Organics Recycling & Biogas

Autumn 2022 Issue 50

- **THE BENEFITS OF BIOFERTILISERS**
  Economic and environmental
- **INTEGRATED AD AND COMPOSTING**
  Greater than the sum of parts
- **BANNING RETAIL SALES OF PEAT**
  Implications and opportunities

The magazine from REA Organics and Green Gas

Tackling plastic contamination

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Welcome

Kiara Zennaro, Head of Heat, Green Gas lead
Jenny Grant, Head of Organics and Natural Capital

Welcome to the Autumn edition of our magazine. The year seems to be flying by – we hope you've managed to have time to enjoy some sunshine.

The policy and regulatory work is ongoing with recent consultations on the Emissions Trading Scheme, Environmental Targets, phasing out peat usage, the Scotland Circular Economy consultations and the annual tariff review of the Green Gas Support Scheme. We've also been involved with work to develop a long-term Bioresources Strategy, the much-anticipated revision of the Compost and Anaerobic Digestate Quality Protocols and the regulatory position statement on CO2 capture from AD plants along with many other activities.

Hopefully, by the time this magazine goes to print, we will shortly see Government's response to the consistency consultation. We look forward to hearing from members on this and to working to ensure the industry is able to realise the potential for recycling organics back to the soil.

Given the current energy crisis, there has never been greater recognition of the role that green gas can play to decarbonise our gas supplies and help address energy security. This is echoed by the European Commission (EC)'s recently published REPowerEU Plan, which sets an ambitious target of 35 billion cubic meters of sustainable biomethane production by 2030. A new Biomethane Industrial Partnership will support the achievement of the target and create the preconditions for a further ramp up towards 2050.

We are here for members and really appreciate all your feedback and involvement. Please get in touch if you would like to discuss any issues with us. We hope you enjoy reading this issue.

Jenny and Kiara.

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Organics Recycling & Biogas is the magazine of REA Organics and REA Green Gas member forums

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Updated UK Plastics Pact Roadmap to 2025

In May, the UK Plastics Pact invited feedback on its Roadmap to 2025 redraft. The REA responded on points relevant to three of its targets and in June WRAP published the updated roadmap. We requested clarification regarding a Pact members' action point under Target 1, which focuses on eliminating problematic or unnecessary single-use packaging. WRAP clarified that, by the end of 2025, 'any items identified for elimination still remaining are removed'.

Under Target 2 – on striving for 100 per cent reusable, recyclable or compostable packaging – we commented on the evolving recycling landscape and the recycled plastics market, asking that 'All compostable plastic packaging, in appropriate product formats, can be collected co-mingled with food wastes from household, commercial and/or industrial sources' by the end of 2025. WRAP confirmed that, by the end of 2023, 'the pathway for the composting of packaging via food waste collection services is understood'. WRAP also clarified that, by the end of 2024, UK Plastics Pact members' design of flexible packaging 'for mechanical / non-mechanical recycling aligns with CEFLEX design guidance recycling rationalising to polyolefins other than when used for components' and that 'design of compostable packaging is compliant with standards and certification scheme rules'.

Target 4 focuses on average recycled content in plastic packaging, setting progressive targets for Pact members: 21 per cent by the end of 2022, 23 per cent by the end of 2023 and 30 per cent by the end of 2025

The REA requested acknowledgement that independently certified bio-based content in compostable plastic packaging would count towards this average, and for inclusion of a target that all compostable plastic packaging has a minimum 30 per cent independently certified bio-based content by the end of 2023, rising to a minimum of 40 per cent by the end of 2025. WRAP responded acknowledging that fossil-derived plastics could not be relied on in the longer term and that bio-based plastics have an important role to play. It went on to say that 'under The UK Plastics Pact bio-based material is not considered as recycled content in its own right', so the REA believes there remain issues to discuss regarding the organic recycling of certified compostable plastic packaging.

Defra proposes mandated food waste reporting

The Government is consulting on its National Food Strategy, setting out measures to mandate businesses to report food waste and considering what type of business should fall within the scope.

Three pathways are outlined – do nothing, enhance voluntary agreements or require waste measurement and reporting for large businesses.

Businesses with over 250 employees could be required to report both the percentage of food waste produced/purchased and its final destination.

Defra is also seeking views on how long it would take to gather the data, and how frequently it should be reported. Mandatory reporting seeks to improve organisations' awareness of food waste arisings. On a national level, data collection should improve assessments of progress towards targets.

Defra notes that previous plans to obligate businesses based on the weight of food waste produced would, in fact, not be viable. Many do not currently measure their waste, restricting the ability to ascertain which businesses should be obligated.

European Commission to revise Waste Framework Directive

Last month, the European Commission launched a consultation on revising the Waste Framework Directive. Proposals include setting food waste reduction targets within the EU, as well as addressing several 'review clauses' in the Directive linked to waste prevention.

The Directive outlines a set of fundamental waste management principles for Europe, prioritising prevention over sending waste to landfill, describing the process as a 'last resort.'

The consultation seeks to increase the protection of environmental and public health through waste management, specifically aiming to reduce waste generation, increase reuse, and improve separate collections to promote preparation for reuse and 'quality' recycling.

According to the consultation document, total waste generation in the EU is 'actually increasing'. The Commission found that the EU produced an average of 5.2 tonnes of waste per capita in 2018, with only 38 per cent of this waste being recycled. 48 per cent of municipal waste was recycled, with the total weight produced amounting to 496kg per capita.

Policy objectives set in several EU schemes are being considered – including The European Green Deal, the Farm to Fork Strategy and the Circular Economy Action Plan. The consultation will be open for feedback until 16th August.

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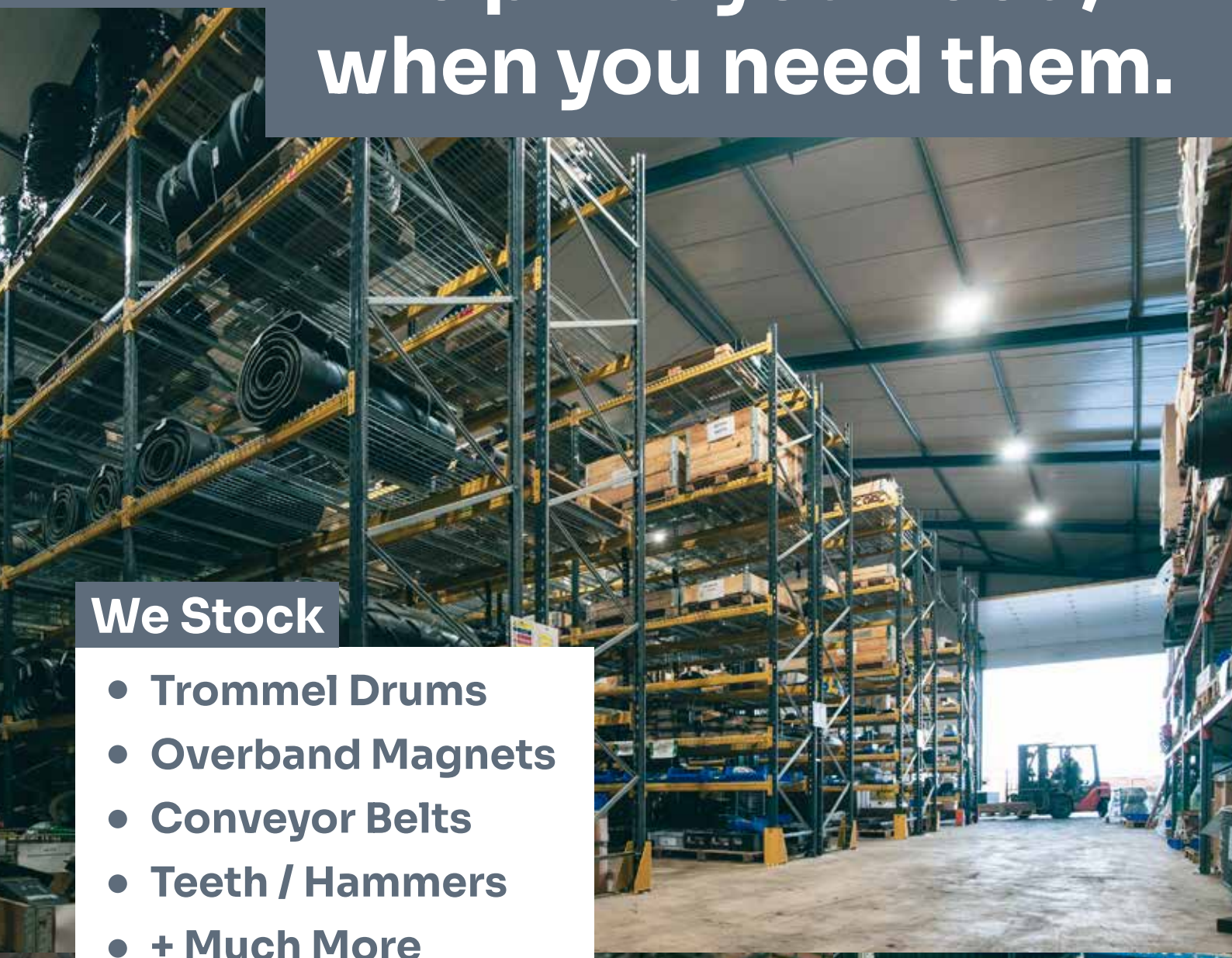

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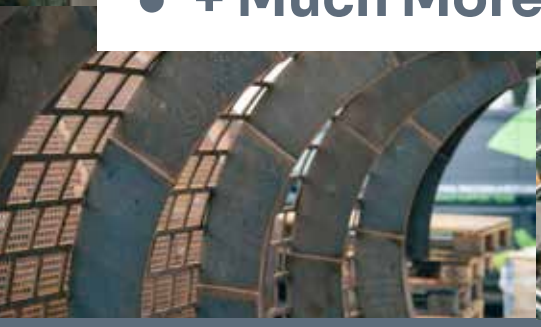

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Innovative compostable packaging project launched with UKRI funding

Emily Nichols,
Technical Manager,
Organics and
Natural Capital

The four leading compostable packaging producers in the UK have teamed up with behaviour change, waste and life cycle analysis (LCA) experts to examine the role that compostable packaging can play in displacing hard-to-recycle plastic packaging. The Compostable Coalition UK: Closing the Loop for Compostable Packaging is backed by UK Research & Innovation's (UKRI) £60 million Smart Sustainable Plastic Packaging Challenge.

This two-year project will study the entire life cycle of compostable plastic packaging, the first full-scale research of its kind. Its empirical evidence will be crucial in informing interventions that aid this packaging's contributions to the UK circular bioeconomy and in responding to Defra's call for further evidence to support the case for classifying the processing of compostable packaging under industrial conditions as (organic) recycling.

This project will investigate whether compostable packaging can provide a viable end-of-life solution to displace hard-to-recycle plastics in the following contexts where little to no quality recycling exists today: flexible packaging (such as fresh produce and snack food packaging); small formats (such as coffee pods, tea bags and twist wraps) and single-use packaging used in food courts and canteens.

This project will also research how best to encourage and support consumers to place compostable packaging in the relevant waste bin. It will focus on three collection routes: a take-back program with an online retailer; household residents; and multiple cafeterias in London. Alongside this, the project will work closely with the bio-waste industry to investigate whether compostable plastic can be sorted and properly processed, along with food waste, in composting and anaerobic digestion.

Results from the study will be used to create a cost-benefit analysis to inform Defra and the devolved administrations. The data and evidence gathered will identify the necessary policy and legislative interventions required to enable compostable plastics to help address the global plastics challenge, alongside meeting the UK Plastics Pact goals.

The research consortium brings together the four leading compostable packaging producers in the UK: Futamura, Vegware, Biome and TIPA®. Hubbub and the University of Sheffield will lead consumer behaviour research, with the latter also conducting an environmental analysis using LCA. Meanwhile, EnVar, the largest composting facility in the UK and Paper Round/Recorra, an expert commercial recycling company will support the project, along with the trade associations REA and RECOUP. TIPA will lead and coordinate this 10-partner consortium.

Futamura's compostable sweet twist wrappers

GGSS annual tariff review

Dr Kiara Zennaro

On 19th May, BEIS published a Call for Evidence to seek views and evidence from biomethane industry, investors, trade associations and supply chain to inform the Green Gas Support Scheme (GGSS)'s 2022 Annual Tariff Review. The Call for Evidence closed on 10th June.

The GGSS regulations allow tariffs to be increased, decreased or held each year from 2022 to 2024. The Annual Tariff Review (ATR) informs the decision to change or maintain tariffs. It aims at ensuring that payments continue to incentivise the deployment of biomethane production plants effectively, whilst ensuring value for money for billpayers.

The Review will be published by 1st September 2022, and any change to the tariffs will be applied from 1st October 2022.

The REA submitted a response to the call for evidence, which can be read on the REA's website, at **www.r-e-a.net/resources**. In our response, we strongly discouraged BEIS from using the annual tariff review mechanism to make significant changes to the GGSS tariffs (e.g. decrease) as doing so could unsettle developers and undermine future investments in this sector at a time when we really need to boost our domestic biomethane supplies. Unless BEIS are confident that the long-term viability of these projects has drastically changed in light of macroeconomic and/or supply chain changes, and that these changes are expected to last in the long term, we do not believe there is a good justification for decreasing the tariffs at this time.

Quality Protocols Revision Update

Jenny Grant,
Head of Organics and Natural Capital, REA

The Task and Finish Groups met in December for a scoping meeting to look at the changes needed in the Compost and Anaerobic Digestate Quality Protocols. The Task and Finish Groups comprise of EA, Defra, devolved regulators, REA, REAL and other trade body representatives.

Following these meetings, the EA have produced an estimate of how much they think it will cost to work through the whole revision process for both the compost (approx. £26K) and AD quality protocols (approx. £29K). These are the direct costs and don't include additional costs for any research that may be needed to evidence change.

Defra and REAL have agreed to contribute some funding for limited parts of the revisions. The good news is that there are sufficient funds from the money that was raised by the industry to cover the EA estimate for the remaining tasks. At the time of writing, we are in the process of signing the letters to enable the EA to proceed with the revisions. The next stage is for the EA to work through all the technical issues within scope and the revisions will progress. We may need to commission work to support changes. We will keep members updated with any progress.

Consultations and Guidance

Recently the REA has responded to the Consultation on the Emissions Trading Scheme and the Environment Targets Consultation. Full details and copies of the responses can be found on our website.

The Environment Act 2021 requires the Government to set targets in various areas. The most relevant target is on waste reduction and they propose a target to reduce residual waste (excluding major mineral wastes) kg per capital by 50 per cent by 2042 from 2019 levels. In the response, the REA support the target for the reduction of residual waste and for the metric for measuring the target to include all residual waste treatment technologies. We also suggest a sub-target with a phased approach for the amount of biowaste/ organic waste that can remain in the residual waste stream.

There are two Scottish Government consultations on actions aiming at delivering on Scotland's commitments to a circular economy. The Route Map sets out how Scottish Government intend to deliver their system-wide, comprehensive vision for Scotland's Circular Economy. The Circular Economy Bill looks to bring forward the primary legislation they need to underpin their key policy measures.

The EA have published its reformatted landspreading guidance. These pages include corrected and refreshed links and they meet GOV.UK publishing requirements for accessible content. The EA has also reformatted and refreshed the LPD1 Application for deployment and the associated guidance. This is what they now expect operators to use.

The statutory guidance on applying the farming rules for water has been updated. Updates include some minor text amends and they have removed reference to soil P index level 3 in section 2.2. The guidance now states 'land managers should plan to avoid applying organic manures that raise the Soil Phosphorus Index (soil P index) above target levels for soil and crop on land over a crop rotation…' Please see the guidance on .gov.uk for full details.

All consultations will be circulated to members and we welcome comments to help develop the REA response. Please contact **Jenny@r-e-a.net** if you wish to discuss any of the above further.

EA publishes RPS on carbon dioxide from AD

Dr Kiara Zennar
Head of Heat, Green Gas lead

In April 2022, the Environment Agency (EA) published a regulatory position statement (RPS) setting the EA's position on carbon dioxide (CO2) from anaerobic digestion that meets food and beverage or industrial grade standards.

This RPS covers capturing, treating, storing and using the CO2 from AD plants. It applies to AD plants that don't have this specific activity listed in their current permit or don't have an environmental permit for a waste operation. On the provision that you meet all the conditions set out in the RPS, the EA will not normally take enforcement action against you if you are:

- Capturing CO2 at your AD plant to produce CO2 that meets food and beverage or industrial grade standards;
- Treating, storing and using CO2 at your AD plant or elsewhere to produce CO2 that meets food and beverage or industrial grade standards,

To check all the RPS conditions, please find the full position statement at **www.r-e-a.net/resources**. We were also pleased to learn from the EA on 23rd June that it has taken on board our and other industry feedback, and amended the RPS, increasing the tonnage for storage of CO2 to 150 tonnes.

Events Round Up

Jenny Grant, Head of Organics and Natural Capital at REA, brings to life some of the in-person events that have been taking place.

After two years of online events, it has been great to finally get back together with members in person. We were lucky enough in Spring to be able to facilitate two site visits as well as our annual conference. One visit was to Levenseat's in-vessel composting (IVC) site in central Scotland and the other to Shorts' open windrow compost site in Bracknell.

Shorts Group Ltd composting

The morning after the Organics conference, a large group gathered to visit Shorts' composting site in Bracknell. Shorts Group is an industry-leading, independent company offering a diverse range of products and services such as Waste Management, Plant and Tool Hire, Demolition Contracting and Agricultural Services. We took advantage of its site's proximity to the conference venue to arrange a site visit for members prior to everyone heading home.

The site is an open windrow composting site and produces high-quality PAS100 certified compost. The site accepts garden waste from local authority collections alongside landscapers and forestry waste, with a capacity of approximately 75,000 tonnes per year. It has a strong focus on quality and as such, every load is thoroughly inspected and picked prior to processing. Once accepted, the material is shredded and formed into windrows which are turned over a period of 10 weeks to allow sanitisation and stabilisation to take place. Following this, the compost is screened to produce two grades of high-quality compost. These then undergo a short maturation period prior to being supplied for use in landscaping, horticulture, agriculture, and turf maintenance. There was lots of opportunity for questions and sharing best practices.

A huge thank you to all the team at Shorts for the hospitality.

Levenseat Ltd's in-vessel composting site

Levenseat Ltd is a fully integrated site based in central Scotland which provides recycling and waste management solutions. Services include; Mixed Waste Recycling, Food and Garden Waste Recycling, Energy from Waste, Aggregate Recovery and Waste Disposal. We visited Levenseat's IVC operation which processes mixed food and green waste from kerbside collections. The visit started with a series of presentations about the process.

Levenseat has recently installed an OREX 500 organics extrusion press from Anaergia with partners Zebec to recover the wet fraction from co-mingled food and garden waste and to increase the capacity and throughput of the IVC. The co-mingled food and garden waste arrives on-site and, following checks to make sure it meets its acceptance criteria, it is discharged in the reception bay. The incoming waste is then screened and put over a picking line to remove any contamination prior to shredding. The screened and shredded material is then put through the OREX press to recover the wet organics fraction. This wet fraction is transferred to an anaerobic digestion facility for conversion to biogas and digestate.

The remaining drier fraction is then processed through its Vertical Composting Unit (VCU) enclosed vessels prior to an outdoor stabilisation phase. The compost is then screened to produce a high-quality product for use in agriculture, landscaping and land restoration. Levenseat is certified to PAS100 under the Compost Certification Scheme.

We are very grateful to Levenseat, Anaergia, Ulster Shredders and Zebec for their hospitality, answering lots of questions and hosting the visit. The day concluded with some good networking over dinner in a nearby hotel. Many thanks to Anaergia and Thoeni Industriebetriebe GmbH in association with Target Renewables Ltd for supporting the dinner.

Organics Conference 2022

It has been just over two years since our 25th Anniversary Conference, and we were delighted to welcome members back together at the Berystede Hotel in Ascot for our annual conference in March. It was great to see everyone in person and lots of networking was done in the exhibition area where there was the opportunity to browse the stands and showcased products.

The day was packed with interesting speakers on all the hot topics, from what future collections will look like to operational challenges and how to make the most of our industry's products. The key takeaway messages were around the important role that the organics industry plays in meeting the country's net-zero ambitions, how proper education and communication are essential and that the industry needs to prioritise quality (feedstocks, processes and products) to ensure that we can maximise the potential contribution to soil health and long term food security.

We are grateful to all the sponsors, speakers and delegates who made the day a success.

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Organics from MSW fines: the key to fulfilling biomethane targets?

Despite presenting technical challenges, the treatment and digestion of organics from MSW fines represent an untapped opportunity for the biogas sector, says **Simon Christian,** Sales Leader and Managing Director of Anaergia.

The development of new AD assets and the generation of biomethane to meet the targets of the new Green Gas Support Scheme (GGSS) have come at a challenging time for the procurement of feedstocks from across the sector as a result of operational and input cost increases.

In the municipal and commercial waste treatment sectors, it is estimated that there are up to two million tonnes of MSW fines being generated each year from the treatment of commercial and industrial (C&I) and municipal solid waste (MSW). Despite legislative measures to encourage more source-segregated collection of food waste from households, it is inevitable and widely accepted that municipal and some commercial waste will continue to contain a significant portion of useful and recoverable organics. In fact, a recent study forecast that up to five million tonnes of food waste will remain in the UK residual waste stream in 2035. This material represents a huge opportunity for the biogas sector as an untapped feedstock for new plants and the generation of renewable biomethane, as well as the prospect of positive gate fees for the treatment of the material.

Technical challenge

The treatment and digestion of MSW fines pose some well-known technical challenges, with the development of this type of plant requiring some specific processing technology in comparison to other types of AD plant. Key elements to consider include:

- Highly effective pre-treatment for the removal of light and heavy contaminant fractions
- A digestate management solution to enable the digestate to be treated and utilised through alternative routes to land spreading

The supporting infrastructure for site selection typically needs to include excellent road access, suitably sized gas and electricity grid connections, and a suitable sewer connection for a trade effluent discharge. This means that this type of plant typically must be developed in existing industrial areas or adjacent to such an area.

One tonne of MSW fines can produce up to 90m³ of biomethane and so it is realistic to assume that this feed source can sustain plants generating biomethane, at and above the top of the Tier 1 GGSS scheme.

A unique suite of proven technologies

Anaergia UK, a subsidiary of Anaergia Inc, a leading global AD and waste treatment technology provider, has developed a solution for the separation and treatment of MSW fines to tackle the challenges posed by this waste stream.

Treating the material through Anaergia's patented OREX™ 500 extrusion press followed by the company's organics polishing system (OPS™) provides a highly effective, integrated and durable solution for the separation of organics from contaminants. These technologies also ensure that the organic element of the waste is 'digestion ready' so that there will be no loss of digestion effectiveness over time. This system combination is proven globally across a number of Anaergia installations including Cyprus, Toronto, Ontario, and San Carlos, California.

After digestion, the second critical process innovation is to provision a purpose-designed digestate management system, incorporating Anaergia's Sludge Screw Dewaterer separation system, which provides highly effective solids removal at low parasitic energy consumption. Alongside this, a membrane bioreactor wastewater treatment solution should be provisioned, incorporating Fibracast (an Anaergia Inc. technology company) wastewater membrane separation. This digestate management system is employed globally by Anaergia in plants including Rialto, California (USA), Camden, NJ (USA), Pontiia, Italy, and Calimera, Italy, among others.

New Solutions for UK AD Developers

We are bringing this technology to the UK AD market, utilising organics as part of refuse treatment plants and as standalone plants treating MSW fines from multiple outlets. We are currently working on a range of projects in both scale and delivery model, including those funded directly by Anaergia.

Tackling plastic contamination

Dr David Tompkins, Head of Knowledge Exchange and Innovation at Aqua Enviro, explores the particular problem of plastic contamination in composts and digestates, and how it might be addressed.

Plastic contamination and plastic limits are a core topic for the current compost and digestate Quality Protocol (QP) reviews. Feedstock contamination levels are required to decline to 'as low as reasonably practicable' (ALARP) by the end of 2025 and the QP reviews are focusing on limits in the end products – and how these might be changed.

> Worst-case situations still allow the equivalent of thousands of fragmented plastic carrier bags to be spread on each treated hectare of land

Since the limits are set in PAS100 and PAS110 rather than the QPs, an overhaul of the standards will be an inevitable consequence of the QP reviews. That is unless the industry lobbies Defra and the EA to port the end of waste process into new GB fertiliser regulations which are currently under development. In either case, limits on plastics will come under close scrutiny.

Although current limits are broadly in line with those applied in other countries, worst-case situations still allow the equivalent of thousands of fragmented plastic carrier bags to be spread on each treated hectare of land. This situation was deemed unacceptable by key Scottish farm assurance bodies nearly a decade ago, and much more stringent limits for plastics were phased in there. Should the rest of the UK now follow suit?

Background

Plastic contamination in composts and digestates is a systemic problem caused by a combination of inadequate processing and multiple upstream failures in governance – from the moment wastes arise to when they are collected and accepted for processing. Various prior attempts have been made to address these failures, the most recent being set out in the series of actions that form WRAP's 2021 Organics Sector Roadmap. This includes changes to environmental permits.

Perhaps in response to the lack of initiative shown in other parts of the supply chain, the EA showed its hand by consulting on and then amending Standard Rules permits in 2021. These now include – for the first time – feedstock contamination limits. In all cases, the presence of non-compostable contaminants must be at levels which are 'as low as reasonably practicable' (ALARP) by the end of 2025, with limits in the meantime of either one per cent or five per cent depending on the specific permit. This approach is unusual, but not unique – Californian regulations say that source-segregated biowastes can't be sent to licensed composting facilities if they contain more than one per cent contamination.

These changes are expected to be rolled out to bespoke permits and, in the meantime, the spotlight has shifted to end-product quality. The EA has previously stated that it considers the limits for plastics in BSI PAS 100:2018 and BSI PAS 110:2014 to be too high, and there have been suggestions of alignment with the approach taken in Scotland. The Scottish limits were first introduced in 2014 for use by members of the Quality Meat Scotland Cattle and Sheep scheme, restricting plastic in compost to 50 per cent of PAS100 limits, and in digestate to eight per cent of PAS110 limits. The same restrictions were subsequently adopted by Scottish Quality Crops, at which point the Scottish Environment Protection Agency (SEPA) took the view that regulatory quality controls needed to fall into line with those adopted by the market. These were phased in between 2017 and 2019. Feedback suggests that the Scottish limits for digestate are readily achievable (for liquid fractions) with appropriate depackaging and screening, whilst for compost, the limits are more challenging to reach.

Outside Scotland, the PAS limits have remained in force, under worst-case scenarios allowing the equivalent of up to 2,500 carrier bags to be spread per hectare each year. Alignment with the Scottish limits would represent significant progress, but how do they compare with standards used elsewhere – and are any of them based on actual evidence of harm?

PAS limits in context

In its 2021 report for the Irish Environment Protection Agency, Percy Foster and Munoo Prasad collated and discussed limits for 'impurities' adopted by various countries, to inform its recommendations for compost and digestate quality in Ireland. It settled on 0.25 per cent for plastics in both materials – on a dry weight basis – which aligns with future limits set out in the EU Fertilising Products Regulation (EU FPR). The PAS limits use different units (air dry for compost and fresh weight for digestate), meaning that they have to be converted to allow comparison with those in force

Figure 1: Limits for plastics in compost and digestate from various geographies (% on a dry weight basis, unless otherwise stated). Note that the UK limits have been converted from air dry (for compost) and fresh weight (for digestate) to dry weight to facilitate comparison

	Compost	Digestate	Particle size cut-off
PAS limits	0.14%	0.44%	>2mm
Scotland	0.07%	0.04%	>2mm
Australia	0.05% (film plastics)	-	-
Austria	0.2%	-	>2mm
California	0.1% (film plastics)		>4mm
EU FPR	0.3% (0.25% from 16 July 2026)		>2mm
Finland	0.5%		>2mm
Germany	15cm2 film plastic where total impurities >0.1%		>1mm
Netherlands	<0.05% (Class A)	-	>2mm
Switzerland	0.1%		>2mm

elsewhere. Various assumptions have to be made to do this, around the typical dry solids content in both materials, and nitrogen content in digestates, but once converted it is apparent that the PAS limits for compost and digestate are broadly in line with international norms. The Scottish limits are more precautionary, but by no means uniquely low (Figure 1).

Other points to note from this comparison are that most countries apply a 2mm particle size cut-off and that all outside the UK apply limits on a dry weight basis. In some cases limits vary by 'class' of material, depending on the intended end use (e.g. growing medium vs soil improver), but for field-scale use such single limits don't account for possible variations in application rate, meaning that more plastics may be applied to some soils than others. Since they can have the most visual impact on compost and digestate quality, some assurance schemes apply limits specifically to film plastics. The low density of these materials creates analytical challenges, addressed in Germany by the use of area-based limits. This can help avoid situations where surface contamination of low-density films might otherwise skew weight-based results.

Challenges with sampling and testing

Data is only meaningful if samples are representative of the original material. Achieving this depends on having robust sampling procedures that are implemented by appropriately trained staff. Sampling approaches for compost are set out in a British Standards European Norm (BS EN) standard (12579:2013), but sampling of digestates is captured only in industry guidance. The sampling port for digestate may be smaller than the final off-take port and act as a filter that keeps larger plastic fragments in the digester, unquantified. This needs attention, as does the lack of independent sampling currently allowed by the UK compost and digestate certification schemes. Sampling by trained, independent third parties is common in other certification schemes and although their use would incur additional cost, it could also improve confidence in material quality and overall scheme robustness.

> Regulators want to see PAS limits reduced, but where should those limits be set?

Once back at the lab, materials are tested with simple dry and/or wet screening methods, followed by visual identification and manual extraction of physical contaminants that are >2mm. These methods have developed over time, based on operational experiences – but their reliability and accuracy are largely unknown, with neither ring testing nor other conformity assessments routinely implemented. Potential weaknesses in the test methods include the propensity for film plastics to fold and pass through the 2mm screen, the reliance on visual identification of different types of physical contaminant and the potential for poorly cleaned plastic fragments to skew sample weights. These weaknesses need to be explored experimentally – and addressed. Experiments could also explore the potential benefits of adopting an area-based approach for film plastics, as suggested in work for SEPA completed five years ago.

Research would also be necessary to determine whether the lower particle size limit should change. There are limited data for non-UK composts which show that the <1mm fraction can contain an equivalent proportion (by weight) of plastics to the >1mm fraction, but in the absence of evidence it's not possible to state that the same would be true of UK materials or the +/- 2mm fractions. Nonetheless, it is impossible to deny the ever-increasing research and public interest in microplastics (>5mm), and mounting evidence of harm to soil organisms from microplastics under experimental conditions.

There are currently no limits in place anywhere for microplastics of <1mm – in composts, digestates or any other biofertiliser or soil improver. Testing for microplastics in these matrices is challenging, requiring separate extraction and identification / quantification steps. Techniques such as FTIR (Fourier-Transform Infrared) and Raman spectroscopy allow different polymer types to be distinguished, and when coupled with suitable scanning software, can allow particles to be counted and categorised by surface area. This can

allow micro and nano-plastic particle numbers to be determined, but doesn't generate a weight-based metric. Mass can be determined through the use of destructive techniques such as Pyrolysis-Gas Chromatography-Mass Spectroscopy (Pyro-GC/MS), but this has its own limitations. In all cases, these methods can be expected to be more expensive than the current PAS-specified methods.

Evidence of harm

The impacts of plastics on soils, soil organisms and crops are various. Soil physical properties such as bulk density, aggregate stability and water retention capacities can be adversely affected, while a growing body of research reports ecotoxicological impacts under experimental conditions. These include: abnormal gene expression in earthworms; changes to microbial communities and biomass; delayed or reduced seed germination rates; reductions in shoot, root and/or overall plant biomass. Very small plastic particles can also be absorbed and transported into the edible portion of crops.

Although alarming, extreme caution should be taken when attempting to translate any of these experimental impacts into field situations. Experiments tend to be short-term and use acute doses of microplastic to elicit an effect. There is also significant inconsistency within published papers, with reported impacts being difficult to reproduce. Soil concentrations of 10% or more by weight of microplastics can be used in experimental systems, and quick calculations suggest that it would take decades of application of PAS-compliant composts and digestates contaminated at the highest permissible level to achieve even the lowest soil concentrations used to produce experimental effects. Moving to the Scottish limits would extend this theoretical threshold out to a century or more of 'worst case' applications – but this would be a highly precautionary response. There is simply insufficient data to recommend evidence-based limits for plastics in soils (and hence, composts or digestates). The same is also true for marine and freshwater environments, where there is already a much larger evidence base.

> The impacts of plastics on soils, soil organisms and crops are various

It must also be highlighted that compost and digestate represent just two of the potential sources of plastics in soils. Others include: sewage sludges, runoff from roads, aerial deposition, littering, and plastic film mulches. There is currently no source-apportionment data for plastics of any kind in UK soils, making it impossible to determine whether any one source should be prioritised for action over any other.

What needs to happen next?

The compost and AD sectors find themselves in an interesting position. The regulators want to see PAS limits reduced, but the available evidence doesn't (yet?) tell us where those limits should be set. It's undeniable that plastic contamination has a huge visual impact and is innately undesirable – but in the absence of scientific evidence any new limits need to be dictated by compost and digestate users – whether in the growing media, field horticulture, landscaping or agricultural sectors. Alignment with the Scottish limits is one logical solution, and a process of knowledge exchange would be extremely helpful – allowing the industry to collectively develop and apply best practices to meet these limits, which could be phased in between now and 2025. Understanding whether those limits are tight enough will require stakeholder engagement.

Aside from the limits themselves, a number of other aspects should be considered in the QP or PAS reviews:

1. Sampling methods – particularly for liquid digestates – to understand whether samples are representative
2. Independent sampling – to improve confidence in the assurance schemes
3. Lab methods – particularly for liquid digestates – should be reviewed to see how reliable they are. The benefits of including an area-based limit for film plastics should be incorporated into this review
4. Proficiency testing – should be introduced for plastics (and other analytical parameters)
5. Research – to understand the sources, impacts and implications for micro and nano-plastics in soils, to identify priority areas and develop an action plan. Research should be funded by central government

Serious consideration should also be given to moving the end of waste requirements for compost and digestate into the new UK / GB fertiliser regulations. It's clear that the status quo on plastic contamination in these materials is no longer acceptable, and that limits will have to come down – whatever the regulatory framework under which this happens.

Dr David Tompkins is Head of Knowledge Exchange and Innovation at Aqua Enviro, a UK consultancy specialising in biological waste and wastewater treatment processes. The interpretation and opinions expressed in this piece are the author's own.

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Biofertiliser benefits

As prices for artificial fertilisers soar, biofertilisers offer an economic and environmental alternative. **Anna Becvar** from Earthcare Technical explains how biofertilisers might now be intergrated into mainstream farming practices.

Harvest 2022 is underway, amongst significant market volatility, following multiple issues around the globe and the Russian invasion of Ukraine. The resulting shortages of gas and fertiliser have pushed prices high. Reductions in the export of grain and oilseeds from Ukraine, 'the bread basket of Europe', have also increased market prices for these products.

The UK wheat area has increased by one per cent on 2021 to an estimated 1,807,000 ha and the oilseed rape area has increased by nine percent to 336,000 ha (Agricultural and Development Market Board (AHDB), Market Survey 2022). UK farmers are hopeful for a good harvest with an increase in exports. This year's crop has been principally grown with fertiliser purchased at 2021 prices. Growers are now faced with significantly higher costs for the 2022/23 harvest. As an example, ammonium nitrate (AN) fertiliser was purchased at £276/t for harvest 2022 for a 445 ha (1,100 acre) farm in Hampshire and £630/t for the crops that will be harvested in 2023, resulting in an increased fertiliser bill of around £100,000 across the farm. AN fertiliser prices are now at around £730/t. Grain prices have gone up but the higher input costs mean that margins for harvest 2023 will be squeezed on crops being planted this autumn and next spring.

In March, Defra set up a 'Fertiliser Taskforce' through which Government and industry can develop strategies to assist farmers in navigating the challenges ahead. Securing the most value from a manufactured fertiliser or biofertiliser was desirable before - now it is critical. Three main approaches have been explored by the AHDB to assist farmers in their decision-making on fertiliser use to hit an economic optimum yield, using virtual farm models which consider applying:

1. the usual economic recommended amount of fertiliser in 2022 and 2023.
2. 75 per cent of the typical application rate each year.
3. 50 per cent of the typical application rate each year.

Perhaps the first step should be sourcing and applying nitrogen from biofertiliser to directly replace manufactured fertiliser use. Biofertiliser is the name used for the digestate that is certified under the Biofertiliser Certification Scheme for end-of-waste and quality assured status, often referred to as 'PAS110' digestate. Here though, I will refer to all digestate under this term. Biofertiliser can replace a proportion, although not all, of the fertiliser needed to grow crops. The nitrogen (N) supplied is the most critical major nutrient to sustain crop growth, alongside a balance of additionally valuable phosphorus, potassium, magnesium, and trace elements. Liquid biofertilisers are typically high in readily available nitrogen (RAN) which can directly replace that supplied by fertiliser. Following on from headlines on 'Soil Health' the catchphrase in farming right now is 'nitrogen use efficiency' and for biofertilisers, this means using them at the optimum time possible to realise

maximum value – in order to replace expensive nitrogen fertiliser.

Crops such as oilseed rape need to take up nitrogen to get well established in the autumn, followed by a rigorous spring requirement. Most cereal crops, such as winter wheat, will establish effectively from the nitrogen held within the soil (soil nitrogen supply) and then require the bulk of their nitrogen in the spring to sustain rapid growth and attain yield over a relatively short period.

Fibre biofertiliser supplies some nitrogen and has the added advantage of supplying good quantities of organic matter. It is typically applied to the field soils around the time a crop is sown, both for practical reasons and because it is typically low in RAN, so is at less risk of nitrogen losses from nitrate leaching. High RAN fibre is best applied to crops with an autumn nitrogen need or ahead of drilling spring crops when the crop will rapidly take up the nitrogen supplied – to minimise risk of losses.

To calculate 'nitrogen use efficiency', farmers need to consider the nitrogen supply from the biofertiliser applied, balanced with that which is supplied from the soil (from the all-important organic matter and soil health) and that met from nitrogen fertiliser. Their agronomist typically does these calculations, to form a nutrient management plan, armed with up-to-date analysis of receiving soils and the biofertiliser to be used, and an in-depth knowledge of crop and regulatory requirements to be met. Typical values are discussed in the AHDB's Nutrient Management Guide (RB209) but each AD Plant is producing a unique biofertiliser, so analysis is key to correctly assess the fertiliser value. The biofertiliser spreading team completes the task with precision equipment, and optimum timing of the biofertiliser application.

The rules and regulations controlling the quality and safety of biofertiliser use are well established. There have been some recent clarifications, though (June 2022), around planning applications of biofertilisers and inorganic fertilisers that are covered under the Farming Rules for Water (FRfW) in England.

The FRfW guidance for England requires that farmers demonstrate a written nutrient management plan prior to the application taking place.

That nutrient management plan needs to then demonstrate how significant risk of agricultural diffuse pollution from nitrate leaching is avoided from an application, taking account of the RAN content of the biofertiliser, hence representative laboratory analysis is important. A low RAN material has a RAN equal to or below 30 per cent. Most liquid biofertilisers are high RAN and therefore the nitrate leaching risk at the time of application must be considered:

- If the application is to be made during the time periods shown in Table 1, a single application must not exceed 30m3/ha and there must be no repeat application within 21 days.
- The application rate must meet the soil and crop need of an autumn/ winter commercial crop, not including conventional cover crops or green manure.

Logistics also need to be optimised when using biofertiliser, getting the material applied to the right crop at the right time to meet crop demand to attain yield. At least six months storage is needed to cope with meeting crop need, without wasting a valuable resource, and the challenges of our changing climate. Storage location is also critical. Placing six months of storage at the AD site can concentrate vehicle movements, leading to expensive wait times either at the AD plant or in the field during loading. Where tankers and spreading equipment are hired daily, and with increased fuel costs also to be contended with, costs can escalate in the 'campaign' period. Spreading vehicle movements more efficiently over a longer period to satellite stores throughout the year can reduce costs over all, with such satellite stores located to serve farm units and their neighbours, meaning the land spreading operation can move efficiently during the short work windows that the weather supplies.

Opportunities abound and innovation in the AD sector continues apace. Sustainably produced enhanced biofertiliser products are hugely appealing to farmers. Further treatment and processing techniques such as ammonia recovery, nutrient stripping, scrubbing, dewatering, pelletising, and nitrification are all underway and being keenly assessed right now. These may offer reduced costs for distribution, storage, and application and potentially reductions in the carbon footprint for the producer and end-user.

Table 1:
Time periods when application rate limits apply for high RAN organic manure

Soil type	Grassland	Tillage land
Sandy or shallow soil	1st September to the end of February	1st August to the end of February
All other soils	15th October to the end of February	1st October to the end of February

Where is biomethane best deployed?

John Scott Kerr,
Biogas Originator,
Vitol

The need to decarbonise our society and economy is forcing a hard look at how sustainable sources of energy can best be deployed. Transport, in particular HGVs, is one of the hardest sectors to decarbonise and it is here biomethane can play a key role. The weight of HGVs means battery power is not an option. At the same time, HGVs are relatively heavy polluters.

Biomethane offers a proven and easy transition to a sustainable transport solution. Clearly the infrastructure needs to be built out, but with the right framework, investment will flow into developing this rapidly across Europe.

In parallel, the biomethane market also needs to develop. We expect to see an integrated European market evolving and the beneficiaries will be those that optimise their returns. A lower carbon intensity and International Sustainability and Carbon Certification (ISCC) registration are likely to command higher prices and a greater market share.

For producers, this means a focus on the detail and a clear and accurate understanding of their carbon numbers and how they overcome methane slip if they want to maximise their returns.

Richard Gueterbock,
Director, FoodChains

As grain prices soar and energy security rises up the policy agenda, the biogas and biomethane landscape is evolving. With food supply a greater priority, farmers face decarbonisation pressures alongside reduced support levels, post-CAP (Common Agricultural Policy). Next year, some crop-based AD plants may struggle to secure the necessary feed volumes.

Biomethane can replace fossil fuels in rural settings, providing heating and fuel for trucks and tractors that are vital to the food supply chain. For these markets, biomethane does not need to be injected into the grid.

Bio-CNG (compressed natural gas) can be produced at off-grid sites – at existing and future biogas plants, on farms and at food factories – and distributed by gas trucks in a virtual pipeline.

The inadequate Green Gas Support Scheme only supports grid-connected biogas plants, excluding swathes of rural Britain. This has undermined the biogas sector but Bio-CNG can help to fuel the agri-food supply chain.

BEIS and Defra should also think hard about banning the internal combustion engine (ICE) in off-road vehicles, as part of phasing out fossil fuels. Electric and fuel cell power trains are ill-suited to heavier off-road/rural applications and New Holland and JCB are building new low-emission gas ICE vehicles in the UK.

John Baldwin,
Managing Director,
CNG Services

Making biogas is a great thing. Burning it at source to make electricity has been great for 20 years, but the boom in solar/wind means it is becoming less of a good option to do this. So, what should we do with biogas? The best option is to upgrade it to biomethane (capturing all of the waste Bio-CO2, of course – for industry or sending to carbon capture and storage facilities) and inject it into the gas grid, using it for anything that can be supplied via the gas grid. The new Reverse Compression technology means that wherever there is a gas grid there is now capacity, which is transformational.

Trucks are a great option for the deployment of biomethane, as this displaces diesel with air quality benefits and starts the journey to alternative fuels. Other uses include putting biomethane into storage to be used for electricity generation during the Dunkelflaute and making specialist chemicals and vaccines that need methane.

Over time, the utilisation of renewable methane will change – the key is to make shed loads, to never burn it in a raw state and never vent Bio-CO2. Oh, and use renewable electricity and heat pumps to heat the AD plant, of course.

Philipp Lukas,
CEO, Future Biogas

Biomethane can directly replace natural gas wherever it is currently used, from heating homes to industrial processes and transport applications. Thanks to its biological origins, its combustion is carbon neutral – i.e., it does not contribute to net GHG emissions.

In 2020, the UK used 811 TWh of gas, responsible for a third of its GHG emissions. AD generated just six TWh of biomethane. The key issue, therefore, is that we need to use less gas overall and make much more biomethane. Improving energy efficiency, reducing gas-fired power, and electrifying heat and transport will help. Remaining difficult-to-decarbonise gas uses can then be met with biomethane.

As a highly flexible resource, biomethane's best use will likely change over time. Today, its injection into the gas grid cuts emissions across multiple sectors, including domestic heat and transport. Later, if the grid transitions to hydrogen, biomethane may be targeted at industry – or converted to biohydrogen.

While the exact pathway to Net Zero is still unclear, the need to increase biomethane capacity is obvious. The use of biomethane can adapt to meet the future needs of society. There is limited utility in trying to define an ideal end-use now – we need rapid growth.

Best of both worlds

Italian waste management company Entsorga demonstrates how connecting anaerobic digestion with composting maximises value from food waste reprocessing. **Emma Love** reports.

Since 2020, an established composting facility in Santhià, a municipality in Northern Italy, has also been home to a biomethane plant. The set-up shines a light on the environmental and economic benefits of connecting aerobic and anaerobic systems.

The biomethane plant, built by the facility owner Entsorga, uses semi-dry anaerobic digestion and aerobic composting processes, which eliminate liquid output: "Over the years, we have understood that the anaerobic digestion process continued to produce too much liquid waste, which was expensive to treat," explained Group President, Pier Paolo Cella Mazzariol.

"In 2019, we exclusively secured the semi-dry anaerobic digestion process from Zenviro Tech, further developing it based on our experience. The technology uses a small amount of water, which then completely evaporates during the composting phase. The implementation of this upgrade, combined with our composting and refining technologies, has eliminated liquid waste and made the recovery of organic waste even more efficient."

Founded in 1997 and headquartered in Tortona, Italy, Entsorga is active across Europe, the Americas and Africa. To date, the company has built more than 100 plants globally, including projects for small communities and large, fully-automated industrial systems.

> "Water accounts for around 45 per cent of the weight of waste entering, which evaporates during the aerobic process"

Entsorga's Santhià plant began as an experiment in a mini-laboratory, created by the company's Research and Development team. In the midst of the pandemic, the entire process was monitored remotely by a team of dedicated processors using a cloud-based system.

"We built a digester on a scale of 1:12 to reproduce the real conditions of the process, to study the stability and consequently correct the mixture that was to be sent to the principal digester," says CEO Gian Francesco Galanzino.

"The results of the tests permitted us to define the organisational choices on a larger scale, optimising the recovery, time and cost of the production of biogas".

The connected facilities treat source-segregated food waste, with contamination levels of between 7-11 per cent, using anaerobic digestion and composting in sequence. In the first phase, the organic waste undergoes mechanical pre-treatment – using a food waste bag splitter, a magnet, and squeezers to remove contaminants such as plastic and ferrous metals. Such equipment, Entsorga says, "doesn't shred plastic into small particles, making it easier for us to produce a high-quality Solid Refuse Fuel (SRF)."

While it is mandatory in Italy to use compostable bags for food waste collection, there is still some contamination of input material by normal plastic bags. According to Entsorga, the plant's digestate solid residues typically contain around 50 per cent non-compostable plastic bags. If small particles of compostable plastic remain in the digestate, they will decompose during the composting

phase. These particles, Entsorga says, often aid the resulting SRF, contributing to higher levels of biogenic content and therefore boosting the eligibility of the SRF as a renewable fuel.

The organic waste is made into a pulp suitable for faster anaerobic fermentation and a higher biogas yield. The digester can take 30 per cent solids, allowing bigger bits of wood to be processed if needed. It is then agitated through a horizontal shaft, with the digestate in the digester remaining in suspension, avoiding the precipitation of solids.

Biogas is produced alongside the solid digestate, ready to be further purified and transformed, through an upgrade system, into biomethane inserted directly into the grid, which runs near the plant.

The second phase sees the digestate firstly mixed with a bulking material of vegetable origin, which contains garden and other plant wastes. According to Entsorga, "such operation is required to prepare a mixture porous enough to be successfully composted." This mixture is then collected using an automated bridge-crane and then subjected to a biological composting treatment. The process takes place in a closed environment and is accelerated by an automatic mechanism of forced aeration, as the air, temperature, and humidity are monitored. After about 40 days, the treated mixture is refined to eliminate non-compostable elements such as aggregates, plastic and glass (and refined samples tested), after which it is sent to the plant's bio cells for slow maturation, and then for storage.

After a minimum period of three months from the arrival of the waste in the plant, the post-AD compost is ready to be used. 90 days is the legal minimum required for biowaste composting in Italy and ensures the compost's stability, allowing for the elimination of ammonia and nitrate issues.

The plant's integrated treatment lines allow for increased performance levels. Water accounts for around 45 per cent of the weight of waste entering, which evaporates during the aerobic process. 20 per cent of the total waste is transformed into biomethane, with another 20 per cent transformed into quality compost. The remaining 15 per cent is mostly made up of plastics and other residues that contaminated the differentiated organic fractions. Entsorga uses a refinement system to convert this material into Secondary Solid Fuels (SSF or RDF), which can be used in cement factories instead of traditional fossil fuels. This saves the costs associated with landfilling and incinerating the contaminants that enter with the food waste.

> 20 per cent of the waste is transformed into biomethane, and another 20 per cent transformed into quality compost.

The connected facilities currently process 40,000 tonnes of organic waste every year, a quantity which is set to increase to 80,000 tonnes with a second digester. Construction is already underway. At full operation, Entsorga says that the plant will transform the organic waste of around one million inhabitants into five million cubic metres of biomethane, 20,000 tonnes of high-quality compost, and 16,000 tonnes of SSF annually. This, the company states, will save the environment emissions equivalent to 50,000 tonnes of CO2.

Gian Francesco Galanzino adds: "The construction of a second digester began in January and is nearly complete. Start-up is set for the end of September, with the new digester expected to achieve design capacity (80,000 tpa of food waste) in early 2023."

"Performance measurements for the first digester show a biogas production rate of 190 Sm3/h per tonne of input – significantly higher than the number reported in the scientific literature (145 Sm3/h), with 58 per cent methane. For investors and decision-makers, this is excellent news, meaning a speedier payoff on their investments and policies."

"Looking to the future, we already have an impressive pipeline of projects in Italy, Europe, and the US. After COVID-19, we have seen a substantial increase in commitments and interest in sustainable waste management processes by companies, investors, and even in public opinion.

"Russia's invasion of Ukraine has also inflated energy prices, focusing attention on the geopolitical issues associated with fuels imports," adds Galanzino.

"The EU's REPowerEU scheme sets out intentions to increase renewable natural gas production to 35 billion m3 by 2030, replacing up to 20 per cent of gas imports from Russia. Although this project is incredibly ambitious, we are up for the challenge – we have been preparing for it for the last 25 years."

Post-Peat

Simon Blackhurst, Head of Quality & Innovation at The Greener Gardening Company Ltd, on the potential implications of a peat ban on retail sales of growing media.

Peat has been used as a growing medium for many years. Its ability to support plant growth is unrivalled by any other single material. The chemical and physical properties of the diluent create the perfect canvas for a growing media manufacturer to design a product for many different uses, from multi-purpose to seed sowing.

Peatlands are unique ecosystems that support biodiversity and serve as carbon sinks, and the horticulture industry uses a small percentage of harvested peat in comparison to other industries.

In December 2021, Defra released its consultation on ending the retail sale of peat in England and Wales, which saw over 5,000 responses before closing in March 2022. At present, the industry has not had a formal response from Defra. It is, however, anticipated that Defra will publish its plans by the end of August or the beginning of September and it is appearing increasingly likely that a blanket ban will be applied.

> Peatlands are unique ecosystems that support biodiversity and serve as carbon sinks

The consultation proposals included: a ban on the sale of peat and peat-containing products in the retail sector, applying to domestic and imported peat alike; the introduction of a point-of-sale charge for bagged peat-containing growing media; mandatory labelling and point-of-sale material containing detail of the environmental reasons for eschewing products containing peat, and mandatory reporting of the volume of peat sold for all sellers of peat and peat-containing products.

The consultation does consider potential exemptions, which should allow for certain uses of peat to be acceptable.

Completely removing peat from all retail growing media is not a simple task. Our industry has spent many years researching, developing and investing in the infrastructure and materials required to move from peat-based growing media, but there is still no single peat replacement diluent readily available, with acceptable quality, quantity and consistency whilst being commercially viable. Many growing media manufacturers now have to blend groups of raw materials to emulate the properties of a peat-based media; typically composted barks, coir (coconut husk), wood fibres and composts (green and anaerobic digestates).

One thing we can all do is ensure we use the right type of growing media for the end-use. For example, a multi-purpose compost is not best placed for use as a way of improving the soil structure and quality in a garden bed, instead, a soil improver product should be used.

> There are peat-free products in the market that perform as good as, if not better than peat-based

The growing media industry has reduced peat use overall and there are peat-free products in the market that perform as good as, if not better than peat-based. One of the key issues is to ensure that the peat replacement diluents are available in sufficient quantities and are sustainable. It would be counterproductive to move from one diluent to another which is potentially unsustainable. For this reason, The Responsible Sourcing Scheme for Growing Media (RSSGM) was developed by the Growing Media Association under the auspices of the Horticultural Trades Association. The purpose of the scheme is to assess each raw material in a product individually on a number of scored parameters. The scheme allows retailers and consumers to make an informed choice when purchasing growing media products, and you will start to see the RSSGM logo on the back of packs and on point of sale information. To find out more visit www.responsiblesourcing.org.uk.

Peat-free growing media requires different watering regimes and fertiliser applications, so be sure to read the information supplied by the manufacturer to help get the best results and be prepared to change your tried and tested habits.

The organics recycling and biogas industry offers potential opportunities whereby materials that may not have previously been used in horticulture could now find a route to market. The support required from Defra and the Environment Agency to allow access to these materials has been sought and positive conversations are underway. As an industry, we must all investigate the use of new and novel materials to ensure the development of growing media for the future.

Creating New Frontiers in Composting

Mark Richmond, Technical Director at WRM Ltd, on the opportunity for the UK to offer counsel to countries looking to establish sustainable composting operations.

The UK composting sector is by global standards a well-established industry characterised by long standing operators, an established regulatory framework and an active national trade association. Policy objectives on the diversion of biodegradable municipal waste from landfill have, through local waste strategy development and the inclusion of composting in local authority recycling targets, supported the development of a market which now processes an estimated 6.8 million tonnes of material per annum.

When making international comparisons of the UK composting sector, commentators often refer to EU member states such as Italy, Germany and the Benelux countries which also have established garden waste collection systems, longstanding operators and developed regulatory frameworks. Frequently hearing of such comparisons may create a reasonable impression that the UK composting industry is typical of our international counterparts, and one could be forgiven for not recognising our sector as a world leader given the operationally focused characteristics of many processing sites.

But a recent opportunity to advise the US government-funded Creating New Frontiers in Agriculture project to establish composting operations in the Republic of Georgia challenged this perception. The reality is that many countries are still managing their organics in an unsustainable manner, and in Georgia, large quantities of compostable materials are landfilled or open burned. The lost opportunities to abate carbon emissions and capitalise upon a circular supply of nutrients are clear.

But the drivers for change experienced in the UK are now taking hold across geographies where organic waste management lags behind. The elevated urgency for the adoption of sustainable practices is pervasive, whilst the commercial incentive to move from manufactured fertilisers to sources of circular nutrient supply is finally driving real change in agricultural demand.

The project in Georgia had the objective of quantifying the national-level composting opportunity and then setting out a roadmap of initial actions which could be progressed to develop the market. Our participation in the project involved meeting a walnut farmer in the Kakheti region who was actively looking to start composting this season, not only to manage wastes from the enterprise but also to take in agricultural wastes from neighbouring farms to create a quality compost for application to the recently planted orchards.

> The reality is that many countries are still managing their organics in an unsustainable manner

I very much enjoyed a discussion on the detailed parameters such as blend selection, carbon:nitrogen ratio, moisture content and windrow management. However, the discussion highlighted an acute lack of expertise in composting and the enthusiastic prospective composter estimated a total of four agronomists in the country; none of which were understood to have experience with organic waste products. Limited supply chain options for plant and equipment were also cited as a challenge to commencing composting operations.

The scenario encountered by the recent project in Georgia is not an isolated one. Several other EU accession states are required to make infrastructure improvements which will enable better organic waste management. A number of other enterprises that we spoke to also

cited international export standards and supply chain sustainability requirements as key reasons to act now. These latter requirements will impact many more geographies than those working to join the EU bloc.

The UK, along with others, has a role to play in supporting the expansion of composting in some of these new geographies. Beyond the commercial opportunities that may present, we must recognise and share the skills, expertise and experience that we collectively hold as a sector. Working together as an industry, we have successfully developed regulatory standards, technical standards and quality protocol, and have successfully marketed recycled organic products in retail outlets. We are therefore in a prime position to assist the global sustainability effort by sharing the lessons learned in our own market development.

Here in the UK, the ongoing evolution of the organics market is set to continue in response to waste strategy, regulatory and commercial drivers. As we collectively look to further increase the contribution that composting makes to sustainability, we should remember that we are also well placed to support the adoption of additional sustainable practices further afield.

CCS & BCS

Emma Laws, Research and Communications Assistant, and **Georgia Phetmanh**, Schemes Manager at REAL, provide the latest on the Compost and Biofertiliser Schemes and the REAL Research Hub

COMPOST AND BIOFERTILISER CERTIFICATION SCHEMES

Forum and TAC meetings

We held the biannual meetings of the CCS Producers' Forum and BCS Operators' Forum in May as hybrid meetings in Cambridge – the first time the forums were not wholly online since October 2019.

The key topics of discussion at the CCS Forum included: an update on the Compost Quality Protocol revision, which led to a discussion on possible comparators for compost; Research Hub updates; and a discussion on contamination levels of incoming loads.

At the BCS Forum, similar updates were provided on the Anaerobic Digestate Quality Protocol (ADQP) revision and the Research Hub. There was a discussion surrounding the Environment Agency (EA) position on manure-based digestate, as well as queries on the funding of the quality protocol (QP) revision. The turnout at both of the forums was high, with operators agreeing that the hybrid format was effective.

Operator comments were then presented at the June CCS/BCS Technical Advisory Committee (TAC) meeting. There was an in-depth discussion regarding contamination levels in local authority contracts and the challenges this creates. The EA clarified its intentions regarding its position on manure-based digestate. This meeting also included an update on the technical discussions over Potentially Toxic Elements (PTE) testing and the inclusion of Molybdenum in the PAS100 testing suite. It was attended by representatives from Defra, which delivered an update on the Fertilising Product Regulations (FPR), and the EA, which gave an update and was open to questions on the QP revisions.

Closing the loop project

Through a new project, we are currently gathering information about the treatment options for independently certified compostable materials at industrial composting sites and looking to inform discussions around a circular economy for compostables in the UK. The aim is to present stories and case studies which may be shared with policymakers and others in the industry.

The final report may be used to bring clarity and share knowledge among operators in the relevant sector and encourage further co-operation.

We have been conducting interviews with certified sites in the first stage of this project and will be working on the next steps soon.

THE RESEARCH HUB

Completed Projects

The First Project: The Organics Recycling Research Library continues to be updated with new research on compost and anaerobic digestate. This resource is available free of charge for all CCS and BCS participants and for an annual fee for all other parties.

The Second Project: Upon completion of the second project in December 2021, the Solidsense Consortium produced two reports: a standalone Digestate Data Pack and an associated Digestate Valorisation Report. The Digestate Data Pack contains database analysis of key digestate characteristics, whereas the Valorisation Report provides a comprehensive examination of viable alternative uses for digestate.

To request access to the Research Library and/or the Second Project Reports, please email megan@realschemes.org.uk.

Current Projects

The Third Project: This project failed to receive any tender submissions during the open tender period, which closed in December. The Hub then sourced stakeholder feedback on the potential reasons for this. REAL's Plant Response Test Technical Working Group, which developed the proposal, accepted the feedback from the Hub's investigation and decided to amend the project proposal to make it clearer and more relevant. The updated proposal has been shared with the Research Panel and its Project Management Team for review.

The Fourth Project: The tender period for the fourth project, titled 'Evaluation of the potential for the improvement of the Residual Biogas Potential test and investigation of alternative test procedures for PAS110 biofertilisers', closed in December 2021. After a thorough consideration of the tenders received, Aqua Enviro was appointed. The consultants have begun work and are due to complete the project in April 2023.

Material changes in the AD market

Ed Bastow, Managing Director at Material Change, explores how anaerobic digestion and composting remain worthwhile investments amidst the various challenges of recent years, with the industry seeing diverse growth opportunities.

Material Change Ltd (MCL) has been operating in the recycling sector for 20 years, building its first greenfield anaerobic digestion plant in 2011. Since then, MCL has developed several more electricity and gas to grid sites. It currently owns three anaerobic digestion plants in Norfolk and Cornwall and provides a one-stop-shop service – including full site management, accreditation, biology monitoring, and accounting services – to a further seven AD plants and six composting sites, some of which it jointly owns. The business has grown significantly over recent years, particularly in the AD management sector. While AD is challenging, we pride ourselves on being able to overcome the challenges that AD plants face and give confidence to investors that AD and composting are sound investments.

The benefits of digestate

With fertiliser prices rising enormously around the world, MCL has seen a significant increase in demand for its digestate and compost products. Prices remain some way behind artificial fertilisers, despite the wider benefits of improving soil structure and a range of valuable nutrients. All outputs from MCL sites have product status, meaning they can be spread straight to land without the need for deployments. Typically, 90 per cent of the following year's fertiliser and nutrients for feedstock will then come from digestate from MCL sites.

The grown crop debate

In discussions with investors, there is some resistance to grown crop-only AD plants, particularly at times of increased food costs and grain production shortages. AD crops, which are planted as a break crop, have significant benefits for farmers when planted with their other crops, helping to reduce issues such as black grass contamination.

The challenges of the Russia Ukraine war

2022 has been an exceptionally challenging year for everyone. While AD sites that are not locked into longer-term contracts have definitely seen the benefit of increased gas and electricity sales prices, there has been a mirrored pressure on growing costs of feedstock. Farmers are facing challenges of increased fertiliser and production costs, as well as issues associated with increases in other crop prices, making growing AD feedstocks less attractive.

While the Government has not yet imposed energy tax tariffs on AD plants of MCL's operating size, the expectation is that this may be implemented in the future. Uncertainties such as these have a direct impact on investors, making future investments in AD more challenging.

Whether due to war, Covid or Brexit, MCL has experienced challenges in obtaining spare parts for plants, and, as a result, has had to incur costs of stockpiling equipment to ensure that any downtime to plants is minimized, and additional equipment hire costs are avoided.

The expanding CO2 market

In 2021, MCL installed a new carbon capture Pentair system at its site in Euston, similar to the CO2 capture plants that are installed at its Helmdon Blackpits site and Bay Farm sites. MCL has seen significant demand for CO2 in the last few years and, with prices and demand increasing in recent months, this has been a good additional revenue stream for its plants. While there was an initial reluctance from some parties for CO2 from waste sources, the market has shifted and, having accredited its CO2 process to ISO9001 standard, MCL is finding that waste CO2 is a viable commodity and is helping to ensure that the recent CO2 shortages that have hit the UK are mitigated going forward.

Investment opportunities

There remains significant interest in the sector from investors: in the turnaround opportunities that carry the most risk; the high-performing assets that command premium prices, and the new build sector supported by GGCS and CO2 sequestration opportunities. MCL is involved in all areas but has learnt that focusing on site performance and solving operational issues quickly is key.

Green Gas Steering Group

A light is being shone on green gas as agricultural and energy markets remain volatile, driving confidence and investment, explains **David Kinnersley**, Head of Agribusiness at Fisher German LLP.

David Kinnersley,
Head of Agribusiness,
Fisher German LLP

There seems to be no let-up in global news as economies try to recover from the impact of the Covid pandemic. The last 24 months have seen unprecedented volatility in global commodity prices and particularly in agricultural commodity prices and energy prices. This is having a positive impact on the economics of biogas production, which may be more than a short term blip.

The dramatic increase in gas and electricity spot and power purchase agreement (PPA) prices has been welcomed by the sector and is helping to drive confidence, already boosted by the introduction of the Green Gas Support Scheme last year. It is encouraging to note that a 12 month electricity PPA now has a greater value than the early Feed-in Tariff values plus the export tariff, giving hope for when the support schemes end. While there will no doubt be plenty of bumps along this road, it is stimulating greater investment in the renewable energy sector and conversation over UK energy security, judging by the surge in activity that the Fisher German Sustainable Energy team are seeing.

Agricultural commodity prices have seen similar increases with feed wheat previously trading at circa £180/t now over £300/t and oilseeds going from £400/t to £800/t over the last 18 months. This has had a positive impact on arable farmers in the UK but inevitably put pressure on intensive pig, poultry and dairy producers who need it for feed rations.

The increase in agricultural grain prices will impact open market agricultural energy crop feedstock prices but margins for the coming year will be under pressure as fuel prices remain over double previous levels and fertiliser prices have almost trebled. The side effect of high fertiliser prices is much greater demand for organic fertilisers, with chicken litter, biosolids, compost and digestate being sought after by growers looking to mitigate their exposure to the turmoil in the gas markets. This may be sustained by forward-thinking farmers looking to reduce their carbon footprint; natural gas derived fertiliser is a major part of emissions for most, presenting an opportunity for those generating digestate and organic manures.

REA Green Gas steering group members

William Mezzullo, *(Chair)* Senior Business Development Manager, Centrica Energy Trading

David Hurran, *(Vice Chair)* CEO UK, Air Liquide Biogas Solutions Europe

Anna Becvar, Earthcare Technical

John Baldwin, Managing Director, CNG Services

Neil Liddell-Young, Strategy and Development Director, Severn Trent Green Power

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Lucy Owen, Environmental Compliance Manager, Marches Biogas

Philipp Lukas, Managing Director, Future Biogas Ltd

Richard Gueterbock, Director, Food Chains

Mark Richmond, Technical Director, WRM Ltd

Thomas Minter, Managing Director, Malaby Biogas

Organics Steering Group

Stuart Hayward-Higham, Technical Development Director, SUEZ Recycling & Recovery UK Ltd talks about the role of organic waste in One World Living, and the importance of reducing consumption alongside mitigating carbon emissions.

Stuart Hayward-Higham,
Technical Development Director, SUEZ Recycling and Recovery UK

The race for net zero and the focus on carbon is constant and relentless – in policy, in the press and in the industry. This focus on mitigation of further fossil carbon releases and constraining climate change is essential, as society is coming to terms with historic and unsustainable practices and the need to change.

However, carbon is not our only challenge. We consume three times our fair share of the world's renewable resources and some scenarios could see consumption rise to support net zero targets.

Learning to live within the available renewable resources that the world has to offer and can sustain is as fundamental as net zero. The inequality in the consumption of resources is stark, not only between different people in different countries but also between the human species and all the other species which share this one planet with us. This inequality drives much of the biodiversity loss we have seen over recent decades. In the UK, we need to cut our resource consumption by nearly two thirds to achieve a sustainable and equitable balance.

These renewable resources are fundamentally based on the soils that support the plants that feed us. These soils not only support the habitats which are so essential for biodiversity, but they also support the growth of plants which fuel biomass power stations and can support carbon sequestration themselves. However, the soils are not renewable, they are very finite. So their protection from over-consumption, from pollution and development degradation is vital; as is their role in storing carbon to help fight climate change.

By 2050, we are likely to need to be producing more than 50 per cent more food for our growing worldwide population, whilst at the same time releasing land back to support biodiversity. Our sector is vital to success in this area, not only in the bins but across the whole value chain of production, prevention and contamination.

REA Organics steering group members

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