... our **Wetting Agent** and **Dew Dispersant range**

Introduction

With an in-depth knowledge of surfactants, this is one of our core areas. At GBR Technology we have amongst us many years experience of hands on formulating and real world use of surfactant based products. We both formulate and manufacture products in-house and sell direct and via re-sellers and distributors.

Our scope for these products now extends to overseas sales. With a reputation spreading for 'best in class' products, service to match and an impressive and dedicated technical sales team, our already well established customer base continues to grow rapidly.

The Benefits of Wetting Agents

As well as the key property to prevent localised dry patch (which can affect play) on putting surfaces, wetting agents have a whole host of other benefits that can improve turf health and the general condition of the course and can also assist with making the best use of available water – giving a more even spread, reduced run-off and loss through preferential downward flow and entrapment in thatch layers (especially on turf containing greater amounts of stolons and rhizomes).

The benefits of wetting agents can include all of the following:

- Eliminate or reduce localised dry patch
- Recovery from localised dry patch
- Reduced water run off
- Reduced level of pollutants reaching water courses
- Reduced evaporative water loss
- Reduced downward percolation of water through channels of preferential flow
- Reduced leaching of nutrients
- More homogeneous and consistent conditions across greens
- Increased uptake and effectiveness of applied nutrients
- Enhances the recovery on non-irrigated fairways suffering drought stress when rain does arrive
- Reduced water holding on spongy thatch layers
- Alleviate or remove anaerobic conditions resulting from saturated thatch
- Help create the right air and moisture levels for aerobic microbes to thrive

Properties of Wetting Agents

The surfactants used in formulations need to effectively lower interfacial tension to allow good wetting, so the ability of a surfactant to lower surface tension (more accurately interfacial tension) is an important property. Once the surface tension of water is below the surface energy of the surface to be wetted then ready wetting will occur on contact. Different surfactant chemistries have different abilities to lower the surface tension of water. For monthly residuals, the ability of the product to keep working between applications is a key performance differentiator - surfactants deplete over time though biodegradation and water washout, however depletion can be significantly reduced if products are formulated with this in mind.

Soil and Rootzones

Soil contains a significant amount of air in its pore spaces. The pores can be considered to be capillary or non-capillary pores. Capillary pores are the smaller pores and spaces where the movement of water is significantly affected by cohesion (surface tension) of the water and the adhesive forces from contact with soil constituents. In the non-capillary – macro – pores, the movement of water is more influenced by gravity (which also generates hydraulic forces).

Certain key levels of moisture content have been identified:

- Saturation – both capillary and macro pores are filled
- Field Capacity – capillary pores essentially filled with water but macro pores filled with air
- Wilt point – water present in soil is at such a low level that the grass plant starts to wilt and die

Field capacity is an ideal point to reach with sufficient water available to support the health of the turf but with the soil nicely aerated. Field capacity allows enough moisture for evapo-transpiration and should also allow free diffusion of oxygen and carbon dioxide – this will also encourage aerobic micro-organisms and these are efficient at breaking down many forms of organic matter and thatch.

Between field capacity and the wilt point the grass plant gets to a point at which it is said to be coming under increasing moisture stress.

Filling the capillary porosity of the soil with water to field capacity or just under is a desirable state. The use of wetting agents can lower interfacial tension and render more capillary pores 'wettable'. Build-up of hydrophobic material could otherwise render areas of the rootzone difficult to wet.

If we consider a sandy rootzone we would normally expect this to be very readily wetted by water alone – sand is a form of silica and has a high surface energy and thus can be readily wetted. However, hydrophobicity can arise from a number of sources:

- Plant breakdown material (especially under anaerobic conditions)
- Insect material and its decomposition
- Animal droppings and its decomposition
- Fungi

The use of wetting agents can over-come this hydrophobicity.

The Flow and Fate of Water

Models exist to describe the flow of water in soils but are different dependent on whether it is saturated flow, unsaturated flow or vapour movement. The reality is then that in many instances the flow of water is quite complex and when surface run off, surface evaporation and evapo–transpiration through plants is considered along with how this can alter throughout the season and with different amounts of irrigation and rainfall, then the real world behaviour can be quite variable.

In many cases though, surface run-off and downward percolation by gravitational flow can lose significant amounts of water (and also result in leaching of applied chemicals – including into water courses) and the use of wetting agents can significantly reduce these losses. Bear in mind too that water held on foliage or upper thatchy layers does not support plant growth and will evaporate directly into the atmosphere.

Water held in saturated thatchy layers will also dramatically reduce oxygen and carbon dioxide diffusion with the root zone underneath – this can then adversely affect the populations and activity of beneficial aerobic microbes in the soil.

The effects just described may affect sand based root zones to a different extent than fairways and steeply inclined courses differently to those with less variation in elevation. The benefits of wetting agents will vary across different parts of the course and under different conditions but a discussion with one of our technical sales team should offer a beneficial insight, possibly with some practical demonstrations which may help you decide how best to use wetting agents for your application.

Types of Wetting Agents

Wetting agents can be formulated to reside in the soil for prolonged periods of time – a common term for these is "residuals". They tend to be higher molecular weight, longer chain, molecules and are the mainstay of most wetting agent programmes.

The terms "penetrants" is ascribed to wetting agents that are generally of lower molecular weight, greater water-solubility and greater surface tension reducing property – they may be short lived in the soil profile but increase the ability of water to penetrate further into the rootzone.

Rather than dose surfactant into the soil, another method is to reduce the surface tension of applied water before, or as it is, applied. Wetting agent pellets, or irrigation tank tablets can achieve this, however they do not of course reduce the surface tension of rain falling onto the course!

Surfactants can be very effective at reducing surface tension of water even at very low concentrations. Even 1 part per million can reduce the surface tension of water from around 73 dynes/cm to around 45 dynes/cm and 1 part per hundred thousand can get down to around 40 dynes/cm. 1 part per hundred thousand is equivalent to a 3kg irrigation tank tablet dissolved in 300 cubic meters of water and may be a good level to aim for.

The table below categorises our range of wetting agents according to type:

Product type classification	Product
Monthly residual	Formulation 42, Hydrozone, Aquazone, Influxer, Influxer Excel, Dewel
Penetrant	Intensive Wetter, Influxer, Influxer Excel, Formulation 42, Hydrozone, Eco-Wet, Dewel
Hose end pellet	Aquazone Pellets
Irrigation tank tablets	Aquazone Irrigation Tank Tablets
Combined dew dispersant and residual	Dewel, Influxer Excel

Use rates and Timing of Wetting Agents

Greens

On greens a good monthly programme is preferred during the main growing season. Susceptibility to dry patch varies course to course and also depends strongly on weather conditions.

Treatments of Aquazone at 15-20 litres per hectare monthly or Hydrozone at 10-20 litres per hectare monthly from March/April till September/October is the norm. Treatments at 50 litres per hectare every 3 months can be used instead if spray time is very limited, although a monthly programme at the rates indicated is preferred.

In the winter, the use of Influxer at 10 litres per hectare or Intensive Wetter at 1-3 litres per hectare can help take water away from the top surface and can also assist in charging the soil profile with water ahead of the main growing season.

Intensive Wetter can also be used as a 'curative' on greens to assist in washing hydrophobic material out of sandy rootzones. In order to be effective, Intensive Wetter should be applied at 3 litres per hectare and watered-in with 10mm of water. After a period of 10-30 minutes, a strong water flush should be applied to the area by hand watering with particular focus on any especially hydrophobic areas. Bear in mind you are essentially 'washing the rootzone'. Intensive Wetter will need to be washed into the rootzone, allowed a period of time to start to emulsify some of the hydrophobic material and then this emulsified material dislodged or flushed through with a strong flush of water. Cleaning power is often expressed by the following equation:

Cleaner power = (chemical action + mechanical action + heat) x time

In this case the Intensive Wetter provides the chemical action and the mechanical action is provided by the hand watering (and thus flow of water through the rootzone) – we have no control over heat in this instance!

Tees

Tees can be treated with Aquazone or Hydrozone in the same way as greens although as this is not a putting surface it is not uncommon to apply 50 litres per hectare every 3 months.

Fairways

Wider variety of treatments are encountered on fairways. With a much larger area to treat then the cost becomes a more significant issue in the vast majority of cases. Also, the availability of irrigation is another key consideration. Spraying the fairways is also much more time consuming, requiring significantly more than one tank to cover a typical 10 hectares of fairways!

The very best option is application of Hydrozone or Aquazone at 50 litres per hectare every 90 days during the growing season. Aquazone has an advantage in that it is more cost effective and can be tank mixed at up to 12% concentration. The task can thus be completed with under half the number of tanks than with most products – saving a significant amount of time.

However 50 litres per hectare would not be in most clubs budget and significantly lower treat rates (down to 10 litres per hectare) will still give benefits and a useful degree of residence time.

Another excellent and very cost effective product for fairways is Influxer – use at 10 litres per hectare during the growing season for a reasonably sustained effect.

Intensive Wetter can also be used at 1-3 litres per hectare for a short but very effective 'restorative hit' – it will get water in to hydrophobic areas and is a great choice to apply ahead of rainfall.

In many cases of applying wetting agents to non-irrigated fairways in a cost effective manor, then using the appropriate product ahead of significant rainfall, a few times a season can be very worthwhile. If turf stress is already very evident on fairways, then again the right wetting agent ahead of a downpour can make a big difference to restoring turf health.

If in any doubt please speak to one of our technical sales team who can help you decide on the best options for your own particular needs.

FORMULATION 42

Uniquely Advanced Wetting Agent – Residual & Penetrant

Formulation 42 is a highly advanced wetting agent – residual and penetrant - for use at 12.5 litre per hectare giving 10L/Ha of residual wetters and 2.5L/Ha of penetrant wetters.

Residual wetters: A uniquely optimised blend of surfactants designed to take wetting property and longevity to a new level.

Penetrant wetters: Employing a unique penetrant engineered to last longer in the profile, combined with a superwetting surfactant for maximum wetting power and the ability to disperse water and dew from the leaf for a period.

Through our knowledge of surfactant technology, Formulation 42 achieves a new level of optimisation of block copolymers used for monthly residual wetting. The absolute wetting performance is further enhanced along with the resistance to both biodegradation and water washout. Extensive trials have confirmed a reduced treat rate of 12.5L/Ha.

One of the significant advancements of Formulation 42 is a unique penetrant wetting agent designed to last longer in the profile through its resistance to biodegradation.

Benefits:

- Highly optimised residual wetter
- Creates more homogeneous conditions across a green
- Allows prevention or reduction of localised dry patch even under conditions of increased moisture stress
- Allows recovery of areas already suffering localised dry patch
- Reduces soil hydrophobicity
- Long lasting penetrant designed to cope with heavy rain fall to give quicker infiltration rates and alleviate standing water

Availability:

5L and 12.5L packs, 120L and 200L drums, 500-1000L IBCs

Application Information:

Apply monthly during the growing season typically from March till September or October. Formulation 42 should be added to water and applied by spray.

Monthly application:

	Formulation 42	Water Volume	Area
Golf Greens	12.5 litres	300-600 litres	1 hectare
Golf Fairways / Tees / Sports Pitches	10 - 12.5 litres	300-600 litres	1 hectare
Bowling Greens	125 millilitres	3-6 litres	1,000 m^2

During prolonged hot conditions (day time temperatures of 26°C and above for longer than 10 days) then apply at 17.5L/Ha monthly or 12.5L/Ha every three weeks

Other application rates:

	Formulation 42	Water Volume	Area	Frequency
Golf Fairways / Tees	5 – 25 litres 5L is minimum effect level	300 – 600 litres	1 hectare	Every 30-90 days
Do not exceed a solution strength of 6%				

Discussion around application rates:

For monthly residual products of 100% activity (i.e. no diluents in the formulation) then typical application rates on greens are 10 to 20L/Ha monthly with most programmes running at 20L/Ha. The rates are designed to give sufficient wetting power to the soil over the period (and a bit of leeway should be built in too) and are chosen considering the breakdown and washout of the surfactant over time.

Once applied, surfactants will biodegrade in the soil and under very wet conditions can also wash out. During most summers the main rate of depletion is expected to be biodegradation rather than wash-out – since evapotranspiration rates are sufficiently high that in most cases the wetting front does not extend down so far.

Biodegradation rates are high in the summer – with higher temperatures, many surfactants will degrade quickly in the soil becoming a food source for microbes. When microbes are active, the biodegradation they give rise to is essentially a chemical process and typically reaction rates double for every 10°C that the temperature rises.

For the south east of England we might expect on average that a wetting agent doesn't last as long as say an elevated course further north (due to both the height and latitude bringing down the average temperature).

Formulation 42 achieves a new level of optimisation with regard to the absolute wetting power of the tri-block copolymer components along with a new level of optimisation in the resistance to biodegradation and water washout. This means better wetting ability and greater longevity. In the 12.5L/Ha rate – this gives 10L/Ha of residual tri-blocks and again is designed to be a safe level with some excess built in.

Another innovation in Formulation 42 is a penetrant blend with a unique twist. Penetrant surfactants are generally shorter chain and more soluble than residuals and they tend to biodegrade quite rapidly when in the soil. This combination means high rates of water washout and a much shorter residence time for penetrants due to rapid biodegradation. Formulation 42 contains a penetrant that is uniquely engineered to resist biodegradation for longer – this is quite unusual (in fact we believe it is unique) for a penetrant surfactant. The penetrant blend also contains a superwetting surfactant giving the whole formulation a very low surface tension and the ability of the product to disperse rain and dew from the sward (for a period after application) giving a drier leaf on average.

During very hot conditions:

During a heatwave – or prolonged hot conditions with daytime temperatures of 26°C and above for > 10 days, we would recommend to increase the application rate to 17.5L/Ha or apply 12.5L/Ha every 3 weeks. In reality this would mean if an application had been made at 12.5L/Ha ahead of very hot weather then the next application should be bought forward to 3 weeks later and if then conditions were expected to continue then to up the rate to 17.5L/Ha monthly or remain at 12.5L/Ha and be prepared to re-apply again 3 weeks later.

Fairway use:

Formulation 42 can also be used on fairways and tees. Typical use rates are 10 – 25 litres per hectare applied every 30 to 90 days although some noticeable effects can be gained at 5L/Ha. Fairways will often show a significant difference most years when a block copolymer wetting agent is used at sufficient rate (low rates of application such as 2.5L/Ha/month can be suggested but these will have much reduced effects). The wetting agent allows greater uptake of moisture and air into the root zone which then supports biological processes. During drought conditions grass cover can be lost and need extensive re-seeding where often a well-timed wetting agent (even in the absence of fairway irrigation) would have allowed a fast recovery and preserved the sward. Bear in mind that once soil has become very dry it becomes naturally hydrophobic and without a wetting agent it can be very difficult to re-wet in the short term.

HYDROZONE

Hydrozone is a 100% active (no diluents as supplied) non-ionic wetting agent developed for use on sports turf to prevent localised dry patch (LDP) and give additional benefits in relation to the use and action of water.

Hydrozone has been carefully engineered for maximum performance giving long residence time and a highly effective wetting action.

LDP can arise from hydrophobic soil conditions which may in turn arise from plant breakdown material, animal sources, fungi and critically low soil moisture content. Hydrophobic soils can inhibit even distribution of water in the soil profile, denying grass roots an adequate supply of water, water soluble nutrients and applied treatments.

Mode of Action

Hydrozone works by lowering the interfacial tension between water and other substrates (specifically soil constituents and grass roots) – this enables contact angles to be reduced and water to spread out laterally through the soil profile and flow into areas that were previously water repellent.

Benefits and Features

- Treatment and preventative for localised dry patch
- Contains a special surfactant to aid the initial spread into the rootzone
- Non-phytotoxic at use concentrations
- Non-scorch formula
- Excellent tank mix compatibility
- Potential to reduce water consumption where no turf wetter is currently used
- Assists in maximising the effectiveness of a range of soil chemicals and fertilisers

Please see the wetting agent introductory information for a fuller list of benefits of wetting agents.

Availability:

5, 20, 120 and 200 litre packs and IBCs

Properties

Appearance	Clear viscous liquid at room temperature
Solidification point	Below minus 15°C
Viscosity	600cP at 20°C
Maximum solubility	5-8% over typical temperature range
Surface tension	25 dynes/cm (3.5% solution in water)

Application Information

Hydrozone must be diluted in water prior to spray application. Hydrozone should be added to water rather than water added to Hydrozone – this avoids the potential for gel phases to form.

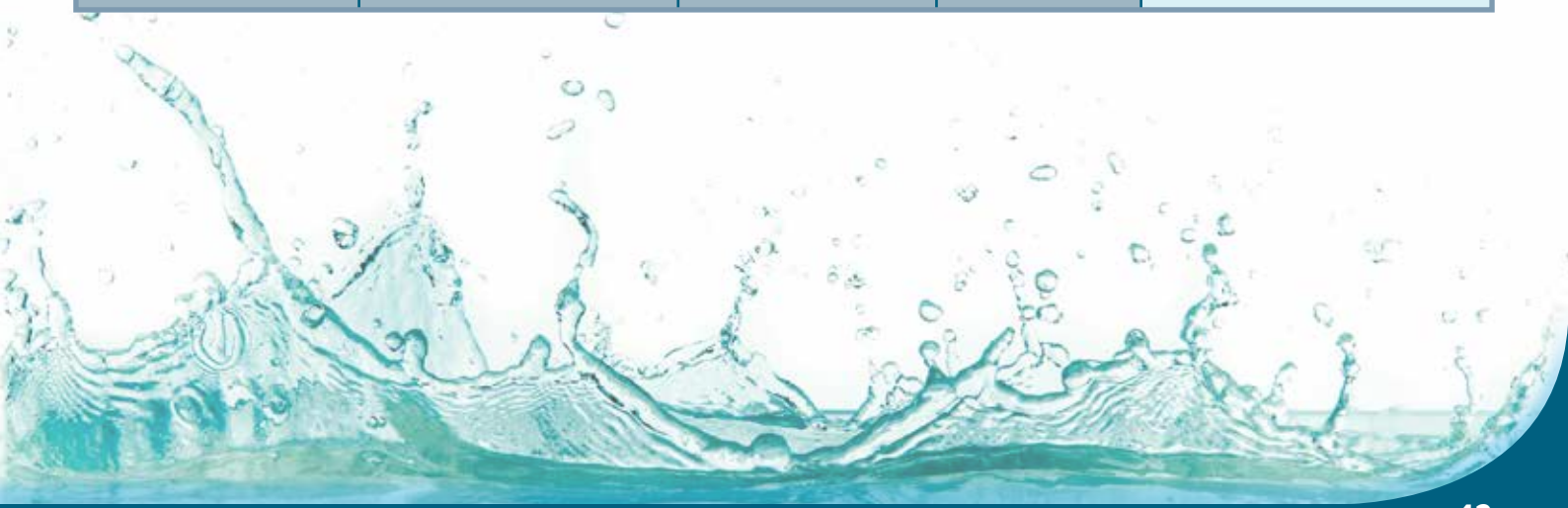
Hydrozone has widespread tank mix compatibility, however a jar test should be conducted first.
Speak to your technical sales contact for any advice.

Monthly application – March/April until September/October:

Zone	Hydrozone	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	20 litres (preferred) 10 to 20 litres under conditions of low drought stress	300 – 900 litres	1 hectare	Do not exceed solution strength of 5%. Water in within 24/48 hours and before cutting to avoid reduced performance.
Fairways (golf)	10 to 20 litres	300 – 900 litres	1 hectare	
Bowling Greens	3 litres	60 – 300 litres	1,500m^2	

90 day application – start March/April, repeat 90 days later:

Zone	Hydrozone	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	50 litres	1000 litres	1 hectare	Do not exceed solution strength of 5%. Water in within 24/48 hours and before cutting to avoid reduced performance.
Fairways (golf)	25 to 50 litres	500 – 1000 litres	1 hectare	
Bowling Greens	7.5 litres	150 – 300 litres	1,500m^2	



AQUAZONE

Aquazone is a 100% active (no diluents as supplied) non-ionic wetting agent developed for use on sports turf to prevent localised dry patch (LDP) and give additional benefits in relation to the use and action of water.

Aquazone is a high quality product giving reliable performance at an exceptional price.

LDP can arise from hydrophobic soil conditions which may in turn arise from plant breakdown material, animal sources, fungi and critically low soil moisture content. Hydrophobic soils can inhibit even distribution of water in the soil profile, denying grass roots an adequate supply of water, water soluble nutrients and applied treatments.

Mode of Action

Aquazone works by lowering the interfacial tension between water and other substrates (specifically soil constituents and grass roots) – this enables contact angles to be reduced and water to spread out laterally through the soil profile and flow into areas that were previously water repellent.

Benefits and Features

- Treatment and preventative for localise dry patch
- Non-phytotoxic at use concentrations
- Non-scorch formula
- Excellent tank mix compatibility
- Potential to reduce water consumption where no turf wetter is currently used
- Assists in maximising the effectiveness of a range of soil chemicals and fertilisers

Please see the wetting agent introductory information for a fuller list of benefits of wetting agents.

Availability:

5, 20,120 and 200 litre packs and IBCs

Properties

Appearance	Clear viscous liquid (hazy at low temp)
Solidification point	Below minus 10°C
Viscosity	500cP at 20°C
Surface tension	36 dynes/cm (3.5% solution in water)
Maximum solubility	12-15% over typical temperature range
Foam	Low
Biodegradability (OECD 901B test)	Readily

Application Information

Aquazone must be diluted in water prior to spray application. Aquazone should be added to water rather than water added to Aquazone – this avoids potential for gel phases to form.

Aquazone has widespread tank mix compatibility, however a jar test should be conducted first. Speak to your technical sales contact for any advice.

Monthly application – March/April until September/October:

Zone	Aquazone	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	20 litres (preferred) 15 to 20 litres under conditions of low drought stress	300 – 900 litres	1 hectare	Do not exceed a solution strength of 12% in water. Water in within 24/48 hours and before cutting to avoid reduced performance
Fairways (golf)	15 to 20 litres	300 – 900 litres	1 hectare	
Bowling Greens	3 litres	60 – 150 litres	1,500m^2	

90 day application – start March/April, repeat 90 days later:

Zone	Aquazone	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	50 litres	450 – 900 litres	1 hectare	Do not exceed a solution strength of 12% in water. Water in within 24/48 hours and before cutting to avoid reduced performance
Fairways (golf)	25 to 50 litres	210 – 900 litres	1 hectare	
Bowling Greens	7.5 litres	70 – 300 litres	1,500m^2	

STRI Test 2016

Summary of STRI findings on the performance of Aquazone and Hydrozone against an untreated control and a global market leading product.

From April till October 2016 a wetting agent test programme was performed by the STRI. Candidates under test were Hydrozone, Aquazone and a global market leading product - alongside an untreated control reference. In line with protocol, multiple plots were used for each product/control reference to ensure that only statistically valid results formed the basis of any conclusions.

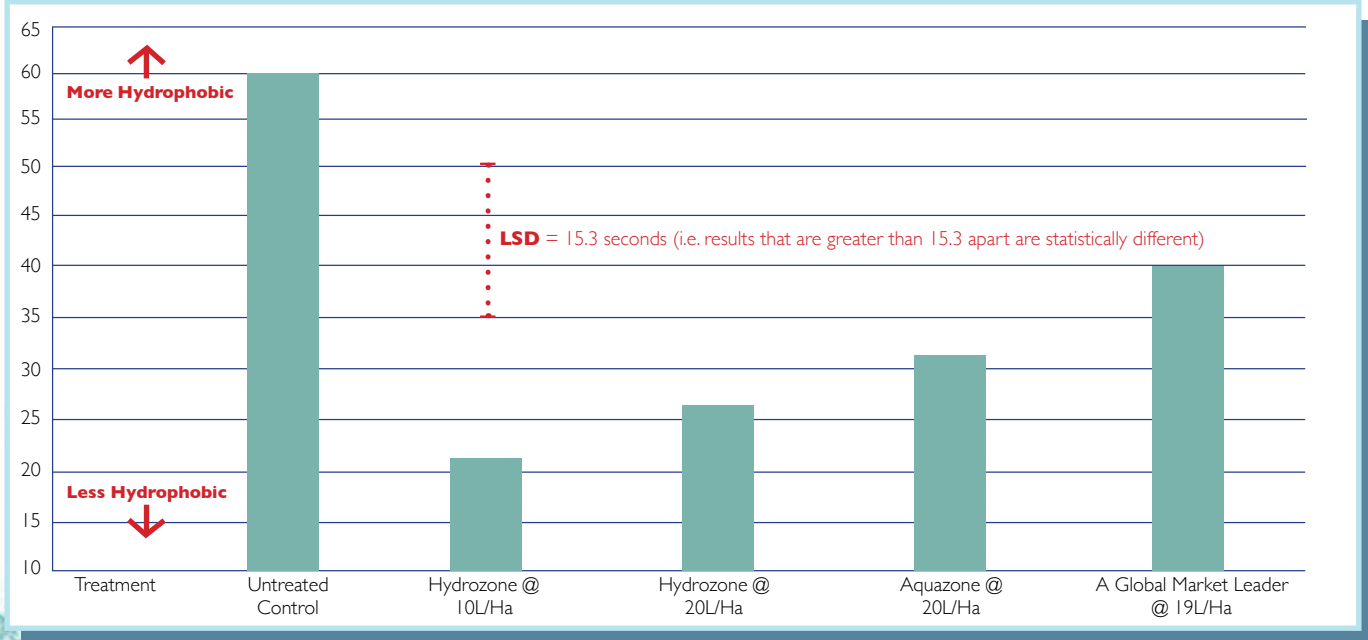
The test site was an area of golf green turf grown on a sandy loam root zone at the STRI experimental ground in Bingley, Yorkshire. The turf used for the trial had suffered from dry patch issues in the past. The trial included two periods of 'dry down' – withholding irrigation and using covers, when required, to keep off rain water.

Six parameters were used for the assessments; turf quality, visual turf colour, normalised difference vegetation index by handheld NDVI meter, dry patch incidence and volumetric moisture content which were all tested regularly throughout the trial and actual soil water repellency (WDPT) which was measured at the end of the trial.

The conclusions showed significant benefits to using Hydrozone and Aquazone over the untreated control.

- Hydrozone and Aquazone significantly reduced the incidence of dry patch formation when the turf was put under moisture stress
- Average soil moisture contents remained higher under moisture stress when using Hydrozone and Aquazone but were not affected at normal moisture contents
- Hydrozone and Aquazone speeded up the rewetting of the soil profile after a dry down period
- Hydrozone and Aquazone significantly reduced the hydrophobicity of the soil
- A global market leading product tested as part of the trial showed the same benefits listed above but did NOT outperform Hydrozone and Aquazone on the tests undertaken
- Hydrophobicity was tested by measuring the water droplet penetration time and a Hydrozone application within our recommended rates came out as superior and the optimal treatment from the trial.

Water Droplet Penetration Time (in most hydrophobic zone)



Eco-Wet Penetrant

Eco-Wet Penetrant is a highly effective penetrant surfactant that is based on environmentally sustainable materials. Both the hydrophobic and hydrophillic portions of the surfactants used are derived from sustainable plants sources. This penetrant does not compromise its performance in favour of its environmental credentials and recommended use rates function as well as penetrant surfactants based on non-renewable raw materials. The hydrophobic group in Eco-Wet is a **palm oil** derived fatty acid, whilst the hydrophillic groups are derived from sugars.

Palm Oil

Palm Oil is considered the most sustainable fatty acid vegetable oil crop having by far the highest yield per hectare. Around 87% of global palm oil comes from Malaysia and Indonesia. The industry employs around 1 million people and there are a further 3 million small holdings world-wide – in short many millions of households depend upon palm oil. Eco-Wet surfactants come from a member of the Round-table for Sustainable Palm Oil (RSPO)

Benefits and Features

- Strongly aids infiltration of water through upper hydrophobic layers
- May reduce localised water-logging
- Helps create a more even playing surface
- Concentrated penetrant based on renewable plant chemistry
- Nonionic in nature for excellent tank mix compatibility

Availability:

20 and 200 litre packs
Please see wetting agent introductory information for a fuller list of benefits of wetting agents

Application Information

Must be diluted in water, as per the chart below, prior to spray application. May be used year round.

Zone	Eco-Wet	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	5 litres	300 – 900 litres	1 hectare	Water in within 24/48 hours.
Fairways (golf)	5 litres	300 – 900 litres	1 hectare	
Bowling Greens	0.75 litres	30 – 100 litres	1,500m^2	

Influxer Residual wetting agent, Penetrant and Restorative

Influxer is a powerful penetrant wetting agent developed for use on amenity grass. Influxer provides effective wetting within the rootzone and can reduce water run-off. Influxer is highly effective at getting water through thatch layers and is good for restoring areas already affected by dry patch. Influxer achieves extremely low surface tensions in water and tests demonstrate an unusually high ability to spread water laterally on a surface. Influxer also has an inherent dew dispersant effect. Influxer also demonstrates a significant residence time and can be used as a very effective residual wetter.

Due to its cost effective nature, Influxer is ideal for use on fairways but may be used on all areas.

Wetting agents help to maximise the availability of rain or irrigation water by ensuring water supply to the whole of the root zone and a more even distribution of water. Fairways without irrigation can still benefit from the use of Influxer by ensuring more even water penetration, reduced run-off from compacted and sloping areas and a quicker uptake of water into the soil following extended periods without rainfall.

Benefits and Features

- Cost effective for fairways
- Reduced water run-off
- Residual wetting ability
- Powerful penetrant properties
- Dew dispersal effect

Availability:

5, 20, 120 and 200 litre packs and IBCs

Please see the wetting agent introductory information for a fuller list of benefits of wetting agents.

Properties

Appearance	Clear, low viscosity fluid
Solidification point	0°C
Surface tension	21 dynes/cm (0.2% aqueous solution)

Application Information

Apply monthly or less frequently as required but not exceeding 20 litres per hectare or applying more frequently than fortnightly.

Zone	Influxer	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	10-20 litres	300 – 900 litres	1 hectare	Water in within 24/48 hours and before cutting to avoid reduced performance
Fairways (golf)	10 litres	300 – 900 litres	1 hectare	
Bowling Greens	1.5 litres	30 – 150 litres	1,500m^2	

Influxer Excel Wetting agent and Dew Dispersant

Influxer Excel is essentially a more concentrated version of Influxer. Apply at 1 – 2 litres per hectare

Application Information

Apply monthly or less frequently as required but not exceeding 3 litres per hectare or applying more frequently than fortnightly.

Availability:

1, 5 and 20 litre packs

Zone	Influxer Excel	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	1-2 litres For maximum dew dispersancy use 2 litres	150 – 900 litres	1 hectare	Do not exceed a solution strength of 1% When using as a wetting agent, water in within 24/48 hours and before cutting to avoid reduced performance
Fairways (golf)	1 litre	150 – 900 litres	1 hectare	
Bowling Greens	0.15 litres	15 – 150 litres	1,500m^2	

Intensive Wetter Penetrant, Targeted Fairway Wetter and Curative

Intensive Wetter is a powerful surfactant that aids water infiltration. The particular strength of Intensive Wetter is its exceptional ability as a penetrant and the detergency of the surfactant when used appropriately. Intensive Wetter can be used selectively as a curative to emulsify hydrophobic materials which can then be removed from the root zone with a strong water flush following application.

Intensive Wetter can be used year round to ensure the best penetration of water into the soil profile, assisting in the uptake of water from the surface. Intensive Wetter can be used cost effectively on non-irrigated fairways by application ahead of pending rainfall.

Intensive Wetter can also be used to 'wash' sand of hydrophobic material. Washing requires that the surfactant is allowed to act for a period of time on the area required – this will begin to emulsify hydrophobic material. However sufficient mechanical action is then required in the form of a strong water flush to complete the process and remove some of the emulsified hydrophobic material. When using as a curative it is best to discuss with a member of GBR Technology technical staff.

Benefits and Features

- Highly concentrated penetrant product means low use rates, cost effectiveness, less packaging and storage space and transportation costs
- Penetrant and curative effect from one product
- Strongly aids infiltration of water
- May reduce localised water-logging
- Curative action for localised treatment
- Helps create a more even playing surface

Availability:

5, 20 and 200 litre packs

Please see the wetting agent introductory information for a fuller list of benefits of wetting agents.

Properties

Appearance	Clear, low viscosity fluid
Solidification point	<0°C
Surface tension	25 dynes/cm (0.5% aqueous solution)

Zone	Intensive Wetter	Water Volume	Area	Notes
Greens/Tees/ Sportsfields	1-3 litres	300 – 900 litres	1 hectare	Water in within 24/48 hours and before cutting to avoid reduced performance
Fairways (golf)	1-3 litres	300 – 900 litres	1 hectare	
Bowling Greens	0.15 - 0.45 litres	30 – 150 litres	1,500m^2	

Aquazone Irrigation Tank Tablet

A 3kg large tablet for addition to irrigation tanks. The tablets will dissolve slowly and uniformly, reducing the surface tension of applied water.

Aquazone Tablets are supplied with a mesh bag which can be used to hang the tablets near to inlet or outlet pipes. Putting tablets closer to the water flow will result in quicker dissolution and more effective surface tension reduction. Tablets can be placed further from any water flow if slower dissolution is required.

Aquazone Tablets in irrigation tanks will typically only achieve very low concentrations in solution due to the high volume of water present. However, even solutions with concentrations below 0.001% surfactant can achieve a significant reduction in surface tension compared with untreated water.

Benefits and Features

- Increases the wetting power of irrigation water
- Tablets dissolve uniformly and do not break-up or disintegrate
- 100% surfactant tablet - no binders or diluents
- Mild system cleaning effect
- Packed in water soluble bag for ease of removal from pail

Directions for use

The tablet should be removed from the plastic pail (complete with water soluble bag). Tablet (including water soluble bag) can be placed in the supplied mesh bag and hung in the irrigation tank (such that the mesh bag can be retrieved at a future date) or may be dropped loose to the bottom of the tank.

Hanging tablets by inlet or outlet pipes will increase the rate of dissolution due to the increased water flow over the tablet. For larger tanks and bigger irrigation volumes it will become more necessary to increase the dissolution rate and/or number of tablets employed.

Availability

3kg tablets supplied in 3 litre white plastic pails with mesh sack.

Store upright in a cool dry environment (tablets will melt at 35°C but will re-form on cooling).

Aquazone Pellets

A unique 100% active, block copolymer wetting agent pellet with very low scorch potential, for use in hose-end applicators.

Aquazone Pellets will give effective wetting performance on 'hot spot' areas.

The pellets maintain their integrity and dissolve uniformly.

The pellets are 'cast' into water soluble bags (which dissolve rapidly in use) to allow their easy removal from the pot.

Benefits and Features

- Effective wetting performance
- Very low scorch potential
- Water soluble bag ensures easy removal from pot
- Pellets dissolve uniformly and do not break-up or disintegrate
- 100% surfactant formulation with no use of binders or diluents

Directions for use

Aquazone Pellets dissolve slowly as water passes over them reducing surface tension of applied water and thus increasing its wetting power.

Pellets, complete with water soluble bag, should be removed from the pot before use and placed into the hose end applicator. Water greens, tees and hot spots as required.

One tablet will treat up to 6-7 greens

Availability

Sold in boxes of 6 x 250 gram pellets.

Approximate pellet dimensions – 55mm (diameter) x 80mm (height):

Storage:

Store upright in a cool dry environment

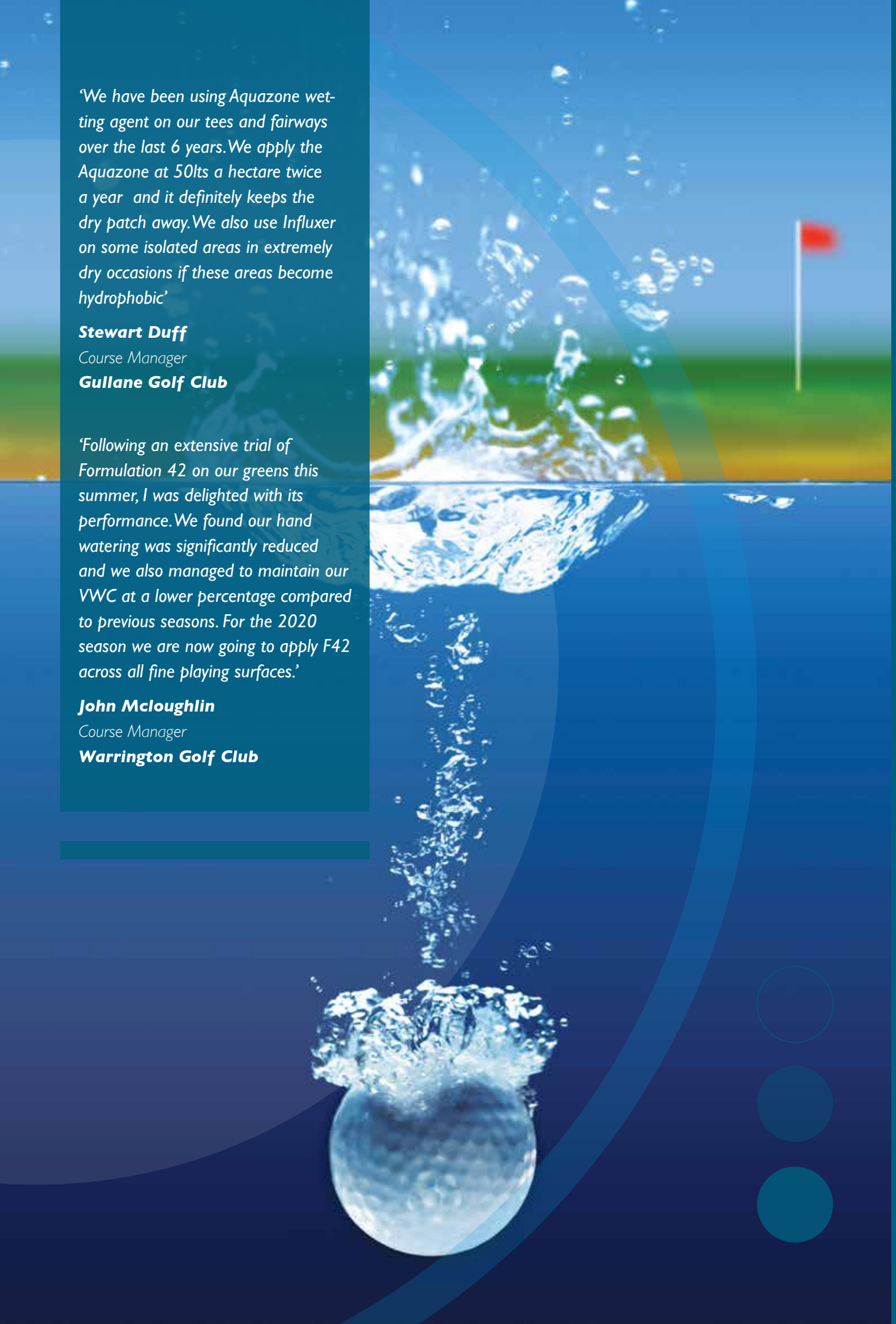
Aquazone Pellets melt at 35°C and should be stored below this temperature. Above this temperature pellets may melt but will readily re-form on cooling without any loss of performance.

'We have been using Aquazone wetting agent on our tees and fairways over the last 6 years. We apply the Aquazone at 50lts a hectare twice a year and it definitely keeps the dry patch away. We also use Influxer on some isolated areas in extremely dry occasions if these areas become hydrophobic'

Stewart Duff
Course Manager
Gullane Golf Club

'Following an extensive trial of Formulation 42 on our greens this summer, I was delighted with its performance. We found our hand watering was significantly reduced and we also managed to maintain our VWC at a lower percentage compared to previous seasons. For the 2020 season we are now going to apply F42 across all fine playing surfaces.'

John Mcloughlin
Course Manager
Warrington Golf Club



Dewel dew dispersant and winter wetting agent

Dewel is a dew dispersant with dual action – additionally functioning as a winter wetting agent. Dewel is 100% active with no diluents or carrier solvents and oils. Instead of bulking the formulation with carriers, additional long lasting surfactants are used – these will 'dose' the root zone ahead of the growing season and will have the added benefit of preparing the soil in the event of early season dry conditions.

Mode of Action

Silicone based "superwetting" surfactants in Dewel will coat the leaf surface. The nature of these particular surfactants prevents water from beading up on the surface and so prevents the formation of dew. The additional surfactant present will reside in the rootzone and give a long lasting wetting effect to assist in overcoming any hydrophobic conditions that may arise over winter.

Benefits and Features

- Allows a dew-free playing surface without the need for switching
- Long lasting effect: 1 – 2 weeks
- Reduces potential for diseases arising from damp sward conditions
- Non "suffocating" formulation can be used regularly without adverse effect
- Dewel has a dual effect – dew dispersing and winter wetting agent
- Prepares rootzone wetting ahead of the growing season

Application Information

Apply as required at 6 litres per hectare but not more often than weekly. Dewel must be diluted in water prior to application.

Availability:

1, 5 and 20 litre packs

Zone	Dewel	Water Volume	Area	Notes
Greens	6 litres	300 – 400 litres	1 hectare	Ensure sufficient mixing before spraying
Bowling Greens	0.9 litres	45-60 litres	1,500m^2	

Important note: Dewel needs thorough mixing in water. The formulation is engineered not to be so readily soluble – this assists with field longevity. Ensure tank recirculation for at least 10 minutes and check to see that material is fully dissolved before spraying

Endew Plus Advanced Dew Dispersant

Endew Plus is a highly optimised and long lasting dew dispersant that gives an extended effect. Rapid removal of rain, dew and guttation fluid leads to drier sward which can significantly reduce the potential for fungal turf diseases as well as aid playability of putting surfaces.

Maximum longevity is achieved during periods of reduced plant growth and cutting, however trials in late August still showed a degree of dew dispersancy after 10 days and 8 cuts. Longevity during optimum periods should be in the range of 2-3 weeks.

Discussion

Switching has long been promoted as good cultural practice to keep the sward drier and help reduce incidence of fusarium patch, however switching will only remove dew and guttation fluid at the time it is done and not stop it building back up. A dew dispersant can stop the build-up of rain, dew and guttation fluid day and night for extended periods. Trials of a new breed of highly effective dew dispersants have shown dramatic effects on reducing incidence of fusarium patch.

Benefits and Features

- High performance products
- Aids morning playability on putting surfaces
- Drier sward reduces susceptibility to fungal diseases
- Also provides a penetrant wetting effect within the rootzone

Application Information

For most reliable results apply as a standalone spray onto dry turf. Dissolve 5 litres of Endew Plus in 300 – 450 litres water and spray apply to 1 hectare of greens. Can be used mid-August till end of Spring, applied up to every 10-21 days. Do not apply immediately ahead of heavy rain.

Availability

5 & 10 litre packs

Zone	Endew Plus	Water Volume	Area	Frequency
Golf Greens/ Tees/Sports Pitches	5litres	300 – 450 litres	1 hectare	Every 10 to 21 days as required

Effective Dew Dispersancy

The New Programme for Fungal Disease Control?

The use of switching has long been promoted as best practise to aid the reduction of fungal disease, as well of course for early morning playability. Switching though will not prevent dew and rain building up on the sward – it is only used at regular intervals to knock the moisture off. With a highly effective dew dispersant you can keep surfaces much drier night and day – aiding playability but also crucially reducing the likelihood of fungal disease outbreak.

We have seen some dramatic results now from an effective dew dispersant programme. Key is to use a product that it both highly effective and long lasting as well as not depositing an appreciable film on the leaf surface (which can affect the effectiveness of fungicidal sprays). Enter two products from GBR Technology – one brand new and one redirected from its initial use as a wetting agent.

Endew Plus – an anionic-type dew dispersant for use at 5 litres per hectare.

Programme: Apply every 2 weeks during autumn and winter at 5 litres per hectare (i.e. 10L/Ha consumption per month)

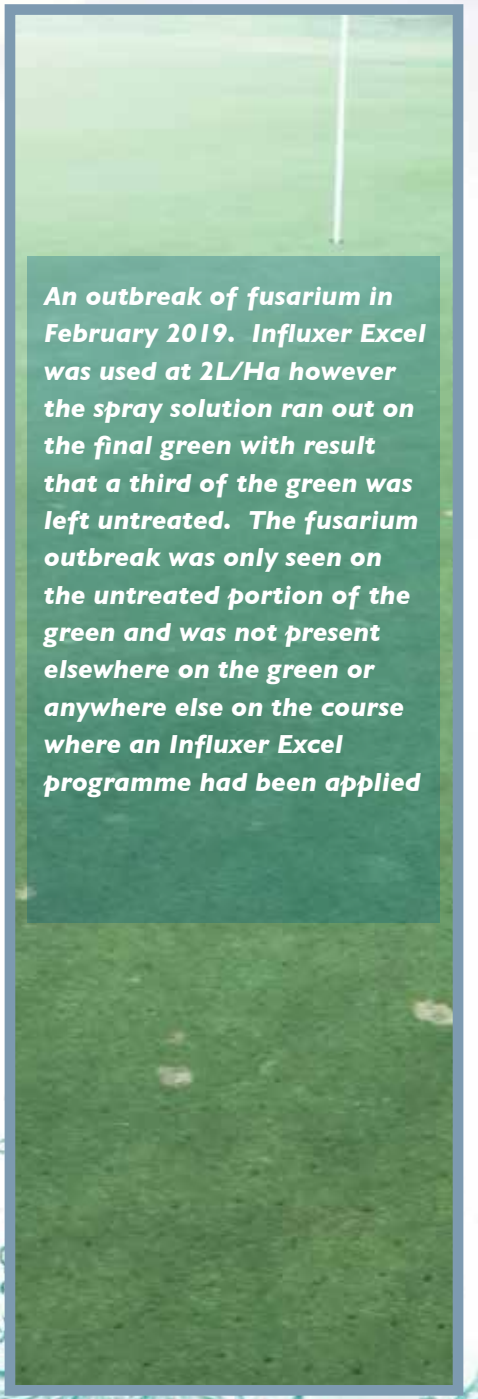
Influxer Excel – a siliconised surfactant type dew dispersant for use at 2 litres per hectare.

Programme: Apply every 2 weeks during autumn and winter at 2 litres per hectare (i.e. 4L/Ha consumption per month)

Notes: Influxer Excel has wider tank mix compatibility but should not be acidified below pH 5. It is best to apply an Influxer Excel solution onto dry sward.

Both the above applications give very reliable dew dispersancy under suitable conditions and for extended periods. High growth rates and cutting will of course reduce the effect quicker.

Two highly effective dew dispersants with disease suppressing qualities. GBR's NEW Endew Plus and Influxer Excel tailored for use at 2L/Ha for dew dispersal.



An outbreak of fusarium in February 2019. Influxer Excel was used at 2L/Ha however the spray solution ran out on the final green with result that a third of the green was left untreated. The fusarium outbreak was only seen on the untreated portion of the green and was not present elsewhere on the green or anywhere else on the course where an Influxer Excel programme had been applied