

Recovering biowastes from municipal waste to land: maintaining public confidence through regulation

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Abstract

This paper explains how the Environment Agency is developing its approach regulating the recovery of compost-like output (CLO) derived from the mechanical, biological treatment (MBT) of mixed municipal solid waste. This is currently the focus of our attention on the recovery of a range of organic wastes. The paper gives the author's current answers and views on the following questions¹:

What is MBT CLO and how can it be used?

What are the problems with its use and the restrictions that are imposed?

What is the position of the Environment Agency on sustainable use of biowastes and the use of MBT CLO on agricultural land?

What is the demand, and how much CLO is there?

What are the risks and how are we regulating them?

How will we improve the evidence?

This approach is driven by the belief that we can only increase public confidence in the recycling of biowastes if we actively maintain public confidence in how we regulate those risks.

Keywords

MBT, CLO, mechanical-biological treatment, compost-like output, bioresources, MSW, mixed municipal solid waste

¹ The reader is assumed to be familiar with MBT technologies and their outputs and uses, and the various permits that may be needed at each stage. Information on permits is available on the Environment Agency website: <http://www.environment-agency.gov.uk>>business and industry >Environmental topics>Environmental permitting.

1 The resource: MBT CLO

1.1 What is MBT CLO?

We use the umbrella term compost-like output (CLO) or grey compost to describe the separated and treated biowaste from mixed municipal solid waste (MSW) after it has been biologically treated and stabilised (using anaerobic digestion and/or aerobic composting) through a mechanical-biological treatment (MBT) process.

This differentiates these biowastes from source-segregated organic waste streams such as green compost and anaerobic digestates. These are regulated under the lighter touch approach of exemptions and are defined as resources when they are certified under approved quality protocols.

There are a variety of components in mixed MSW and different processes of mechanical-biological treatment (MBT) resulting in the variable composition and quality of compost-like outputs (CLO) from the range of MBT plants in England and Wales. For this reason, the Environment Agency regards CLO from MBT of mixed MSW as a recovered waste that poses higher risks than other biowastes spread on land.

The environmental permitting regulations in England and Wales, excludes the use on agricultural land of compost like output (CLO) derived from non-source segregated wastes from the lighter touch approach of exemptions. They can be used on non-agricultural land that has been previously developed for the purposes of providing either an agricultural benefit or an ecological improvement.

The Association for Organic Recycling published its report 'The State of Composting and Biological Waste Treatment in the UK 2006/7' in February 2009. From this we know that: In 2006/7 about 77,500 tonnes of mixed MSW went to biological treatment in the UK. As a proportion of the total mixed wastes going to biological treatment (MSW and non-MSW) this has reduced from almost 100% to about 56%. It is estimated that about 86% of this mixed MSW is the biodegradable waste that MBTs sort, separate and treat (about 66,900 tonnes in 2006/7).

From the information we have, there are about 28 MBT plant we can identify as operating, under construction or planned. Of these, about 11 produce or are planned to produce CLO. This is currently going (or is planned to go) to landfill, land recovery or as a refuse-derived fuel.

There are many different processes that may be combined in different ways to recover CLO from mixed MSW. These are under ongoing innovation and development. They include physical processes (trommels, mechanical and magnetic screens, air knives, percolators, filters, presses); heat treatment (autoclaves, pyrolysis) and biological

treatment (anaerobic digestion, in-vessel composting and aerobic composting). The mixed waste that goes through these processes and the resulting biowastes, are also sensitive to changes in collection strategies and practices. These biowastes vary over time, depending on the content of MSW, the MBT processes.

1.2 How much CLO is there?

The amount of mixed MSW being processed through MBT plant and the amount of CLO being produced is due to rise sharply as new plants come on line. These will tend to be larger, more complex plant with a wide range of physical and biological treatment processes, in the capacity range of 150,000 to 200,000 tonnes MSW per year producing CLO in the range of 90,000 to 120,000 tonnes per year. We estimate that in 2010 there will be a ten-fold increase in the amount of CLO produced in England and Wales over the amount for 2006-7, to about 650,000 tonnes. We believe that this is likely to rise to between 900,000 and 1,800,000 tonnes of CLO per year by 2020.

Some local authorities in England and Wales, and operators who have MBT and CLO's as a significant part of their waste strategies, are investing heavily in improving their processes. This is not only by developing complex or more sophisticated technologies, but also through simpler approaches. These include; source separation of batteries to reduce lead content, handpicking and other soft segregation at the front end and introduction of aerobic processing at the backend to break down chemicals such as triclosan.

1.3 How can it be used?

The current options are:

- Landfill disposal as stabilised waste
- Soil conditioner and nutrient source for landfill recovery, the recovery of previously developed non-agricultural land, and (subject to the restrictions discussed later) agricultural land
- Refuse-derived fuel

Landfill disposal as stabilised waste is not strictly a use so much as a means of satisfying the criteria for landfill under the Landfill Directive. It may be an option for reducing carbon dioxide and methane emissions, since the carbon content of the waste may have been reduced through generation and capture of biogas during anaerobic biological treatment and stabilisation. However, it does not satisfy the current criteria for a reduced rate of Landfill Tax. It is the lowest in the hierarchy of waste options, but it may be where most is currently going in England and Wales.

The most commonly chosen options appear to be the use of CLO as a soil conditioner and nutrient source for landfill recovery, for the recovery of previously developed land, and as a refuse-derived fuel. Biogas is recovered from the anaerobic biological treatment processes and used as a fuel. Another option that is used in Europe and being developed in the UK is the integration of MBT and CLO into a wider Combined Heat and Power (CHP) option for a cradle to grave strategy.

No CLO is currently being used on agricultural land in England or Wales, although in principle it could be under an appropriate permit. I discuss this later.

1.4 What are the benefits of using CLO on land?

They are advocated as its value in:

1. Improving soil condition
2. Increasing soil nutrients
3. Diverting biodegradable wastes from landfill
4. Reducing use of fertilisers
5. Contributing to soil organic matter

Producers of CLO call their products by a variety of terms, intended to remove the negative connotation of waste; for example, organic matter amendment (OMA), stabilised organic fraction (SOF) and organic growth medium (OGM). Operators of higher end MBT plant state their CLO is similar in composition to treated sewage sludge (biosolids) and green compost, with comparative metal content.

2 Potential risks of using MBT CLO on land

2.1 What are the problems?

We don't know enough about the quality and variability of the waste that goes into MBT and the biowaste that comes out of MBT. This means the risks to the environment and human health are also unknown. This includes direct and indirect risks to soil quality and sustainability, ecology (including plant and animal health) the food chain, water quality and the quality of life.

It is commonly observed that: 'anything can go into municipal solid waste'. As discussed earlier, numerous variables can also affect biowaste quality from an individual plant over time.

We need improved data and evidence, but industry research tends to focus on the benefits of CLO, while as regulators we are more concerned with the potential contaminants and their risks. There are things we need to know about CLO before we

can develop our knowledge of the risks when spread on land. These include the contaminants that are currently addressed for sewage sludges recovered to land and under the quality protocols for green composts and anaerobic digestates; that is, levels of specified nutrients, physical contaminants (glass and plastic), metals and metalloids and pathogens. Our analysis suite for MBT CLO also includes organic pollutants that are likely to be part of the mixed MSW composition and of the resulting CLO.

Our evidence is that levels of some contaminants can be highly variable in a given CLO, and that there are potential risks, for example from Zn, Cr, Cd and some micro-pollutants, triclosan, benzo-a-pyrene and several phthalates. We are paying particular attention to these.

2.2 What are the restrictions?

Land spreading of wastes is carried out under exemptions in England and Wales, and has to be for agricultural benefit or ecological improvement. Exemptions are available for low risk land spreading, with standard permits for low to medium risk activities and bespoke permits for medium to high risk activities.

Exemptions are being reviewed by the UK government. From later this year they will only be available for a restricted range of low risk operations including small amounts of landspreading of certain wastes. Standard permits will be used for low to medium risk activities. MBT CLO is not source-segregated, so it is excluded by the regulations from the option to spread it to *agricultural land* under the proposed new exemptions. It could only be used for spreading on agricultural land if a permit were to be issued. Since we regard CLO as a higher risk waste for use where contaminants could enter the foodchain or water, it would have to be a bespoke permit.

We are proposing a standard permit for spreading certain wastes to *non-agricultural land*, since we consider the risks to be lower. These wastes will include CLO.

3 What is our position on the use of MBT CLO on land?

Our overarching position on biowastes is given on our website at <http://www.environment-agency.gov.uk/research/library/position/41227.aspx>.

The key elements are that:

1. We believe biowastes should be treated and recovered to maximise their benefit as a resource, while minimising their impact on the environment.
2. We want a more coherent and integrated approach to management and disposal of biowastes, linked to waste strategy and land use planning.

3. We prefer separation at source. This has clear advantages over mixing of wastes.
4. We recognise that source segregation of MSW is not always practicable, but local authorities and operators should bear in mind that lack of separation will limit their options for re-use of the outputs.

We have published a more specific position on the use of MBT CLO for agricultural land, at <http://www.environment-agency.gov.uk/research/library/position/41227.aspx>. (This is the same url as above)

This states that we do not believe CLO should be applied to agricultural land used for growing food or fodder crops, or any land that is likely to grow food or fodder crops in the future. We are concerned with minimising and managing the risks of:

1. Chemical contamination
2. Physical contamination
3. Longer term, cumulative risks to environment and sustainable use of land
4. Unreliability of the quality of CLO (and/or data on that quality) coming out of MBT processes
5. Our current lack of good, necessary and sufficient evidence on those risks

4 What is the demand to spread MBT CLO on agricultural land?

4.1 Who wants to do it and why?

The UK government has specifically excluded non-source segregated wastes from the remit of exemptions for spreading on agricultural land, because of the relatively higher risks. The government (and the EU) are reviewing the evidence on current standards for sewage sludge, which have been the basis in England and Wales for regulating standards for other biowastes and for PAS100 and PAS110 protocols. Some limits may become more restrictive, and the available land could be considerably restricted.

MBT is a key feature of a number of local authority waste management strategies; mainly for use as a refuse derived fuel. CLO is of interest in land use, development and planning and represents a business opportunity for operators. But the waste management industry and local government should take into account the costs and burdens of pursuing this option for the use of their MBT CLO.

Although any future increased use of CLO on agricultural land may please local authorities who have invested in MBT plant or who have included MBT plant

construction in their waste strategy, other stakeholders may not be as happy and may see it as direct competition for their product.

For example, land owners and developers have been using MBT CLO for the recovery of previously developed or brown field land for some years, generally as single or limited applications under exemptions, to establish an ecology or land suitable for planned use.

Farmers generally apply organics in repeat applications, on an annual or biannual basis, under exemptions.

No farmers or operators have yet applied for a permit to spread MBT CLO on land and a demand from farmers has yet to be demonstrated. The size of such a market against that for all the organic resources spread to land is relatively very small (less than 1%) and the proportion of available agricultural land that could be affected is small (hypothetical maximum of 0.4% rising to 1.1% by 2020).

Such a market will be sensitive to market prices for soil conditioners and fertilisers, and the farmers' needs for agricultural benefits or ecological improvements, balanced against their desire to protect and enhance their land and the marketability of their produce. They will need to be convinced about the quality of CLO before using it.

They may also think it is unnecessary to produce an additional source of nitrates when a large proportion of farmland lies in Nitrate Vulnerable Zones and farmers have to store sewage sludge due to spreading restrictions.

Retailers are the missing link in the creation of a market for CLO for agricultural land. They will be critical to the demand for CLO by farmers, and rigorous on the potential contamination of food. The grocery and food production sectors will also question the quality and standards of animal fodder and food grown on agricultural land in England and Wales where CLO has been used. There may be extra sensitivity in the light of issues in 2008 in Ireland and NI with dioxin contaminated cattle and pig feed.

One of the hats we wear is as members of the public. However, that hat comes in many colours, styles and sizes. As members of the public our confidence and attitudes regarding MBT CLO on land will be sensitive to our particular situations and interests, and to how we perceive and understand the risks. Those concerns will often be modified or mediated by interest groups and, critically, media reports.

Our position has been (and remains) that CLO should not be spread on agricultural land. As I shall describe below, we are prepared to consider applications for strictly controlled trials for a specific operator spreading a specific CLO at a specific site on

specific soil. However, the media may see this as opening the floodgates to CLO use on agricultural land.

Consequently, they may take issue with any of the following:

1. Contaminants – like metals and organic pollutants;
2. Odour, bioaerosols, and methane emissions;
3. Soil quality – now and in the longer term – and the suitability of land that has been spread with MBT CLO in the past for growing food for human consumption;
4. Health of animals grazing the land;
5. Health of humans consuming food grown on the land; and
6. Other risks to the environment.

4.2 How much is there and how is it being used?

MBT CLO is currently a very small proportion of the market. The 650,000 tonnes of MBT CLO that we estimate will be produced in 2010 would constitute only about 0.6% of the approximately 100 million tonnes of biowastes estimated currently spread to land (the greater proportion of which are biosolids from sewage sludge treatment). By comparison, in 2006-07, 1.15M tonnes (53%) of source-segregated compost products went to agricultural use. This had doubled in four years. [ASSOCIATION FOR ORGANIC RECYCLING, 2009]

Land availability is a key issue. We estimate there are about 5.5 million hectares of agricultural land available. No CLO is currently going to agricultural land, but hypothetically, if all the CLO produced were to go to agricultural land (assuming a rate of 30 tonnes of CLO per hectare per year) then this would cover about 0.4% of the total available land in 2010, rising to between 0.5% and 1.1% in 2020.

5 Improving the evidence on the risks of MBT CLO

5.1 Do we know what we need to know?

We do not yet know enough. The Environment Agency is a modern, better regulator, risk and evidence-based, but firm, fair, flexible and proportionate. We want to work with industry to develop the evidence needed to determine where this waste stream should be spread. But we are also mindful of the risk to public confidence in the recovery of biowastes and its regulation if we are perceived to have got it wrong on MBT CLO. While scientific trials are underway, we will continue to maintain a protective approach.

It is our aim to ensure that operations are permitted and carried out on the basis of the best available evidence.

5.2 How will we improve the evidence?

We are an evidence-based regulator. But the best evidence we have is too general, non-specific, unclear and unreliable to merit a review of our position on the use of MBT CLO on agricultural land.

We recognise that technology is developing and in recent years, the quality of CLO from some MBT has improved as regulation has driven better processes. There is evidence that processes can be developed to reduce the risks so that (in certain circumstances) they can be managed to an acceptable level. We are working with the operators producing CLO to derive a better understanding of the use of these materials.

We have been developing and improving our risk assessment models. A review of human health and environmental risks associated with the land application of mechanical-biological treatment biowastes (ENVIRONMENT AGENCY, APRIL 2009). This will be published on our website.

We have given permission for a small scale time-limited research study to spread small amounts of CLO from a specific, high end MBT plant on farmland in Leicestershire, England. This trial is the first to take advantage of an Environment Agency lighter touch approach to regulating trials of waste management activities. The small-scale, time-limited trial will quantify nitrogen release from the organic fraction of MBT residues to show it has a beneficial effect on crop yield. Up to six tonnes of CLO from the Biffa MBT plant in Leicestershire will be spread on 0.2 hectares of land during the two-year trial.

We have decided that where there is a genuine trial of a previously untested process and it would be disproportionate to require an environmental permit, we will permit land spreading. We are not inclined to issue permits for use of an area of land for spreading MBT CLO, where this land is or is likely to be used for food or fodder crops. But we are exploring a middle way with industry and government.

On this basis, we will consider applications for large-scale trials subject to defined limits on capacity and rate of application of a defined CLO to a defined area of land. (Our requirements are described later). There will be costs, risks, and burdens to be borne by the operator and potentially by the farmer or landowner that need to be recognised. We do not guarantee the success of an application, but we will consider each application on its merits. Good assessments and good, reliable and applicable evidence will be key.

5.3 Research

Defra is contracting research into levels and limits for metals in soils, and into attitudes towards biowaste recovery to land. WRAP (Waste Resource Action Programme) provides useful data and reviews and reports on the reduction, recovery and use of biowastes, as well as (with ourselves) the Quality Protocols for composts and anaerobic digestates. The Environment Agency is continuing its research into risks and risk assessments. This includes a sampling and analysis programme involving a number of operators producing MBT CLO.

The waste management industry is generating research and collecting evidence through organisations such as the Sustainable Organic Resources Partnership (SORP), the Association for Organic Recycling (AFOR), and the BioCompost Alliance.

5.4 Europe

We have published a review of the use and application to land of MBT compost-like output and current European practice in relation to environmental protection (ENVIRONMENT AGENCY, MARCH 2009). This presents a confusing picture, and it is difficult to draw any conclusions.

CLO from non-source segregated MSW has been applied to agricultural land in a number of EU countries, but we have found that there is no uniform system for setting compost standards and these can vary significantly from one country to another. So far it has not been possible to obtain useful data to apply to such applications in England and Wales. The composition of MSW and CLO, soil conditions and qualities and environmental factors vary geographically and there is no large-scale field evidence directly applicable.

5.5 How will we regulate large-scale trials?

We are in discussion with an MBT operator and are expecting an application for a permit to carry out a trial of a large-scale application of the CLO from their plant to a farm. The scale of the operation is under discussion. As for all applications we receive, applications for such trials will be considered on their merits. They will have to be specific to the CLO, the site, the parameters of use of the CLO and the crop type and use. The permits will be bespoke and the operator's assessments will need to be detailed and specific. We will require rigorous management and detailed quality assured sampling, monitoring and analysis. We will require submission of data and defined reports on the progress and outcomes of the trial, to inform a review of that permit and of our approach.

It is not a simple task for operators to apply for a permit to trial use of their CLO for agricultural purposes. It will incur significant time and resources, without the guarantee

of a favourable outcome. We will use the information from such permitted trials to improve the evidence base, our strategic advice and our regulatory approach for MBT CLO.

5.6 Why limit the amount and area?

We do not have enough good evidence to permit any operational spreading on a commercial scale on land where potential contaminants could enter the food chain. We need a defined and enforceable line where the EA and the operator can take stock, and we can weigh the evidence openly and transparently before taking the next step. We are currently developing the detail of how we will apply these limitations through the permit conditions.

5.7 What will we require from the operator?

The permit conditions and guidance will provide equal opportunities for operators. Our standards are high but proportionate to the need to improve the evidence, while protecting the environment, animal and human health and maintaining public confidence.

The permit will require the operator to:

1. Closely manage the operation
2. Provide extensive and detailed information and assessments
3. Protect human health and the environment, ensuring long term sustainability of the soil is not compromised.
4. Restrict use of the crops to prevent harm to animal or human health
5. Monitor and assess the soil and crops until the permit is surrendered, against appropriate criteria and assessments
6. Report on defined outcomes

We will use the information from trials to improve the evidence base, our strategic advice and our regulatory approach for MBT CLO and other higher risk recovered biowastes.

6 Key messages

We are working with industry, but we are working for the environment, the public and the government of England and Wales.

We believe that MBT is an area where regulation is having a positive effect in driving improvement of the technology and processes, but also, more fundamentally, in reviewing options for resource use and recovery.

We are a modern regulator and a better regulator. We support and observe the Regulators' Code of Practice. We are working to improve the way we regulate the recovery of biowastes (like CLO) and organic resources (like green compost). MBT CLO is a key example of the options for biowaste recovery. Our regulation needs to be robust and flexible to protect the environment. Our level of knowledge is growing but until we know what is safe and what is not, we are taking a protective, evidence-based approach.

We acknowledge it is not an easy task for operators to apply for a permit to trial their CLO for agricultural purposes. It will incur significant time and resources, without the guarantee of a favourable outcome. But it will also take Environment Agency resources to regulate trials.

The burden of proof is on the operator to provide evidence regarding their CLO and each site and use. That burden is not light, nor should it be at this stage, but it will have to be borne if we are to maintain public confidence in the use on land of biowastes in general and MBT CLO in particular.

We can only increase public confidence in the recycling of biowastes if we maintain the confidence of the public in how we regulate.

7 Literature referenced

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