

Edition 3



NEWSLETTER

May - August 2019

Welcome to Edition 3 of our newsletter. Spring is well underway (in fact it seems to be racing by – now over half way through!) and it's been all systems go. You have been (and still are) getting your supplies in for the season ahead (thank you – we have been nicely busy!). We give an insight into activity here as the season got underway and also give an overview of biostimulants and a discussion on wetting agent pellets and irrigation tank tablets. We hope you find it useful!

There is also a Q&A on a new development product - Formulation 42!

Do you have something that you wish us to cover in our newsletters? If so please email us at info@gbrtech.co.uk – please title your email 'GBR Newsletter' – we'd be delighted to hear from you!

Paul Morris
Managing Director



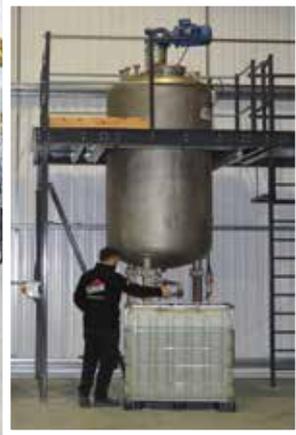
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We're in Full Swing!

Continuing the theme of giving an insight into the company, Managing Director Paul Morris describes the goings on of a few days in early February.....



It's the second week in February and things are ramping up as we enter peak buying season for sports turf products.

Monday morning and a list of blends have to be prepared – Influx (a penetrant wetting agent with extremely low surface tension), a turf nutrient blend, a 500kg batch of Formulation 42 (an exciting development product off to trial at 8 sites around the UK and overseas) and a batch of foam bout marker.

The manufacturing is in full swing now, by close of play Tuesday the three blends above have been prepared, quality controlled and are racked and being filled off with material also left over for stock – raw materials are also being adjusted on SAGE. Tuesday however saw a further list of blends to be prepared coming in – a bespoke wetting agent blend for one of our reseller customers, an IBC of a special turf nutrient and a batch of liquid turf hardener – two of these latter blends were started for completion on Wednesday.

The above 7 blends represent a range of formulating skills and some real chemistry. For example the foam bout marker uses 2 surfactants – one anionic and one amphoteric – all coupled together with a propylene glycol ether lower toxicity compared with ethylene glycol ethers and containing MGDA - BASF's environmentally friendly but powerful chelating agent to soften the water that it will be mixed with in use (any hard water salts can act as an antifoam – and you don't want any antifoam creeping into your foam bout marker!). You'll notice GBR have added two more environmentally friendly innovations compared with some current products!

The turf nutrients utilise NPK straights – carefully chosen to give the required NPK and nitrogen in the most appropriate form for the season and function – a 'proper' dose of fulvic acid also goes in. These turf nutrients have a manufacturing process that is highly endothermic – endothermic meaning that on dissolving the solution takes in energy from its surroundings and so the temperature drops. The first half of the production process starts with water at around 8 degrees C and around half way through the solution temperature has dropped to almost minus 4 degrees! Ice has formed on the outside of the blending vessel – it's a 2 day blend this one – dictated by the temperature drop – instead of wasting energy with heating – we allow the vessel to warm naturally overnight – why not!

For Influx we are using our 3300 litre blend vessel – the water, surfactants and coupler are added and then we have to acidify to pH 5.5-6.5 – we used to use sulphuric acid for this last step but now use citric acid – it's far safer to handle, does the job fine and is a natural plant product. Now we have to add a bit of biostat – it's a biocide – it's added at just the right level to give 'in-can' preservation – the formulation contains water and we don't want it to go 'buggy' in storage – there isn't enough biocide in there to actively kill microbes but just enough to stop them growing in our product – when you dilute the product for use, the biocide is at such low concentration it then does nothing – it won't affect your soil microbes!

Outside of blending, orders are picked and packed from stock – 5 pallets are being prepared for different bowling clubs, containing an assortment of products, two pallets are being prepared for shipment to Iceland and many more pallets for golf clubs around the UK. Pallets of goods are being filled for our reseller customers too. Much goes off on the pallet networks but also too FedEx are picking up individual containers and boxes for sub-pallet orders. For anything that is hazardous for transport then our Hazchem carrier will be transporting those items! Collections and deliveries occur throughout the day for products, raw materials, packaging and other items. Office staff are taking orders, processing them on SAGE, completing the paperwork, booking deliveries on carriers and labelling up orders.

Our lubricant activities are in full swing too - we supply some critical materials to a wide range of industries and customers. Orders going out today include a Krytox fluorinated grease off to a corrugated cardboard factory where it will be lubricating bearings operating at around 200 degrees centigrade – conditions far too arduous for most greases. There are orders for silicone diffusion pump fluids heading off overseas for use in the production of metallised packaging. A barrel of an Anderol compressor fluid specially approved for the use on railway train braking systems is leaving us today too. There are some critical products being supplied vital for the production of everyday items we rely on.

Exciting months lie ahead now and there are a lot of customers to keep happy - we'll be working hard. The business is growing strongly and we are well set up to handle it. It's happy days!

Biostimulants

Biostimulants are a category of product that have been around for some time. However, currently it is fair to say that there is greater emphasis on what these products can do as the number of Plant Protection Products available become ever more constrained. Increasing the turf plants own health and that of symbiotic species with the aim of increasing resistance to pathogens is certainly a goal worth striving for.

A biostimulant is distinct from a fertiliser and a plant protection product – a biostimulant should not have any direct action on diseases or pests and thus is not regulated by the same framework covering plant protection products.

A biostimulants main role is also not to provide NPK and other elemental nutrients or micronutrients although in practice some biostimulants do contain these elements that can assist with general fertilisation e.g. trace elements in seaweed and carbon sources from seaweed and molasses.

Many biostimulants when applied to the soil (or a plant via foliar application) can increase resistance to abiotic stress, they can increase plant yield, vigour or quality and they may be in the form of a diverse range of natural or synthetic materials or even micro-organisms.

Biostimulants may act with a wide range of different mechanisms and it's useful to understand what these mechanisms are and whether they may be of relevance for you. However, frequently, biostimulants will have effects for which the mechanisms are not well known or well understood.

Common products sold as biostimulants include seaweeds and their extracts, humic and fulvic acids, molasses/sugars, amino acids, soil oxidants, phosphite solutions, chitin derivatives and microbes (bacteria and fungi).

Results of application can be mixed in some cases and it should be noted that benefits seen in research on some plant species may not necessarily transfer to grass species – this fact should be borne in mind when studying research papers relating to other crops. Also, it's important, in order to see results, that suitable application rates are used. Products exist on the market with added biostimulants at sub-effect levels and it is worthwhile considering whether the extra cost for these additions justify the price charged. However with these reservations made, there are, of course, many biostimulant products being successfully used on turf grass.

Let's look at some of the product types:

Seaweeds:

Ascophyllum nodosum is a seaweed that naturally contains macro and micro nutrients but also contains plant hormones and is rich in cytokinins. Higher cytokinin levels (relative to auxins) can stimulate shoot growth. Most seaweed product sold in the UK are based on extracts of *Ascophyllum nodosum*.

Ecklonia maxima is a species native to southern oceans – this seaweed is rich in auxins and the higher auxin to cytokinin ratio present is promoted to stimulate root growth. A key brand here is Kelpak.

Humic and fulvic acids:

These are natural decay products of dead plant material – they are normally extracted under alkaline conditions from humus – humic acid precipitates upon acidification whilst fulvic acid remains in solution at all pHs – they are highly complex mixtures largely of carboxylic and phenolic organic compounds



Molasses:

Molasses is a by-product of sugar refining – it contains sugars itself as well as other macro and micro elements. Sugars are also a rich source of carbon and can help achieve a desirable nitrogen to carbon ratio in fertilisation programmes. Sugars can be an easy food source for microbes, releasing quick energy (as they do for humans!).

Soil oxidants:

Oxidation in chemistry is defined as the removal of electrons. In nature on earth, since oxygen gas is the predominant oxidising agent in the atmosphere, then living organisms have evolved mechanisms to utilise oxygen in energy pathways. Most soil oxidants reportedly work indirectly by stimulating soil microbes to produce oxygen, although some soil oxidants have been known to contain hydrogen peroxide that directly decomposes and generates small amounts of oxygen. The formulations often contain nitrates and so will show a green up and plant growth effect. Interestingly too, in soils with a low redox potential (redox = reduction-oxidation; redox potential indicates how aerobic the soil is), the nitrogen in nitrate form maybe the next most potent soil oxidant after oxygen. Nitrogen in nitrate exists in the +5 oxidation state – so it can take 2 electrons from other atoms (and remember chemical oxidation is defined as the removal of electrons) and convert to the +3 oxidation state – this type of oxidation would only be possible in low redox potential soils. Sulphate would be the next most potent soil oxidant as the redox potential drops further; but at this stage anaerobic sulphate reducing bacteria are active here and the reaction product of this oxidation are toxic sulphides (hydrogen sulphide the rotten eggs gas – which can then also react with iron in the profile to form black layer). Soil oxidants will themselves not work miracles – they may help tip the balance but are, of course, no substitute for good cultural practice.



Phosphite:

Phosphite supplied as a solution of potassium phosphite (or ammonium phosphite) is regularly used to help reduce incidence of fusarium patch. Phosphite itself is well translocated within the plant but is not believed to be a form of P that can be used to replace phosphate P for nutritional uptake in turf grass. Phosphite at certain levels of use can directly act on a pathogen although applications are normally made at levels below this and it is believed that the action then is one of stimulating the turf plants own natural defences. Phosphite converts slowly to phosphate in the soil environment.

Amino Acids:

Amino acids are the building blocks of proteins and these make up various structures and components of plants and animals including cell walls in plants. Nitrogen uptake in plants is generally converted to amino acids and then much of these into proteins as well as incorporation into DNA. Plants need various amino acids many of which they can synthesize themselves – however this synthesis requires energy and during periods of high stress it is believed that supplying some amino acids directly will reduce the abiotic stress on the plant.

Chitosan:

Chitosan is a derivative of chitin. Chitin itself is biosynthesized in nature and is highly abundant – it makes up the exoskeletons of many insects and crustaceans and also found in the cell walls of some fungi. Chitosan is a soluble material supplied in aqueous solution.

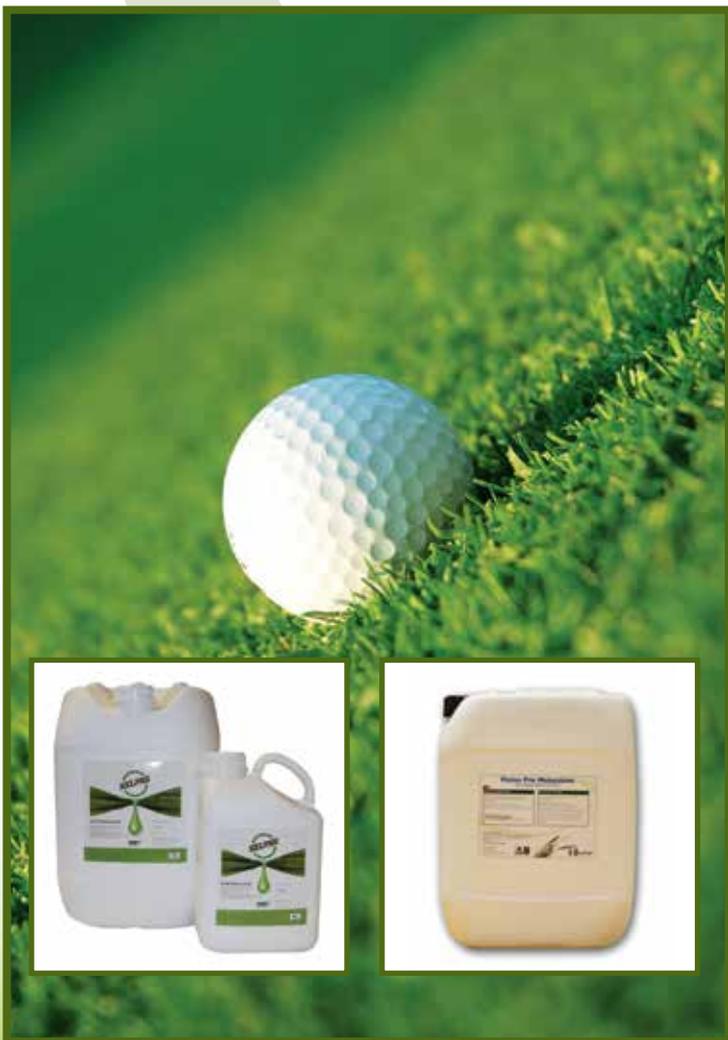
Chitosan is made by a deacetylation process (a type of chemical synthesis reaction that removes a chemical group) on chitin and may typically come from crustacean chitin (e.g. crabs shells etc.) or from fungal chitin. Chitosan has been extensively studied and has a number of bioactive effects.

Microbes:

Microbes in the form of bacteria and fungi can bring positive effects by breaking down plant material and releasing back nutrients – this gives nutritional benefits to the turf plant as well as reducing thatch. Certain fungi can also work symbiotically with plants to exchange benefits (nutrition and energy) and it is also believed that in many cases the fungi can help protect its symbiotic partner against pests and diseases.

Mycorrhizal fungi can have underground networks forming the mycelium which link into root systems and which can form very extensive networks effectively increasing dramatically access of a plant to nutrients and water.

One issue of course with applying microbes is to ensure that their populations can survive and thrive in the soil.





The Use of Wetting Agent Pellets and Irrigation Tank Tablets

The extended dry hot weather in the summer of 2018 led to a huge increase in the consumption of wetting agent pellets to assist the effectiveness of hand watering. Our own production ran pretty much constantly through July and early August to keep up with demand.

The main function of wetting agent pellets is to lower the surface tension of the water that is applied through the hose and to assist this water to wet through the profile rather than just run-off the surface.

Very dry soil becomes naturally hydrophobic – add to this a gradient i.e. around a bunker and it becomes easy for the water to just run off rather than get through to the rootzone.

The Underhill Pellet Pro hose end applicator is a very well made piece of kit and widely used. The pellet sits in a screw on cup and dissolves slowly as water passes through. It's typical that one pellet will last for around 6 greens when used for top-up watering of greens.

The formulation of pellets does vary somewhat – with different surfactants being used. Some pellets contain binders in order to solidify otherwise liquid surfactants, some pellets contains solid surfactants which are cast into pots.

The key point with a surfactant is that it can effectively lower the surface tension of water at very low addition rates. The reason being that surfactants migrate to surfaces and will concentrate there.

Measured statically, 1 part per million of a surfactant can reduce the surface tension of water from 72.8 dynes/cm down to around 50-55 dynes/cm and 1 part per hundred thousand can achieve 40-45 dynes/cm (lower surface tension = better wetting).

Bear in mind though that although a wetting agent pellet can help the water that is passing through it to wet better, it won't have a significant residual effect. The reason for this is that if one 250 gram tablet lasts for watering 6 greens you are thus applying only 750 grams of surfactant over 18 greens (normally about 1 hectare) – contrast that with a typical monthly residual treatment of 20 litres (around 20,000 grams) per hectare.

Hand watering can also be assisted by using liquid containing hose end applicators. In this case the screw on reservoir (typically around 1 litre in capacity) can be filled with a wetting agent liquid. A dial controls the rate at which the wetting agent is sucked up into the water flow and consumed. The rate the wetting agent is consumed does depend quite significantly on its viscosity and the dial will need adjusting to compensate. The system can work very well but operator variation can be quite significant due to the need to adjust the dial and it's variation with the viscosity of the fluid but you can dose quite high rates of surfactant in this way and give residual effects too.

Let's consider irrigation tank tablets now: In many cases they are the same materials as the pellets just now in a bigger size – typically 3 kg. They are normally either tossed into the irrigation tank – or hung in mesh bags.

If the tablets are hung where water flows around them they can dissolve as quickly as within 1 or 2 days. Left in a calm spot at the bottom of the tank and they could remain for a couple of weeks.

If we look back to those surface tension reduction figures mentioned earlier – we might aim to get a concentration of surfactant in the tank of say around 1 part per 100,000. That means a 3 kg tablet dissolving in around 300,000 litres or 300 cubic meters of water. The way to achieve this is through the positioning of the tablets so they dissolve at roughly the correct rate for the amount of water consumed. If you are using about 50 cubic meters a day – that's a dissolution rate of one tablet every 6 days. It will be approximate but at least you can ensure they are dissolving quickly enough to have a suitable effect.

Irrigation tank tablets, just like the hose end pellets will be primarily effecting the wetting power of the water as it is applied rather than having a residual effect.

In summary:

Routine use of pellets around bunker edges and hot spots is the norm. Top up watering of greens, assisted with pellets is also very common during extended hot dry weather. Irrigation tank tablets may be used routinely to assist the wetting power of your irrigation system – or again reserved for deployment during extended hot dry conditions.

Products:

Aquazone Pellets come in boxes of 6 x 250 grams. They comprise a blend of melted and mixed surfactants cast into water soluble bags for ease of pot removal. There are no binders or diluents and small amount of humates are not added – instead the focus is on maintaining a 100% concentration of surfactant in the pellet.

Aquazone Irrigation Tank tablets are cast into larger 3kg tablets again in water soluble bags. Mesh bags are provided to enable users to hang the bags in the most appropriate position.

Underhill Pellet Guns and Liquid guns can also be purchased from us.



Hi Paul, so this time we are talking about a new product – one in the pipeline?

Yes – the big innovation is something we are currently calling Formulation 42 – it's a new residual wetting agent, designed to be even longer lasting (so lower treat rate) and also to contain a penetrant that is engineered to last. It will also have the lowest surface tension of any residual on the market.

Tell me more!

Ok, where to start..... block copolymers make up the mainstay of the monthly residual products and you can engineer them. They are made up of blocks of polymerised ethylene oxide (EO) and propylene oxide (PO). In turf wetting it's tri-blocks that are used. So you have a configuration of EO-PO-EO or better PO-EO-PO. You can vary the ratio of EO and PO and the size of the molecule and also the configuration, as I said – this give specific properties.

Sounds like chemistry now! What are the properties you are talking about?

Three key properties are wetting ability, water solubility and resistance to biodegradation. You want the best wetting ability from the block copolymers and then you want them to last in the profile as long as possible so they maintain their performance – so this means they don't wash out too quickly or biodegrade too quickly.

Isn't Hydrozone already optimised in this respect?

Yes it is – we believe it is the best product on the market currently – there are others close in my opinion but I do believe Hydrozone has an edge. But we know we can now optimise the formulation further. Formulation 42

increases the wetting power of the block copolymer components further plus reduces the water washout potential plus further resists biodegradation. They are incremental gains but quite significant and worth doing – we have to use 3 carefully optimised block copolymers in the formulation to achieve this.

Sounds like a good improvement then?

Yes! Another another key innovation is that we have added a unique penetrant. It is quite unique for a penetrant as it is engineered to last longer – penetrants tend to wash out and biodegrade quickly in the soil – often with a residence time of just a few days in the summer – Formulation 42 uses something quite special and we have early indications of its performance from trials underway in the field. Then the final component to Formulation 42 is a more substantial dose of a superwetting surfactant – this gives an exceptional wetting ability upon application and will also disperse rain and dew from the sward for a number of days – this latter property will reduce disease pressure especially later in the season.

What is the treat rate?

It's 12.5L/Ha – down from the normal 20L/Ha. This should be a good effective dose that will last well for a month. 12.5L will deliver 10L of highly optimised residual and 2.5L of the highly effective and longer lasting penetrant combination. During prolonged hot dry weather we recommend increasing the rate to 17.5L/Ha but this is only likely to be necessary on 1 or 2 treatments during the season if such conditions do arise.

When will the product be available commercially?

At the end of this year: We have already scaled up to a 500kg batch but this has gone for trials in the UK and overseas – 7 or 8 trials are being conducted as full season programs. Full production will begin at the end of this year for commercial application in 2020.

Thanks Paul - so we better watch this space for more news later in the year.

New Starters - GBR Technology are delighted to welcome two new members of staff :



Mark Handler

Joined the company on the 17th April. Mark will focus on the lubricants side of the business, particularly our activities in the vacuum sector for which Mark has many years of experience, but he will also spend some time on other areas of our lubricants activities. Mark has extensive technical sales experience.



Stephanie Holland

Joined our customer services team on the 15th April. Stephanie combines a degree in publishing with logistics experience.

GBR Technology Ltd

Unit 42, Easter Park, Benyon Road, Silchester,
Reading, Berkshire, RG7 2PQ

Telephone: +44 (0)118 982 0567

Fax: +44 (0)118 982 0590

Email: info@gbrtech.co.uk

www.gbrtech.co.uk/amenity

