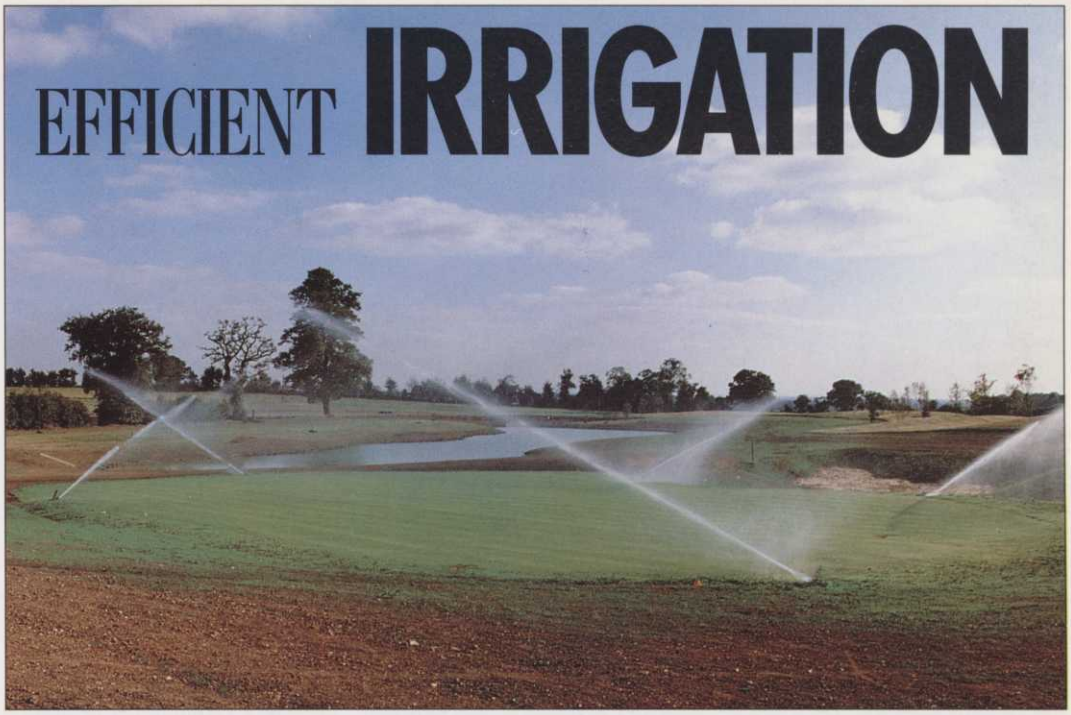
Independent consultant and chairman of the British Turf & Landscape Irrigation Association, Philip York, looks at sprinkler spacing, placement patterns and timing of operation.

EFFICIENT IRRIGATION



The right selection and spacing of sprinklers is critical if a course's irrigation system is to be efficient. To understand that, you need to remember that a single rotating sprinkler will distribute progressively less water per square metre to its maximum radius and that is why, even if it were practical in golf, you do not see one sprinkler in the middle of the green. The problem though is often seen on tees where for misguided reasons of economy one sprinkler is positioned in the middle of a tee (there are other factors which effect the performance in this case which I will discuss later). How then do we achieve a reasonably uniform application of water?

Initially, let's take the case of two sprinklers overlapping each other. As we move them closer together to the point where the radius of one reaches the other, one can see the resulting improvement in the uniformity of coverage to a point where theoretically it is 100%. Now take four sprinklers, typically used on say a 500m² green. It is probably not difficult to imagine that within the spacing the uniformity is as near as possible to 100%. Usually, because of sprinkler design and the distance across the diagonals, 80-85% can be achieved.

Outside the spacing there is a limited distance where sufficient water will be applied for the operating times required to be the same as the area within the spacing.

If spacings are stretched (or for that matter compressed) the result will be uneven applications with the result that the operator will have to operate the sprinklers for longer than necessary to ensure the under irrigated area receives sufficient water, therefore water will be wasted, adding to operating costs and quite probably causing agronomic problems through run off, puddling and soil saturation.

Before we move onto specific applications for golf course irrigation equipment there are further aspects which must be discussed which have a major bearing on system efficiency.

Firstly, wind. The theoretical situations I have explained so far assume a still air situation (and this is the basis of all catalogue information). If we introduce the wind factor to the single sprinkler situation more water per m² will be deposited on the windward side, therefore the more the site is exposed to strong prevailing dry winds the more the designer must take this into account. Incidentally, it is an accepted fact that the triangular spacing of sprinklers is better than square in helping to combat the effects of

A BETTER UNDERSTANDING

To promote a better understanding of golf course irrigation techniques, design and cost factors, the British Turf & Landscape Irrigation Association (BTLIA) is considering opening its membership to club secretaries and course managers.

Formed 20 years ago as a trade organisation, the BTLIA is of the opinion that individuals with an interest in irrigation – perhaps as a purchaser of a system or senior greenkeeping staff – would benefit by becoming more closely involved.

"Experience has shown that the majority of UK golf club officials, committees or managers have little idea of the deeper considerations of the use of irrigation equipment in the long term," says Philip York, BTLIA chairman. "By joining our Association they will become much better informed. This, in turn, will assist developers, architects and golf club officials to appreciate just what they are buying, and why.

"At present, purchasers of irrigation systems are largely influenced by cost factors. Price alone should not form the ultimate decision-making process.

"Membership of the BTLIA will help golf club officials by educating them in the technicalities, finer points of design and operating costs and standards of workmanship.

"It will also help them to service, maintain and efficiently operate what is, after all, a complex investment."

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wind, as there is within reason better coverage of the area equidistant between heads.

Secondly, the typical application rate of sprinklers in a square or triangular configuration is between 12-18mm/hour. Other than on extremely well constructed greens or tees, it is unlikely that the absorption rate of the soil in the rootzone will be equal to this, therefore if there are any slopes, high points etc – and usually there are – the surplus will run to the low points and again there will be a tendency to over irrigate to compensate. This can to some extent be overcome by aeration and the use of wetting agents.

Sprinklers which are not operating at the correct pressure will not distribute water efficiently; under pressurisation will result in too large a droplet, over pressurisation will result in too fine a droplet too easily disturbed by the wind.

We advocate the use of pressure regulated valves on even the simpler systems. The flow control device on basic solenoid valves is only of use when the upstream pressure is constant and in case it is usually unwittingly altered after (if it ever was!) calibration. To know how much water you are applying see the formulae in last month's magazine.

Now let us look at some typical practical applications.

Greens

Sprinkler selection for the putting surface will be determined by the overall dimensions and shape. The objective should be to place the sprinklers – all must be of the same configuration – in a uniform square or triangular spacing at the edge of the putting surface so that even with a minimal specification no part of the putting surface is more than the equivalent of 25% of the radius outside the spacing.

Approaches

Except in exceptional circumstances, two full circle sprinklers should be used of the same configuration and spacing (extended from the greens sprinklers) as the greens sprinklers.

Tees

Many budget proposals for tees feature a single sprinkler or single row of sprinklers (depending upon tee size). We do not recommend this layout as, inevitably, disappointment will result through a combination of unfortunately mis-specifying, wind and mis-management.

Far better to go for a double row either side of the teeing surface, preferably using full circle sprinklers.

The current general practice in the British Isles is to irrigate once per 24 hour period to replace the losses by evapotranspiration during that period. Some agronomists would argue that this encourages surface root growth and therefore thatch. Therefore it is better to irrigate an 18-hole course over a 48- or even 72-hour period, watering 9 or 6 holes per night.

We are irrigation engineers, not agronomists, but do know that providing the control equipment is correctly programmed the losses by evaporation will be reduced.

A normal irrigation cycle should always be at night, not only to avoid inconvenience to players and other maintenance practices but also because wind speeds are typically lower and ambient temperatures are lower, therefore evaporation losses are less.

Some controllers have a syringe (or soak cycle). This permits a full cycle (or partial cycle on selected areas) of the system, wetting the surface which will encourage better percolation of water when the full irrigation

cycle follows. Towards and during peak season do not endeavour to replace all the water lost by ET in one operation, better divide the required operating time into 2 or 3 equal periods and re-cycle the controller. Thus the first and/or second application can be absorbed before the next application, reducing run-off and subsequent puddling.

Do consider the advantages of what is called individual head control where each sprinkler in a sensitive area has its own in-built automatic valve and is allocated a dedicated station in the controller, therefore permitting it to be individually timed. This can be a very useful feature particularly where greens and approaches are partially shaded or where mixed part circle and full circle sprinklers are required, for example around a green. Incidentally, this type of sprinkler body has a built-in pressure regulation feature – therefore the problem of incorrect operating pressures is avoided, provided the system has been designed properly.

A word of warning: some contractors design systems with individual head control to reduce the cost of pipework, particularly with spurs and laterals. These must be sized for all greens heads to be operated simultaneously, semi-automatically or manually for the washing in of fertiliser etc.

To accurately programme a controller (which should be done daily), it is essential a water balance record is kept in order that the irrigation programming can be adjusted to compensate accurately for natural precipitation in the preceding 24 hour plus period.

There are controllers on the market now which can be connected to a weather station which in various stages of sophistication can automatically adjust the controller for rainfall, sunshine, wind, temperature and humidity, or alternatively in the simplest form give readings of these various factors.

Add all these factors together and not only will turf grass management be easier but also operating costs will be reduced. And in these days when courses are being encouraged to be more "environmentally friendly" that's important!