor was M J Abbott Ltd whom Marc praised highly. Reasons for deciding on an Ocmis installation was the use of MDPE – blue plastic – piping with screwed connections, price, a three year warranty overall and installation by Abbotts – who was a contractor already known from previous work carried out for the James family who own the land.

Water for the system is stored in a winterbourne brook-fed 12 million gallon lake situated on clay. Under half of this was used during each of the last two summers, furthermore such volume was replaced last autumn in a single week of rain. Irrigation is laid on to all greens, tees and approaches, it is supplied to four zones by two Grundfos CR8 pumps each with an 8.8m3/hr output (at 10.3 bar). All sprinklers are of the pop-up type, full or part circle, either Buckner impact heads on greens and

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approaches or Hunter gear driven on tees. In-head controls are used on greens and approaches, some of these having twin nozzles, while each tee has a single control. The actual sector can be set on all heads. Marc stated that greens at Cumberwell are relatively large and have, on average, four heads each, while approaches have two, and tees five or six. Hydrants for hose and a lake feed have been included in the specification and the controller has several spare outlets to make it easy to add to the system if necessary – Marc said that one green is to be extended this winter and so will utilise this expansion ability. The wall mounted CIC computer control operates the system in four zones. It can be linked into a P.C. at a later date and incorporates a small printer which Marc finds useful to give a hard copy of settings.

Programming the controller has proved to be quick and easy, Marc reckons that on average he now takes under five minutes per day. Experience has taught him how to tweak the system to maximum effect and while he did not criticise the manual provided, he did say that it took a little time to learn the jargon used. The volume delivered by each head can vary according to height and distance from the pump but this is easily compensated in programming by adjusting individual run times. Similarly other physical differences on each green, such as shade and exposure to wind can be corrected by actual run time. Some manual watering, with a hand held hose, is still carried out, perhaps ten hours a week, to correct areas of specific deficiency. Some of this need results from wind effect on sprinkler pattern, some from the inevitable difficulty of using circular pattern sprinklers – even if overlapped.

The system is decommissioned in autumn and recommissioned each spring initially by Ocmis, however the club will be drying out the system themselves this winter. Ocmis's engineers will still be used in the spring.

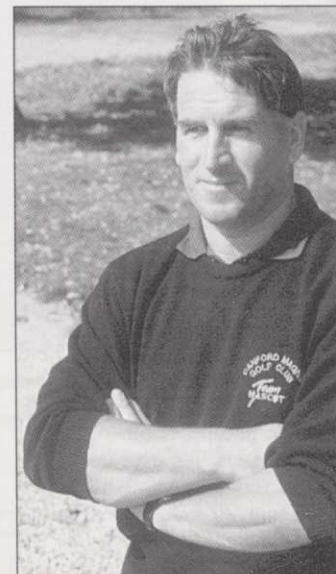
Very few problems have been experienced overall, there have been no leaks in the line and a minimum of head problems – the greatest number of problems

being wear on the impact drives, and sticking pop-ups close to bunkers when sand has got in. There have also been a few blown fuses. Frost damage has been limited to the outer castings on a few heads, but Marc thinks this was due to ground water seeping in. The course is on clay which forms the impermeable strata for the lake. Where heads have stuck they have been easy to spot, either due to the dew still being on the grass or by turf colour and growth.

Overall Marc said the system has been trouble free, and while past experience has led him to expect some problems he said the Ocmis system at Cumberwell has almost always gone through its cycle without trouble. Installation had been "very good" and Ocmis were "very helpful" were his summary words.

Canford Magna in Dorset

This course began as a 9 hole and has been extended to 36 in the past few years. It is variously laid over gravel or on silt over gravel in the Stour river flood plain and all greens are to USGA spec, thus drainage is exceptionally good. Course Manager, Trevor Smith, said he feels that it is essential to keep the root zone moist. The system was installed by Salisbury-based ISS and it now comprises of a computer (IBM) control running about 400 sprinklers through six zones. Water comes from a spring fed lake via three



Canford Magna's Trevor Smith

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Irrigation in action:
Watermation system at
Hankley Common

main Godwin pumps with a small pilot pump which is used to maintain pressure. The controller has recently been changed from the original ISS BBC "Aquaflow" to a new IBM 486 computer and "Aquaflow +" software. Change-over has not been entirely straightforward due to some misunderstandings and polarity mix ups which 'blew' several chips – ISS are sorting this out. The new controller will give the system almost infinite flexibility and being 'Windows 3.1' based will enable the operator to use a mouse to set all parameters more quickly and easily. Important features of the Aquaflow+ program include "global adjust" which allows the operator to alter the times on all heads by percentages from -50 to +100%. Producing new programs – or files or adjusting old ones is quick and easy by copying, modifying then re-naming – several files can be 'chained' together to operate consecutively. ISS says the new controller system was released in March 1996 and some 32 new systems or upgrades have been sold to date.

Pipework and the low voltage control cables were all trenched in, the pipes all being 6 m lengths of uPVC with solvent cement joints. All were protected by hand by the greenkeepers with a layer of sand over the top and Trevor said that the care with which this laying was carried out has ensured that there have been absolutely no problems – no bursts or leaks over three years.

Greens and approaches are watered by Toro 650s and 760s, adjustable part or full circle, gear driven pop-up sprinklers while all tees are irrigated by Hunter I31 ADS pop-ups, the latter having

proved to be easy to service and clean out. Trevor said that it was his belief that all greens and approach irrigators must be of the in-head control so that they can be individually set to allow for shade or wind variations etc. He said that it was also important that each green had a hydrant for hand watering.

Canford Magna is going to change its water source in the next winter from the spring fed lake currently used to a borehole fed lagoon. The main reason Trevor gave for needing this change was the high pH found in the spring water. The club has always worked in close consultation with the Environment Agency – previously NRA – and a significant factor in this has been that the River Stour bounds the lower course for a considerable part of its perimeter. There are also some 14 feature lakes on the land.

The club will also extend the system to include some fairway watering as it has found it necessary to use a bowser to apply water to the fairways in the two past summers. This will mean changing the present system from six zones to eight, however, the ISS system has sufficient flexibility built in that changing is not considered to pose any problems.

Use, last year, amounted to 8, million gallons, with a full summer irrigation cycle taking about 75 thousand gallons per night. Trevor said his aim is to apply the water as early as possible in the evening so that it has the maximum length of time to soak into the rootzone. He said the club is open throughout the year and has an expectation of putting some 60,000 rounds through each year

– thus keeping surfaces playable as a must.

Consideration was also given last year to installing a weather station, however this was deferred in preference to upgrading the controller. Trevor feels that a weather station is but another aid to the management of the course, but he still has to be convinced of its need. ISS believe that once installed he will give it increasing credence.

Hankley Common in Surrey

This 18 hole sandy heathland course on lower greensand had its first irrigation in the 1960s – installed by locally-based Watermation. Upgrading in 1971 put automatic irrigation on all greens while an 1991 upgrade resulted in tees and surrounds being included in the system. In 1995/6 the whole system was virtually reinstalled or refurbished with water on all fairways as well, a borehole feed and new controls and pumps. Prior to last year the club took all its water from the mains and last year only had a licence to extract 3 million gallons, which, said Course Manager, Ian McMillan, was insufficient. An abstraction application for 9 million gallons including summer use has now been sought and should mean independence from mains water supply. The specification with which the club went to tender included an ability to apply 21mm per week from 7 hr/day working. Some 16 hectares in total are now covered by irrigation from pop-up sprinklers.

Watermation won the contract for the last improvements and Ian admitted that the company's satisfactory past record and local

base, as well as the quote price, were important considerations. No details of the other bidders were given but it was intimated that there were about three and all were nationally known names.

The installation has mainly GR series pop-up impact heads, variously full or part circle, some 530 of them, which are mostly controlled in stations of 3 or 4 by two TW2/4 controllers operating two pumping stations with a total of five pumps. The overall system is divided into two (old and new) with three zones for fairways and two for greens and tees. Ian said Hankley Common opted, as an extra, for a radio remote control, this is interlinked to both controllers and enables him to operate any station from almost anywhere on the course. This facility, he has found to be invaluable as it allows him to check the functioning of any sprinkler or group of sprinklers as well as allowing him to water in feeds or fungicides etc. without his needing to stop or leave his vehicle – this not having to stand around was a major time saver. In particular it means that he can switch on or off as he drives around or as greens are fertilised.

All heads have the same nozzles, with variations in water delivery being made either by spacing or by run time. Full circle sprinklers are placed in parallel lines on either side of fairways to give full application to the fairway and this meant that they apply only 50% to semi-rough. The use of travelling irrigators for the fairways was considered but rejected as being too labour intensive.

Installation was undertaken by Watermation supervised by McMillan Shields in a strictly controlled schedule which allowed each hole to be closed for only two days. Pipework was all uPVC – in 6m lengths, solvent welded and then mole ploughed in – larger sections also having a mechanical ring to ensure water integrity. It was, Ian said, a very smooth operation. There have been no problems with installation and the only small problem, with the header tank, was painlessly sorted out by Watermation. The impact heads, the GR3 in particular, have been very



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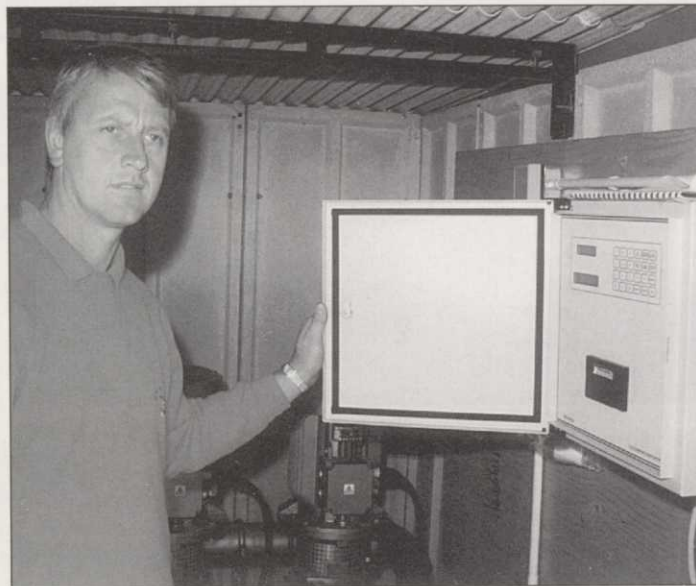
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Andrew Hall of St George's Hill

successful and easy to get out for maintenance, as has all maintenance and draining down.

The TW2/4 controllers have been found to be particularly user friendly and have a good level of diagnostic ability built-in. Programming is very easy and Ian insisted that all important documentation, i.e. user manual and maps, were encapsulated in plastic making them durable even if used with wet or dirty hands. As far as Ian was concerned user manuals are extremely easy to understand. He relies on traditional greenkeeping principles to judge when and how much water to apply and this includes a regular use of probes.

St George's Hill in Weybridge, Surrey

Superseding the original 1970s installation the club's latest system by British Overhead Irrigation Limited has three variable speed pumps, a Photron CIC4 controller, three zones covering the 27 holes and allows for the use of (three) self-travelling sprinklers – with a 200m cable. The heathland courses are extremely free draining however Head Greenkeeper, Andy Hall, uses wetting agent and Toro Hydroject aeration to ensure optimum use of water. This is particularly pertinent as all water is bought from the local water company and stored in a 21,000 gallon butyl lined above ground tank. A key-

stone policy is to keep the system simple, and Andy said this applies to programming the system. Nevertheless the CIC4 which superseded a CIC1 model is extremely flexible. Mr Gerry Wilkins of BOIL suggested perhaps more flexible than any greenkeeper is likely to need. CIC controllers are produced by a 'sister' company. The previous irrigation system only had a single zone and single phase pumps of limited output which meant that it was taking over 14 hours of watering "just to keep the course alive". While the original system was only designed to irrigate 18 greens the addition of 9 holes plus watering of tees (and some banks) called for a radical re-think. The new system has just completed its first season. The system is a constant pressure system, however a time clock maintains a lower pressure during the day and this is increased at night for irrigation. The design pressure is 9.23 kg/cm² – at the lowest point – at St George's Hill there is a variation of about 30m between top and bottom points in the system.

Typically each green has four heads, controlled in pairs, while approaches have three or four, and the tees have from four to six each. All are pop-up gear driven Hunter G600 or G650 heads, full or adjustable part circle. Fairways are covered by three BOIL travelling sprinklers each with an output of 1600 gallons per hour,

these take water from hydrants through 1in. flexible pipes. However, consideration is being given to about putting in a permanent pop-up system for some or all of the fairways. Virtually no hand watering is carried out.

The sophisticated pump control system allows any of the three Grundfos pumps to be set as the duty pump which maintains line pressure – and this can be operated at very low revolutions little more than tick-over so minimising electricity consumption. It is only when demand exceeds this pump's capacity that the other pumps are called in. The variable speed motor controller means that each motor soft starts, avoiding starting under full load and considerably reducing the sudden pressure stresses placed on the whole system but in particular on pipework.

A notable feature of the CIC4 controller is the "duration percentage" function which allows an overall percentage increase or decrease to be made to all watering times, without the need to alter individual settings. Pipework is uPVC solvent welded in sizes suitable to location, some 8 miles of it, and most was mole ploughed in. Ample flush out and drainage points were installed and any section is easy to isolate says Andy.

There were a few small teething problems, but no more than Andy was expecting and these were readily rectified by the supplier. Once the system was set up, fine tuning and operating proved to be quick and simple. Andy said that knowledge with the previous system made using the new one simple.

THE ONE QUESTION I WOULD LIKE TO ASK OTHER GREENKEEPERS IS:



"How much do you earn?"
Terry Crawford, Clondeboye