



# A double edged sword for soil moisture management

How Duncan Kelso at Kings Hill deals with his course's unique soil moisture management challenges

**The name Qualibra has the ring of 'Excalibur' but this double-edged sword of the wetting agent world is made for mending – turf that is – by cutting through hydrophobic profiles of potentially drought stricken soils and drought stressed swards.**

Traditional soil wetting agents are exclusively penetrants or polymers, but Qualibra's duality gives it the mantle of both and the 'top hat

and tails' of soil moisture management in more ways than one.

Greenkeeper International spent a day with Dr Simon Watson of Syngenta and Duncan Kelso Course Manager at Kings Hill Golf Course at West Malling near Maidstone. Duncan uses Qualibra as part of an integrated soil moisture management programme. We could not have come to a better place to see Qualibra put to the test and through its paces and to pass with

flying colours on this particular golf course.

## Oasis in dry climate

Combined climate and topography place Kings Hill in an inherently high evapo-transpiration situation. This is a smart course in looks and the methods used to manage sports turf in clearly less than ideal environmental conditions. Duncan Kelso has been here since



**MAIN:** Undulating greens at Kings Hill lead to differential drying out with susceptible 'high spots'  
**BELOW LEFT:** Kings Hill's very own weather station in operation '24-7'  
**BELOW:** In spite of high percolation and evapo-transpiration pressures on soil water turf grass at Kings Hill displays good growth and colour



the course was constructed in 1995 on the 'old' West Malling Airfield, a Second World War Night Fighter Station boasting the legendary Guy Gibson of Dambusters Fame as a station commander.

Duncan explained how the course was constructed on a lowland heath environment with classic heathland substrate and soil, very rocky but by the same token exceptionally free-draining. At 300 m above sea level it suffers the twin effects of free draining soil and high evapo-transpiration from strong drying winds.

Soil moisture drop from evapo-transpiration can be up to 6.5 ml/day during periods of 30°C ambient temperature. "Only UK coastal locations can compare with that" says Duncan, adding how even on an average temperature day the drop is a hefty 3.0 to 3.5 ml. "During the three critical summer months (June, July and August) we expect to lose 100 ml per month. You can see the effects of evapo-

know where to channel the irrigation.

This is supplementary irrigation and extra and on top of 'base irrigation' delivered at night via the Toro sprinkler irrigation system. Governing how much is applied is the information sourced from their very own weather station. Key parameters measured, collated and calculated include solar radiation, wind speed, air temperature, soil temperature and natural rainfall.

"We can measure how much is lost during the day and we calculate on putting back about 50 per cent of this in base irrigation at night. If we lose 3.5/day expected during an average summer we will aim to return around 2.0 ml of this in base irrigation," says Duncan.

Kings Hill clearly requires a reliable source of water for irrigation but unfortunately that cannot always come from the local water course. They have an abstraction licence to take 4 million gallons of water/year from Stanton Brook (a

## “Undulating greens at Kings Hill lead to differential drying out with susceptible ‘high spots’”

transpiration by four o'clock in the afternoon with footprints staying on the turf and grass plants visibly wilting.”

These greens were constructed according to strict USGA specifications using layers of sand. USGA greens are designed with the maintenance of firmness, smoothness and playability very much in mind but the soil conditions are tough on turf – like 'trying to grow grass on a beach'. High surface temperatures reaching 5-8°C above ambient temperature in no time are a fact of life at Kings Hill. And any fall-out from this rapid and reactive response to rising air temperature is over and above inherently high percolation and leaching rates through the soil profile.

### Rivers and reservoirs

During a normal summer the workforce manually water the greens with hosepipes during the day. "Our greens are characteristically undulating and therefore suffer differential drying out with 'high spots' always going first" says Duncan, adding how it all comes down to skill and experience and knowing each green like the back of your hand, so you instinctively

tributary of the River Medway) from October to March. Abstraction is allowed only when pre-set flow conditions of 890 megalitres/day are met. These will typically exist for only for a relatively short period of time. Fortunately, they are sitting pretty thanks to an on-site reservoir built in 1995 with 5 million litres capacity.

### Deficit irrigation

Kings Hill clearly runs a policy of 'Deficit Irrigation' so I asked Duncan why not put back the full amount of water lost during the day. "Firstly we will invariably get some rainfall even during the summer months. We calculate on receiving 30 ml/month during each of June, July and August and that goes into the equation."

The second reason is what can best be described as a 'horses for courses' policy to soil moisture movements. By design the sward was originally sown and maintained as a fescue/bent mix. As a natural heathland site fescues and bents would have been the predominant wild grasses (*Agrostis* spp and *Festuca* spp), inherently well adapted and suited to prevailing climate and soil conditions. "We

work on the basis of ensuring these turf grasses 'stay alive' in summer while letting nature take over and do the rest. The original seed mix was fescue/bent 'wall to wall' and a logical choice given the Kentish Ragstone substrate and soil and the accompanying high drying conditions."

Out on the greens with minimal Poa incursion it was clear to see how the fescue/bent combination was thriving, dominant and clearly at home in this location. As Duncan says, for 17-year old USGA greens to have less than 5 per cent Poa is virtually unique.

Kings Hill's turf is challenged by perennial ryegrass which we saw first-hand out on the course. But we also saw how this is taken care of using herbicide in an all Syngenta exercise, applying 'Rescue' at 1 L/product as a foliar spray through XC nozzles mounted on a boom sprayer. 04 and 025 XC nozzles are used respectively, for fairways and greens.

#### **Qualibra – the double edged sword**

A reservoir and a sprinkler irrigation system is clearly not the total answer to King's Hill unique water

resource, supply and utilization situation. Without sustainable soil water management the course would always be in a 'catch up' situation with water literally 'running away' before its very eyes. Helping the course to hold onto its water is Syngenta's Qualibra wetting agent used as a key component within an integrated soil moisture management programme.

"The design and development background to Qualibra was quite simply the idea of making much better use of valuable water resources in turf management", says Dr Simon Watson, Technical Manager at Syngenta. He highlights two basic situations where the services of a wetting agent are traditionally sought after.

First situation is water remaining in the top layer of soil to create a soft layer which the roots are unable to exploit. Soft surfaces are the norm. Footmarks stay and playability is compromised with ball roll speed reduced on characteristically soft slow greens.

"Such situations", says Simon, "tend to be species related with worst effects on Poa-based and non-USGA greens." Kings Hill and other comparable courses have overcome such problems by investing in tech-



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*"From what I have seen, using Qualibra would mean I may only need to irrigate once a week – a big saving in time and money."*

**Glenn Rayfield**  
Felixstowe Ferry Golf  
Club, Suffolk

*"Where we had sprayed Qualibra there has been a marked and sustained improvement in sward quality."*

**Philip Baldock**  
Ganton Golf Club,  
Yorkshire

LEFT: Roughs are awash with wild flowers and classic heathland shrubs like wild broom and gorse. Course manager Duncan Kelso in the picture



ABOVE: Dr Simon Watson of Syngenta with a soil/root core (Picture Syngenta)

#### about the author



#### Dr Terry Mabbett

Dr Terry Mabbett is a disease, pest and weed control specialist with forty years international experience covering research, advisory and journalism. His current fields of focus are professional turf and alien insect pests and pathogens of Britain's native and naturalised trees.

nology and growing medium from the very start, designing and constructing to USGA specifications for year-round playability. There is always the option of re-constructing greens to USGA specifications but you can't just do one. You have to do 9 at least and at up to £25,000/green you are talking about up to half a million pounds for an entire 18-hole course.

Managers of such courses are looking for products that will move rainwater and night-time irrigation down through the soil profile so that water is not just sitting there during the day to create a wet top layer and poor playability. They would traditionally go for a wetting agent with small molecules and accompanying strong penetrant properties to take water right down through the soil profile. However, by facilitating straight through movement of surface layer water droplets they are also promoting the accompanying rapid passage of dissolved nutrients which are no longer available to the grass plant.

"Duncan and other course managers in similar situations are looking to retain moisture in the soil profile", says Simon, "and are therefore looking to polymer technology featuring bigger molecules that can

hold on to water by re-connecting with soil particles."

#### Bridging the gap

Qualibra fundamentally bridges an apparent divergence in situation and need by presenting both penetrant and water holding properties. The research and development behind Qualibra is all about more evenly distributing moisture throughout the soil profile, thereby increasing the interfacing area of root surface and soil water containing dissolved nutrients.

Qualibra achieves the desired even spread of soil moisture through a unique combination of 'soil wetting' components. First is a small-molecule penetrant to move water and achieve the desired spread along the length of root mass, cutting through any hydrophobic zones along the way. Working in tandem with these penetrant properties, is the larger molecule water holding polymer also in Qualibra. This retains moisture right through the root zone, a feat unlikely to be achieved when using a conventional exclusively polymer product.

Soil moisture is now held more effectively at increasing depths in

# Qualibra

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the soil profile. Reduced leaching leading to improved nutrient uptake and more efficient fertiliser application, and less environmental impact from nutrient loss into groundwater, are now all on the agenda.

Many might automatically assume that lack of water is the cause of turf yellowing in summer but Simon says it is more likely due to a lack of available nitrogen. Nitrogen in its soluble, plant-available form only exists dissolved in water. In situations where Qualibra makes moisture more accessible, greater availability and higher uptake of soluble nitrogen should automatically follow. Syngenta say Qualibra can delay the onset of summer senescence if used in a programmed approach from spring through to autumn.

### Out on the course

'Proof of the pudding is in the eating' and a walk around King's Hill showed clearly the potential soil water management problems faced by Duncan and his team, and also how an integrated soil water management programme, including aeration, is maintaining and retaining grass root structure through the delayed spring and summer of 2013.

Our visit to Kings Hill took place on a bright, sunny and warm June day but with a distinctly drying wind blowing across the course. Soil temperature measured on one of the greens at 4 inches depth was 17.5°C. Duncan said this would be expected to drop some 2-3°C at night. Undulating nature of the greens was clear to see. A soil/root core taken from one of many 'high spots' showed how excellent grass root formation, structure and depth was being maintained.

Syngenta recommends foliar applications of Qualibra through a 08 XC nozzle at between 550-800 L/ha. Duncan uses a Gambetti sprayer mounted on a Toro Workman. He tank mixes Qualibra wetting agent with nutrients including sulphate of iron (Ferrous sulphate) to get that little bit more acidity for good grass growth, while keeping the turf hard.

"The course is not normally troubled by turf diseases like Fusarium Patch and anthracnose or surface worm casts", says Duncan. "Greens were uniformly constructed at 90 per cent sand and 10 per cent peat. We work hard to keep the organic matter fraction down in order to keep the greens firm and the spin-side of this effort

is inherently low turf disease and surface worm casting." The extra acidity from iron sulphate is clearly helping on both counts. Duncan uses Qualibra alongside Primo Maxx growth regulator to obtain the mutually provided benefits of improved rooting, drought tolerance and good grass colour.

**RIGHT:** A soil/root core taken from one of the many 'high spots' on greens showed how excellent grass root formation, structure and depth was being maintained (Picture Syngenta)

**BELOW:** Constructing the reservoir was the best decision we ever made says course manager Duncan Kelso pictured here (Picture Syngenta)

**BOTTOM:** Roughs are both scenic and challenging with gorse, broom and other typical heathland shrubs very much in evidence

