Workshop Report: Towards Certainty in the use of organic MBT outputs

DBERR Conference Centre, London, 19/05/2008

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This workshop was produced by The Chartered Institute of Wastes Management and r3 Environmental Technology Ltd with support from the following organisations:

Towards certainty in the use of MBT organic outputs

Paul Bardos and Antony Chapman

A workshop report produced for The Chartered Institute of Wastes Management by r³ Environmental Technology Ltd, May 2008

This report is a record of a workshop entitled 'Towards certainty in the use of organic MBT outputs', undertaken by the Chartered Institute of Wastes Management (CIWM) in conjunction with r³ Environmental Technology Ltd (r3), held on May 19th 2008 at the DBERR Conference Centre in London. The workshop was supported by Defra, Bedminster Organics Ltd, Donarbon Waste Management Ltd, Global Renewables Ltd, New Earth Solutions Ltd and Norfolk Environmental Waste Services Ltd.

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The Chartered Institution of Wastes Management (CIWM) has served the wastes management industry for over 100 years and is the industry's leading professional body, representing over 7,000 individual professionals in the UK and overseas.

The CIWM sets the professional standards for individuals working in the wastes management industry and has various grades of membership determined by education, qualification and experience.

The CIWM has a key role to play, not only in the United Kingdom but also on the European and world stage. The expertise of its members plays a vital role in influencing and interpreting EC legislation. CIWM is the UK's national representative on the world body, the International Solid Wastes Association (ISWA), and its members chair several key technical committees.

The Biological Treatment Special Interest Group (SIG) was formed in 2003 on completion of the technical publication *Biological Techniques in Solid Waste Management and Land Remediation.* The purpose of the SIG is to facilitate the dissemination of information relating to the biological treatment of biodegradable wastes, including new techniques and technologies for composting, anaerobic digestion, land remediation or other processes such as mechanical biological treatment (MBT) involving biological treatments of residual waste.

The SIG works in close liaison with The Composting Association, The Environment Agency and other CIWM SIGs, such as Thermal Treatment. Links are established with the County Surveyors Society, The Association for Sustainable Use and Reuse of Resources (ASSURRE) on resource management and bio-treatment, the International Solid Waste Association (ISWA) Composting Working Group and the European Federation of Waste Management (FEAD).

http://www.ciwm.co.uk/

The Department for the Environment, Food and Rural Affairs (Defra) is the UK Government Department with responsibility for recycling and waste issues. Defra helps Government as a whole to deliver economic, social and environmental sustainability. The Department has a strong international dimension, with a critical role in both European Union and global policy making.

The overarching challenge for Defra is to enable everyone to live within their environmental means. Improvements to waste management are a crucial aspect of this goal. The Government's key objectives for waste management in England are to: decouple waste growth from economic growth and emphasise waste prevention and re-use; meet and exceed the Landfill Directive diversion targets for biodegradable municipal waste in 2010, 2013 and 2020; increase diversion from landfill of non-municipal waste and secure better integration of treatment for municipal and non-municipal waste; increase recycling of resources and recovery of energy from residual waste using a mix of technologies. The overall impact of this strategy is expected to be an annual net reduction in global greenhouse gas emissions from waste management of at least 9.3 million tonnes of carbon dioxide equivalent per year compared to 2006 (equivalent to annual use of around 3 million cars).

The *Waste Strategy for England 2007* sets out details of how the Government will achieve its aims, including a range of increased targets for recycling and composting (at least 40% by 2010, 45% by 2015 and 50% by 2020), with an aspiration to reduce the amount of household residual waste to 12.2 million tonnes in 2020, a reduction of 45%.

Defra's Waste and Resources Evidence Programme (WREP) aims to provide the evidence to underpin development and implementation of the waste strategy. Some 80 projects were commissioned in the first 3 years of the programme. The *Waste and Resources Evidence Strategy 2007-2011*, published in September 2007, sets out the strategy for the next 3 years of the programme.

http://www.defra.gov.uk/environment/waste/index.htm

http://www.defra.gov.uk/ENVIRONMENT/waste/wip/research/index.htm

r³ Environmental Technology Ltd is a consultancy and research company specialising in the re-use of wastes (particularly through MBT and composting), contaminated land remediation (particularly using bioremediation, and for biomass production), river basin management, and sustainability appraisal. It carries out consultancy feasibility studies, research (including experimental work) and information management via networks, databases and web systems. It is an independent consultancy located at and collaborating with the University of Reading in the UK.

Examples of the range and nature or our work includes the following: Technical consultancy and product development, for example appraisal of composting and remediation technologies and, process development and project development and compost / soil improver standards and audit development (for various clients); Research and development, for example the use of composts and mechanical biological treatment outputs (Grantscape), sustainability appraisal and decision support for contaminated land and waste management (various projects funded by EC, Defra and the Environment Agency) and feasibility studies, for example the Markham Willows project (linkage of biomass, remediation / risk management, compost re-use and land regeneration with job creation and economic and social regeneration) in collaboration with exSite Research Limited, Groundwork UK and others.

Another major work area is information management, in particular the development and management of several significant portals, including EUGRIS the EC funded European portal for contaminated land and water information, EURODEMO EC project coordinating demonstration projects – on-line project and funding databases, the Compost Bibliography web site and the NICOLE web site, reports and newsletter (Network for Contaminated Land in Europe).

http://www.r3environmental.co.uk

GLOBAL RENEWABLES™ http://www.globalrenewables.com.au/	Global Renewables is the brightest and most dynamic entrant into the UK waste management market having closed a £2bn contract to design, build, own and operate two cutting edge waste treatment facilities in Lancashire. Using the UR-3R technology already proven at their Australian facility, the company is setting new quality standards in sustainable waste management through the implementation of long-term environmentally sustainable infrastructure and local community partnerships, both here in the UK and worldwide.
newEARTH SOLUTIONS LTD http://www.newearthsolutions.co.uk/	New Earth Solutions Ltd (NES) utilises proven technology for the treatment of biodegradable organic waste to reduce the biodegradable content of residual MSW. The system has been assessed in accordance with Environment Agency Guidelines and can deliver a LATS contribution in excess of 80%. With a design, build, finance and operate capability, NES is able to offer bespoke facilities and process systems that make a significant contribution towards meeting both LATS and Best Value Performance indicator (BVPI) targets. New Earth technology can also be designed to process a wide range of source segregated wastes and has achieved full State Veterinary Service ABPR approval for the composting of both Category 3 Animal By Products and catering waste, including meat. Its performance has been independently assessed by the Organic Resource Agency Ltd.
Donarbon WASTE MANAGEMENT http://www.dickersongroup.co.uk/Donarbon/index.html	Donarbon Waste Management Ltd is a privately-owned family business including composting, recycling and landfill facilities, at Waterbeach, just north of Cambridge. It has recently secured Cambridgeshire County Council's 28-year waste processing and recycling contract. The contract includes a £41 million state of the art MBT plant, plus expansion of the company's in-vessel composting facility and new recycling infrastructure to ensure that over 80% of Cambridgeshire's household waste is diverted from landfill. The MBT plant may make a refuse derived fuel before producing CLO with the organic rich remainder. It is hoped that some of this material will be used for remediation of the group's aggregate quarries. Donarbon also offers a range of recycling and waste collections to local businesses and works with community groups and local councils to promote waste reduction, reuse and recycling.

http://www.norfolk-waste.co.uk/	Norfolk Environmental Waste Services (NEWS) is a leading waste management company based in East Anglia. It was formed in 1993 as a Local Authority Waste Disposal Company and recently became part of the Norse Group of companies, a subsidiary of Norfolk County Council. It is at the forefront of innovative new approaches to waste management. Its recycling centre at Costessey is among the most modern in Europe and was the first of its kind in this country. Through its sister company, Sustainable Resource Management, NEWS has gained planning permission for the construction of a groundbreaking facility at Costessey, for the recycling of general waste through a MBT process incorporating anaerobic digestion. NEWS also operates transfer stations at King's Lynn, Costessey and Caister-on-Sea, an active landfill site at Edgefield, North Norfolk, and provides commercial waste collection services to customers all over the County.

Executive Summary

This report provides a summary of the workshop held at the DBERR Conference Centre in London: 'Towards certainty in the use of MBT organic outputs' organised by the Chartered Institute of Wastes Management (CIWM) with r3 Environmental Technology Ltd (r3) and supported by Defra, Bedminster Organics Ltd, Donarbon Waste Management Ltd, New Earth Solutions Ltd (NES), Norfolk Environmental Waste Services Ltd (NEWS) and Global Renewables Ltd. The workshop was attended by 47 delegates from a range of backgrounds including waste management companies, regulators, consultants, a local authority and the finance sector.

The aim of the workshop was to discuss the current extent of scientific knowledge and the regulatory context surrounding compost-like outputs produced by a Mechanical Biological Treatment process (MBT-CLO), using this background to set an agenda to provide greater certainty for the use of MBT-CLO in the future. This was explored in the context of the three principal potential end-uses available for the various forms of biodegradable waste, namely application to land, solid recovered fuel and deposition in landfill sites as a treated biowaste. r3 presented an initial briefing on the challenges facing the MBT sector related to the re-use and treatment of organic waste. A range of perspectives followed from a local authority, an operator, an investor and a regulator. These were followed by an interactive discussion identifying the issues of greatest concern to delegates. This report summarises the papers and the resulting discussion.

MBT in its various forms is becoming an established municipal waste treatment approach in the UK. Over the next few years the volume of outputs from such facilities will increase, very probably significantly. As MBT becomes more prominent, so the need to clarify what is and is not biostabilised, and what will or will not be possible in terms of the re-use of materials has become critical. This situation has effectively been confirmed by the recent release of the Environment Agency position statements on MBT-CLO organic outputs, which place the onus on the industry to provide evidence to the Environment Agency to support the use of MBT-CLO on land.

The workshop identified a number of actions required to support an effective MBT sector. These are listed below, in order of importance as decided by the workshop delegates.

1. The creation or adoption of an organisation to act as a single representative voice for the industry in promoting the acceptance by the regulator of CLO as a soil amendment.
2. The development of an output-based standard for CLO to allow industry to develop materials of consistent quality. Separate standards would be required for each of the three principal end uses, but was highlighted specifically for CLO to land.
3. The development of case studies, field trials and the production of quality data for an evidence base from which to form a risk-based approach. The compilation of evidence of CLO quality and its successful application to land in appropriate circumstances (e.g. already developed land), both in the UK and in comparable locations elsewhere, is important if a case is to be made for wider use of CLO to land, and would address the challenge issued to the industry by the Environment Agency.
4. A revised landfill tax system that reflects the extent of CLO biostabilisation or accounts for its use in cover. *This implies the need for evidence on the measurement of biostabilisation (see also point 7 below).*
5. Engagement of all stakeholders with an interest in CLO, e.g. through a cross-sectoral task force encompassing among others CLO producers, local authorities, regulators, policy, consultants, environmental technology, landowners and farmers' representatives.
6. The creation of a precise, modern, official definition of agriculture to update that of the Agriculture Act, 1947.
7. Research to give improved understanding of the behaviour of stabilised MBT-CLO in landfill, in terms of emissions to air and the carbon agenda. Additional issues may include load-bearing capacity and the long-term implications for site closure (e.g. residual methane emissions and discharge of metals and other pollutants in leachate).
8. Improved resources to support a co-ordinated approach to research and evidence needs.
9. Independent scrutiny and/or peer review of the evidence used as the basis for the recent Environment Agency position statement on MBT-CLO.
10. Equal treatment for all biosolids in terms of taxation: the landfill tax escalator increasingly favours materials that are classified as inert.

Contents

List of Abbreviations

AD	Anaerobic Digestion
CHP	Combined Heat and Power
CLO	Compost-Like Output
EfW	Energy from Waste
ERA	Ecological Risk Assessment
IBA	Incinerator Bottom Ash
LATS	Landfill Allowance Trading Scheme
MBT	Mechanical Biological Treatment
OBC	Outline Business Case
OM	Organic Matter
PDL	Previously Developed Land
RSG	Revenue Support Grant
RDF	Refuse-Derived Fuel
SRF	Solid Recovered Fuel
WDA	Waste Disposal Authority

1 Introduction

This report is a record of a workshop entitled 'Towards certainty in the use of organic MBT outputs', undertaken by the Chartered Institute of Wastes Management (CIWM) in conjunction with r3 Environmental Technology Ltd (r3), held on May 19th 2008 at the DBERR Conference Centre in London. The workshop was attended by 47 delegates (see Annexe C for a complete list of delegates and affiliations) from a variety of backgrounds in waste management, including Local Authorities, representatives of waste management companies, policy and regulation groups, managers and consultants.

The overall aim of the workshop was to discuss the current extent of scientific knowledge and the regulatory context surrounding compost-like outputs produced by a Mechanical Biological Treatment process (MBT-CLO), using this background to set an agenda to provide greater certainty for the use of MBT organic matter (MBT-OM) outputs in the future. This was explored in the context of the three principal potential end-uses available for the various forms of biodegradable waste, namely application to land, waste-derived fuel and deposition in landfill sites as a treated biowaste.

A particular goal of the workshop was to respond to the recently published Environment Agency [1]position statement on the use of MBT-CLO, in particular the challenge posed to industry to provide evidence to in support of the application of MBT-CLO to land.

1.1 Workshop format

The day-long workshop was divided into two sessions, each of which was sub-divided into two parts. The morning session consisted of a series of presentations including an introduction to the key issues and a proposed agenda for action in each of the three applications for biodegradable waste, along with a perspective from four representatives of interested parties (regulator, Local Authority, financier and technology provider). These presentations were followed by an opportunity for questions and discussion around the issues raised, the audience having been primed for the event with a prior circulation of some of the presentation material.

The afternoon session involved a series of interactive discussion sessions focused on the three potential applications for biodegradable waste; the aim of the syndicate group sessions was to identify the issues in each application considered to be of most importance by the delegates, the results of which were fed back in the following plenary session. The group was then invited to vote on the results of the syndicate session, to refine the results and identify the key issues from those identified, giving a consensus from the entire group. The results and conclusions of the voting were reported back in a second plenary session.

The workshop was undertaken under Chatham House rules[2], making the findings those of the workshop as a whole rather than those of any individual.

It was emphasised that presentations did not necessarily reflect the views of the sponsoring organisations nor would all participants necessarily agree with all of their content.

2 Presentations

2.1 An agenda for the development of MBT-OM applications: Paul Bardos, r^3 Environmental Technology Ltd.

The aim of the presentation was to provide a context for the workshop as a whole by giving a

[1] Within this document the Environment Agency may also be referred to as 'the Agency'
[2] When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed. No meeting participant can take a quotation out of the meeting, and say for example that Organisation X said Y.

background to developments in technology and regulation of MBT and suggesting means by which the industry might move forward, given the imperatives of the Landfill Directive, the reality of current and expanding MBT-CLO production in the UK and the implications of the recent Environment Agency position statement on MBT-CLO. The presentation was divided into three parts, namely a discussion of the scope and potential for MBT-OM, development agendas for the three options for MBT-OM (landfill, incineration and application to land) and a summary.

MBT is seen primarily as being applied to residual waste after source segregation removal has been optimised. MBT has the potential to extend recycling rates and energy recovery, as well as biostabilise materials for landfill. It is a flexible approach which can be used in synergy with source segregation. It also offers the potential for moving waste management up the waste management hierarchy (as shown in Figure 1), so for example while an initial configuration may focus on biostablisation as a pre-treatment to landfill, a later configuration, at the same facility might generate greater quantities of recyclates and/or energy recovery. The major factor in achieving these changes is the re-use or recovery of organic matter (including paper, card and plastics) in the residual waste as a fuel fraction (solid recovered fuel - SRF[3]) or as a soil amendment (compost like output – CLO). MBT-based solutions have also been promoted by a number of non-governmental organisations and are seen as having greater public acceptability than mass burn incinerations (as outlined in the following presentations).

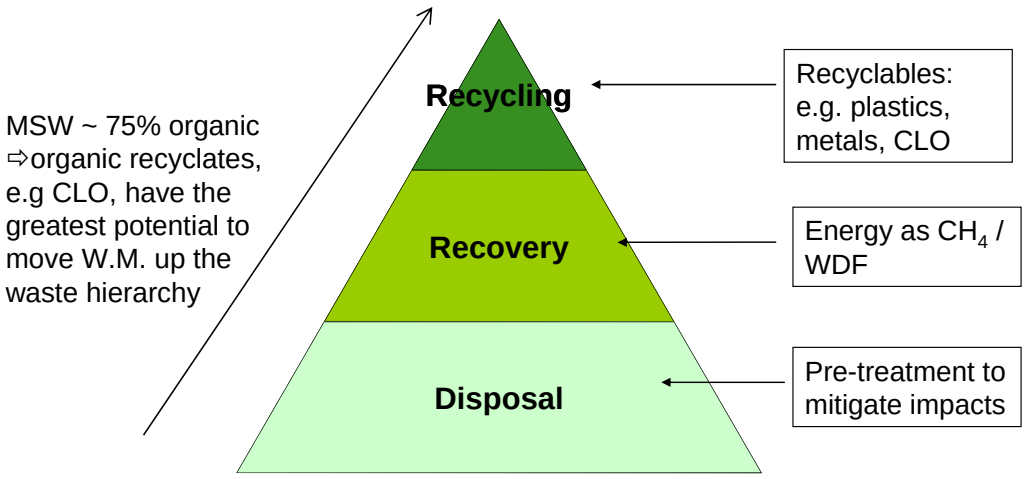

Figure 1: MBT Applications and the Waste Management Hierarchy

However the developing MBT industry and market faces several challenges at present, which put the industry at a crossroads for its future development, whether it will be a major residual waste management option or whether it will be marginalised as an approach. These challenges are:

1. limited market availability for compost like output use to land
2. limited market availability for waste derived fuel use (indeed some markets may charge gate fees)
3. differences in the rate of landfill tax for disposal of MBT stabilised waste, which is taxed as an active waste at £32 per tonne; compared with Incinerator Bottom Ash (IBA) which is taxed as an inert waste. at £2.50 per tonne

MBT as a pre-treatment for landfill

MBT as a pre-treatment for landfill is technically very feasible and reduces use of void space, increases bulk density and reduces methane generation and flux per unit of residual waste collected.

[3] Solid recovered fuel (SRF) is material that has been refined and processed from Municipal Solid Waste (MSW) to increase its calorific value. Generally this involves removal of non-combustible recyclables such as metal and glass, retention of combustible organic material and reduction of moisture content through some form of MBT process. SRF is also referred to as Refuse-derived fuel (RDF) and sometimes waste-derived fuel (WDF).

Pre-treatment *may also* lead to shorter landfill stabilisation time. Eunomia (2008)[4] argue that biostabilised waste should be taxed at a lower rate or be classified as inert waste. However treated CLO is not completely inert; levels of leachate generation may be similar to untreated waste, landfill gas is still generated (although flux may be lower) and there may still be issues with geotechnical stability. The argument for a graded taxation system is important. One immediate opportunity to reduce the tax burden within the current system is to use density and size separation to extract an 'inert fraction', which may be a large proportion of the stabilised biowaste's mass[5]. Development of this approach will need agreement with the regulator and independent scrutiny. Graded landfill tax rates are under negotiation, but may find a greater consensus if evidence based bio-stabilisation 'standards' or benchmarks that merit lower LFT can be agreed based on reduced environmental impact per unit landfilled waste, and not based on carbon balance arguments alone. There is also an argument that CLO used for genuine landfill engineering should not be taxed at all. At present landfill design is not optimised in the UK for MBT stabilised organic matter (MBT-OM). While the size graded nature of MBT-OM would appear to create opportunities for faster landfill stabilisation, modelling studies in the UK[6] have not indicated that this would happen under current landfill configurations. A useful research project might be to investigate what changes in landfill practice might both exploit the opportunities of MBT-OM for landfill operators and mitigate potential problems such as geotechnical issues, such as the 'thin layer' approach being investigated in Germany.

Solid Recovered Fuel from MBT

Solid Recovered Fuel production from MBT is already underway at a number of locations in the UK. It provides energy recovery, saves void space, and should produce an inert output that does not generate methane in landfill. MBT production of SRF for energy recovery has several advantages compared to mass burn incineration (a) the removal of poorly combustible and also hazardous materials before combustion; (b) better burnout because of the controlled particle size, (c) and synergy with other recycling and recovery options for the residual waste. The market limitation for SRF is that it can only be used in facilities compliant with the Waste Incineration Directive. The market is also limited because of concerns about fuel quality, in particular its impact on maintenance requirements for energy recovery plant because of deposition of volatile salts to heat exchangers for example. Questions have also been raised about the overall sustainability of SRF processing and use compared with other waste management options. The future for SRF appears to be the integration of energy recovery with the MBT production facility to provide a local use for the SRF. However, this may need to be supported by better evidence related to maintenance issues associated with using SRF, sustainability, carbon and energy efficiency.

Compost Like Outputs from MBT

Relatively large amounts of MBT-OM will be being produced by 2010 (perhaps some 650,000 tonnes per year). There are a number of potential benefits from reusing CLO on land: return to land of plant nutrients and organic matter, soil functionality and condition improvements; improvements in soil buffering, resilience and workability; and possibly wider benefits such as (temporary) carbon sequestration. CLOs may also find other applications in pollution control, erosion control, swales and sound barriers, although these are not established applications at present. However, these land use benefits are critically dependent on CLO quality and the technical feasibility of 'high quality' CLO is widely seen as not proven. Concerns include its potential content of toxic elements, organic pollutants and contraries, its conductivity and biological risks from, for example, entrained animal pathogens. It is subject to generally negative market and land owner perceptions, which have been substantiated by

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[4] Eunomia (2008) Biostabilisation of Wastes: Making the Case for a Differential Rate of Landfill Tax. Eunomia Research and Consulting Ltd, Bristol, UK, January 2008.
http://www.eunomia.co.uk/shopimages/Eunomia%20Landfill%20Tax%20Paper%20Final.pdf

[5] Based on studies at the former Warren Spring Laboratory on mixed waste compost refining are summarised in Bardos, R. P. (1992) Composting studies using separated fraction of urban waste from the Byker reclamation plant, Newcastle, UK. Presented at Intern. Symp. 'Compost Recycling of Wastes' Athens, Greece, 4-7 October 1989, IDEA, Athens. Acta Horticulturae (302) 125-134, ISBN 906605 0756.

[6] Hall *et al,* Estimating pollutant removal requirements in landfills in the UK, Parts I, II and III. Environmental Technology **27** 1309-21; 1323-1333 and **28** 25-32

the recent Environment Agency position statement on the use of CLOs from MBT[7].

The key points of the Agency position statement are that:

- The amounts of CLO used are small but rising; MBT is new
- The Agency needs more evidence about risks from CLO use on land and how these might be controlled
- CLOs should not be used on land for food and fodder crops, or likely to be used for these because of concerns over chemical and physical contaminants, the accumulation of contaminants in soil, variability of quality and a general lack of knowledge about the properties of CLOs
- CLOs may be suitable for use on previously developed land (PDL), but better evidence about risks is needed and Agency guidance on exemptions will be reviewed
- MBT industry and local authorities must consider these limitations in planning facilities
- The Agency suggest that contaminant risks be managed 'at source', i.e. not be mitigating risks by pathway management or receptor management after the CLO has been applied.
- The Agency will consider industry-led research

There are several reasons why the Agency (and indeed other stakeholders including land owners) are taking a precautionary approach towards CLO use on land, which seems to be more stringent than the regulatory and policy controls on sewage sludge and incinerator bottom ash. As an idea MBT has been around for decades, even if was not known by this term. The historical problems with applications of 'mixed waste compost' are one of the drivers for this precautionary approach. Other drivers are the limited experience in the UK of MBT compared with sewage sludge management and mass burn incineration, so that there is perceived to be little evidence from use or disposal of MBT-OM, compared with sewage sludge or IBA. In addition, to date the MBT industry is associated with widely varying levels of credibility and performance, and output quality is quite variable, and several unacceptable uses of processed waste have taken place in the past. These are all major influences on risk perception and underline the need for independently evaluated demonstrations / evidence and an 'open doors policy' on the part of the industry and other stakeholders to establish a basis for consensus for evidence and decision making.

Formulating a response to the Agency's call for evidence should be centred on supporting a risk based approach to managing hazards from <u>all</u> biologically treated organic wastes, which also needs to be linked to policies for soil, water and waste. Useful steps relating to CLO in particular would be the collation of existing information about the nature of CLOs and the environmental risks they might pose (and how these might be mitigated). This collation should be undertaken quickly, given the pending review of exemptions and soil policy, and published in the Public Domain as a public document (near term). This should consider existing published information[8], but also grey domain information. A useful step would be the disclosure of existing privately held compositional data. This information should be supplemented by information available in other EU Member States with substantial MBT interests. It is important that own language information is reviewed in this process, as not all available information is published in English. Where this review identifies important knowledge gaps, public domain research should be undertaken to address them. The information needed has two perspectives:

CLO production and risk management. The Agency requires management at source rather than on land. : Source reduction risk management techniques might encompass feedstock management or process and refining. An example of feedstock management might be reviewing the impact of separate collection of household hazardous materials analogous to effluent control for sewage collection. Process and reefing techniques might include a range of possible mechanical (and biological) interventions. A parallel initiative needs to be the demonstration of 'quality' in contemporary CLO outputs, and also assessing how quality is affected by different operational configurations. Independent demonstration / evaluation of facilities would support this kind of

[7] Environment Agency (2008) Position statement, sustainable management of biowastes: Compost-Like Output from Mechanical Biological Treatment of mixed source municipal wastes. Published April 2008. http://www.environment-agency.gov.uk/commondata/acrobat/mbt_2010727.pdf

[8] For example as collated by r3 in www.compostinfo.info

initiative (as was carried out for materials recovery facilities by Warren Spring in the 1970s to 1990s). This will be a strategy that will likely identify 'winners' and 'losers' in terms of approach and may mean that companies have to re-evaluate their MBT agreements and approaches. It is therefore a controversial step from this perspective; however, it may be the most successful means of developing general confidence in MBT as a technology sector.

CLO application and risk assessment. Applications of CLOs to land require risk assessment. This requires an understanding of sources, pathways and receptors for items of possible concern in CLOs so that environmental quality objectives (EQOs) can be established. These EQOs can then serve as a benchmark for any code of practice developed for CLO use to land. Risk assessments will be affected by the land-use (for example use for food versus production of non-food crops), so a matrix of EQO's may be appropriate. While the driver for such EQOs might be CLO use in land, from a soil and water protection perspective, their derivation should be cross-cutting for materials applied to land in general. Precedents for risk based quality criteria are the Soil Guideline Values, however these should not be used as benchmarks in their own right because their derivation may not reflect possible pollutant linkages[9] that directly equate to organic matter use on land, and in any case their use is currently proving difficult to implement. It may be possible to begin this process on the basis of existing information, collated as above; however, there may well be a need for field trials. It may also be useful to investigate sites which have a history of CLO applications (such sites may not be present in the UK). It is also important to consider the effects of the organic matrix on environmental risks. An example of this is a finding from the SU:BRIM project which looked at the use of source segregated composts for contaminated site rehabilitation. This project found that for some contaminated sites, adding organic matter may lead to mobilisation of toxic metals as soluble complexes.

There is an important requirement for disclosure in the MBT sector if there is to be a general improvement in confidence for all stakeholders. This disclosure could take the form of a meta-study of the composition of CLOs currently being produced in the UK and independently produced case studies of their production. This approach has been used successfully by WRAP in promoting compost use. The flip side of this need for disclosure is that the existing evidence base that has led to the Agency to its Position Statement on CLO use should be published for independent scrutiny and peer review, with a clear statement of how far the position depends on actual and perceived risks.

The application of this evidence would be as an evidence-based code of practice for CLO use to land, taking into account policy on agriculture, waste, water and soil. The evidence base itself should be shared, for example using platforms such as www.compostinfo.info and Wastenet.

Decision making for organic matter re-use should be on the basis of sustainability appraisal for organic matter re-use compared with other options. This can be seen at several levels from an overarching (policy level) overview, to supporting local decision making – and sustainability appraisal is more than just a carbon balance assessment!

In moving forward, an important consideration is the value and capacity of the outlet for CLO use versus the cost of evidence collection. For example a question might be: is the PDL outlet on its own enough – particularly given its geographical distribution. New outlets and applications, for example for non-food crops such as biofuels, biomass, fibre, and biofeedstock on dedicated land may increase capacity, as might other types of applications such as for engineering purposes.

It would also be useful to produce simplified 'route-map' decision making guidance about CLO use at an MBT planning stage to support stakeholders through the process of option appraisal and implementation.

Overarching Actions

The specific suggestions for MBT as a pre-treatment for landfill, for SRF and for CLO use need to be supported by some overarching actions. The MBT service providers have not worked as a broad coalition to find solutions to the challenges they face for these three applications. They tend to be fragmented in their attitudes and working, and often highly competitive in terms of their assessments

[9] combinations of source, pathway and receptor

of competing approaches. They would be far more influential on other stakeholders, including potential users, waste authorities and regulators and planners if they were able to communicate, at least for certain common concerns, with a single cohesive voice. A common approach to working would also allow them to support and participate in joint working to address the evidence needs discussed above and the development of a code of practice and other guidance. However, it is unlikely that the MBT operators and service providers alone would be able to fund or manage a credible evidence base and code of practice development on their own. For this purpose a wider 'task force' is needed that incorporates the views of a broader coalition of interested parties to find a consensus based way forward and a common basis of technical evidence, and also provides a public-private partnership (PPP) towards funding[10]. Hence two important overarching actions are for the MBT industry to find a common platform and advance, as far as possible, a common position and approach to evidence collection and the development of guidance, but also for a wider coalition to develop a cross-sectoral approach to supporting and steering evidence collection and research and the development of guidance. This would need to find a home (i.e. a secretariat or organising principle) with an organisation that all parties trust, for example the CIWM.

Table 1 sets out a summary of the suggestions made for developing an agenda for action for developing greater certainty in MBT. These are ideas to stimulate discussion in the workshop. Their aim is to provide a starting point for a discussion that will filter these suggestions to identify the most significant and raise additional suggestions from the experience of the delegates, over the afternoon session.

Table 1: Summary of suggestions for a development Agenda for MBT

<table>
<tr>
<td rowspan="3">CLO to land
• Peer review of the evidence base for the Agency Position Statement
• A risk based approach to managing hazards from all biologically treated organic wastes, linked to EC framework policies for soil, water and waste
• Public domain survey of CLOs
• Investigation of linkage of input and process to output quality
• Evidence-based code of practice for CLO use to land, taking into account policy on agriculture, waste, water and soil
• Sustainability appraisal for organic matter re-use compared with other options
• Feasibility of new applications for CLO?
• A 'route-map' for decision making</td>
<td>SRF
• Better evidence to support access to markets
• Understanding of means of reducing maintenance load
• Better evidence on energy / carbon efficiency and sustainability</td>
</tr>
<tr>
<td>MBT-OM as pretreatment
• Working with existing definitions: processing for 'inert' waste
• Impact based biostabilisation thresholds and graded taxation
• Designing landfill for MBT-OM</td>
</tr>
<tr>
<td>Overarching
• Establishing a cross-sectoral task force
• Finding a PPP way forward for funding
• Finding a common voice for the industry / service providers
• Independently evaluated demonstrations / evidence</td>
</tr>
</table>

2.2 A Waste Disposal Authority's perspective on MBT and CLO: what do we need to know and by when?

Alex Creecy, Essex County Council

Many large infrastructure projects to deal with waste management over the next 20 to 25 years are coming to market now or in the near future. At present, there is uncertainty about the use of CLO which will result in many additional and arguably unnecessary costs for Waste Disposal Authorities (WDA) in the short and medium-term future. Consequently there are pressing issues that many WDA

[10] It may also be relevant to consider European partnerships for medium term or longer term research funding.

are particularly interested to have resolved. The presentation outlined the history of waste management in Essex and the current Waste Strategy in the context of the evolution of the PFI credit funding process, as well as an explanation as to why Essex CC have opted for MBT-SRF rather than a conventional EfW approach and an outline of what Local Authorities need to know and when in order to move on from the current position.

Essex CC has developed its current Waste Strategy over a period of approximately ten years through public and stakeholder consultation. Essex County Council's interest in MBT has its origins in waste management plans put out to consultation in the 1990s. Initially a local plan for site specific waste management in the 1990s was set up. Originally it was proposed to use mass burn incineration but this was opposed by the public; a review of alternative waste management strategies supported some form of MBT method and invited industry to propose technology to suit the requirements of the county by maximising value from the outputs, both in terms of producing value-added outputs and reducing input to landfill and therefore reducing the county landfill tax bill. Essex CC follows the Waste Hierarchy, with an emphasis on reduction and recycling at source: the aim is to achieve 40% recycling and composting of household waste by 2010, 45% by 2015 and 60% by 2020. MBT is seen as an option for residual waste management that is able both to extract the maximum value from the residual waste stream and minimise residual waste disposal to landfill.

The development of an MBT process that is appropriate to the county has also been influenced by changes in the PFI process. In 2005 Essex CC put forward an Outline Business Case (OBC) for waste treatment facilities, using Anaerobic Digestion (AD) of organic material to produce a high quality CLO with residual material being disposed to landfill, rather than a thermal approach. However there was (and is) uncertainty over the marketability of the CLO output, particularly over its application to land: over this period the consultation over Paragraphs 7A and 9A of the Waste Management Licensing Regulations took place and the Environmental Permitting Programme was launched. Defra required certainty in the market assessment of the facility, which was not possible for CLO to land given the consultations underway. Consequently the financial models used had to be based on the CLO produced being sent to landfill. This assumption, together with the anticipated increases in landfill tax resulted in a business model with costs three times higher than the existing budget for waste management in Essex. As a result this OBC was withdrawn.

Defra changed their PFI credit criteria in May 2006, with over-performance against LATS[11] becoming a priority. The original OBC of depositing CLO in landfill was not compatible with this criterion, whereas an alternative aerobic MBT process resulting in the production and use of SRF was both a lower cost option and compliant with the new criteria. However the Defra PFI criteria were altered once more in January 2007: on this occasion a minimum of 50% capital expenditure was now eligible, potentially resulting in an additional £145 million being available in the RSG[12]. The OBC was withdrawn and resubmitted, taking into account the new PFI criteria. The final proposal was submitted in April 2008. This is based on an aerobic MBT process producing SRF, which will be used in an EfW facility based within the county (see Figure 2). This has produced an affordable solution with a lower risk profile in comparison to other options; the approach has also been relatively popular with the public.

MBT configured to produce SRF was preferred to a conventional EfW approach because it was felt to be a more intelligent use of resources: for example, it does not burn glass or batteries. SRF is also a source of energy in an increasingly difficult fuel market and there is also the additional potential to extract more value through Combined Heat and Power (CHP), an approach that also reduces transmission losses to the national grid through proximity to the power source. The ultimate target is to achieve 50% displacement of fossil fuels using SRF.

[11] Landfill Allowance Trading Scheme

[12] Revenue Support Grant: a central government grant made to local authorities each year to make up the shortfall between a Council's Standard Spending Assessment (SSA) and the Council's share of Non-Domestic Business Rates plus the amount of Council Tax it would collect if it was set at a national standard rate. The Essex Partnership PFI bid is seeking £171m of credits (yet to be approved by central Government), the value of which is derived by multiplying the eligible capital cost of the project (MBT plants etc) by 0.5 i.e. 50%. Under PFI, the contractor borrows the capital cost of the scheme from the banks and the local authority repays the financing costs plus the operating costs over the project life in what is called the Unitary Charge. The PFI Project Support Guide published by CLG sets out a methodology for translating the credits into £319m of Revenue Support Grant (RSG) for the Essex Partnership. Assuming the bid is successful, the RSG is paid annually to the Waste Disposal Authority over the life of the project (28.5 years). The reason the RSG being higher than the credit value is to enable the local authority to be able to afford the Unitary Charge payments which are higher than the operating costs alone.

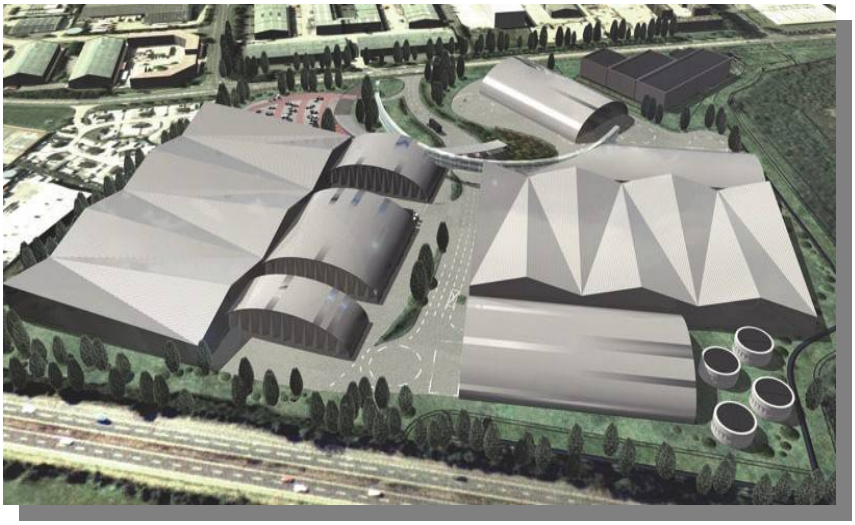

Figure 2: An artist's impression of the proposed new Essex CC waste management facility

Having established the waste management method and initiated development of the facilities required, Councils such as Essex still have issues that they need to have addressed. In particular there is the issue of the fine material produced in the MBT process, which is unsuitable for SRF production. As fines are unsuitable for SRF, potential management options other than landfill are required and research is necessary to develop clean-up technology to create a CLO that has a valid re-use. Essex CC would prefer to see a re-use rather than disposal of residual fines in landfill. There is also a need for research into the environment and health impacts of CLO to reduce negative perceptions of the material and improve regulator and public confidence in the outputs. These processes would be vital in assisting the development of a significant market for CLO. In the meantime there is a parallel need to reduce the cost of the disposal of such material to landfill, which is a considerable drain on the WDA both in terms of landfill tax and reduced landfill void space. For a WDA three requirements exist in this regard: the creation of a taxation system linked to the extent of biodegradation; simpler and cheaper test methods to measure biostability and the development of methods to achieve biostabilisation more quickly and cheaply.

From the perspective of Local Authorities all of these issues need to be resolved as soon as possible: the current PPP and PFI contracts are being awarded without a definitive solution to the issue of fines, which may result in higher costs over the life of the project.

2.3 The operator's perspective: Peter Mills, New Earth Solutions Ltd.

New Earth Solutions (NES) was borne out of a traditional landfill operations business and was established to deliver MBT and other biological treatment solutions, initially as a form of landfill pre-treatment in line with the Landfill Directive. NES have developed a bespoke MBT approach based on technical support from a number of service providers and consultants. A range of technologies were sampled and assessed against German landfilling criteria as well as additional assessments of the process and the outputs. The selected approach was a simple form of pre-treatment, including a mechanical phase of shredding, screening and metal recovery, followed by a biological phase with further subsequent refining processes. The overall MBT process was designed to be inherently flexible, so that the outputs could be adapted to purpose depending on the strength of available markets. The first facility has been established in Dorset.

Following the development of this facility a range of problems and opportunities have become apparent as the technology has become more common in the UK and legislation has developed over time. Environment Agency guidance on the measurement of MBT was published after the development of the facility. This was interpreted and implemented to provide a source of data to

assess the processes (Figure 3). Tests included BM100[13], DR4[14] and LOI[15]. Problems encountered during this process included engagement with the Environment Agency over the published guidance, the results of the tests (correlation of DR4 & BM100 results, lack of laboratories equipped to undertake the prescribed testing regime) and the testing and laboratory analysis itself (including the need for tests to be conducted overseas due to a lack of laboratory capacity in the UK). Other problems included establishing sampling protocols, correlating DR4 and BM100 data and a lack of information and understanding within the LA sector. One opportunity of these testing processes was the chance to establish benchmark performance data, i.e. detailed assessments of the rate of biodegradation of an MBT process based in Britain, using British feedstock. This work confirmed an operational protocol and resulted in the development of a LATS Monitoring Plan[16] that was recognised by the Environment Agency, although more face-to-face discussion and a site visit would have made this process easier.

Having established an MBT process and an appropriate sampling and monitoring procedure that meets with regulatory approval, further work is still necessary from the perspective of the plant operator. Proposed changes in the testing regime are leading to nervousness in the sector; certainty over what is required breeds confidence in the process for operators. The classification of the outputs and what can and cannot be done with them is an important issue that needs clarification, as is a resolution of the landfill tax classification of relevant outputs. Audit trails of materials and outputs also need to be established. A more committed dialogue with the regulator and consistent regulation countrywide would be beneficial to all sides.

There needs to be an appropriate regulatory mechanism to control the application of CLO to land; a specification would be a valuable development, as would clarification over the definition of agricultural land and industrial crops. Recyclates from the MBT process also need to be controlled, including the measurement of capture rates, the development of specifications for recycled material, quality control and market development.

Current issues for SRF include the identification of waste fractions suitable for thermal conversion; SRF specifications; technology assessment; the development of guidance and long-term contracts with energy users. These needs reflect the need to overcome certain attitudes and restrictions relating to MBT, which has so far received a mixed reception in the UK. This is reflected in the mixed economic success of various MBT outputs and the fear over the outputs, with the exception of fuel, which appears to be developing a successful market. A risk matrix approach may be a suitable way forward. Operators must take ownership of the risk associated with the outputs from their processes.

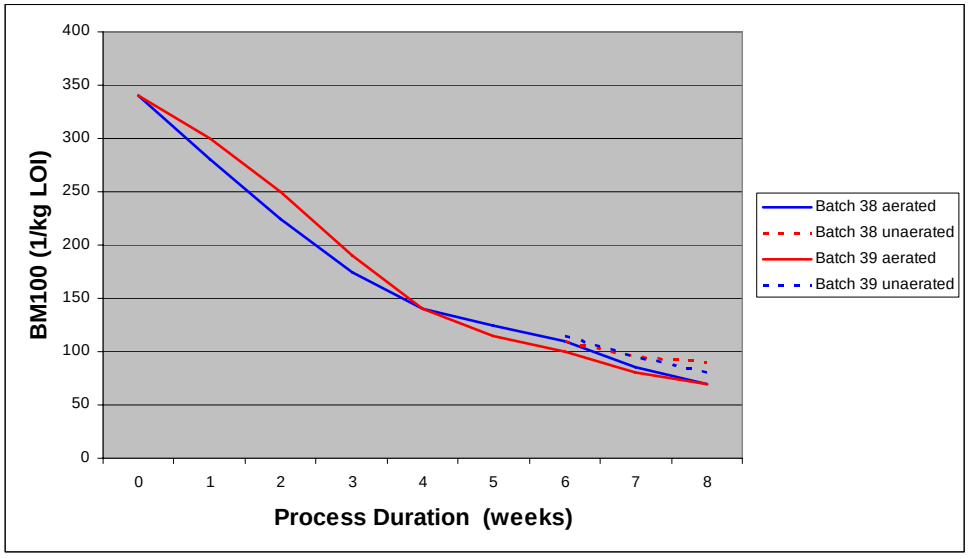

Figure 3 Comparison of stability data for residual municipal waste subjected to two different pre treatment regimes

[13] The Biochemical Methane Potential test (BM100) is a laboratory test that typically takes 100 days to run.
[14] The Dynamic Respiration test (DR4) is an aerobic test method that takes four days to run.
[15] Loss on Ignition (LOI) is a test used as an *indication* of the organic matter content of a sample.
[16] At a cost of £100,000 over and above the standard testing costs.

The development of MBT in the UK has been slow and difficult; a particular stumbling block in the process has been the desire of the regulator to have proven technology without having established facilities. However the technology is now gaining ground and becoming a significant means of waste treatment. As well as its operation in Poole, NES has now also developed an MBT facility at Blaize Farm in Kent, while other companies have developed further facilities around the country.

2.4 The Environment Agency position on MBT-CLO: Viv Dennis, Environment Agency

The regulation of CLO use to land cannot be divorced from the wider perspective of organic matter re-use on land, which includes BMSW[17], BC&I[18] waste, sewage sludge, manure and slurry. Total biowaste production in the UK is approximately 100m tonnes per year, which must be managed for maximum benefit and minimum environmental impact. The biowaste management industry is changing rapidly at present and the regulatory system needs to keep up. The 'Sustainable Management of Biowaste' (SMB) project was set up by the Environment Agency to gain an up to date understanding of the issues in the sector and to develop a range of relevant position statements. The project has interviewed key stakeholder groups, investigated Agency and other sources of waste data, identified the main issues at stake and developed four position statements related to a range of biowastes[19], including MBT-CLO, which were released in April 2008. Drivers for this approach included: the Landfill Directive and Tax; recycling and composting Best Value Performance Indicators (BVPI); the waste hierarchy; the balance between benefits of applying biowaste to land against the dangers of contamination; the need to reduce emissions of greenhouse gases and renewable energy; the Nitrates Directive and the waste Quality Protocols. The exemptions review will also have a big influence. All of these influence the biowaste sector (composting, MBT and AD), which is expanding significantly. The potential use of such material on land needs to be assessed carefully to balance the benefits and potential negative aspects of the use of the material.

The overarching position statement on biowaste (Figure 4) requires an integrated approach to waste management, a balance of controls and incentives, source segregation where possible and a precautionary approach where risks and benefits are uncertain. Ongoing research by waste producers is an important tool in the assessment of benefit and risk. Technology choice is an important factor as no one option is best suited for everything; knowing the market for outputs (both in terms of land and energy) is therefore a crucial factor.


position statement

Environment Agency

Sustainable management of biowastes

This position statement and those linked to it state our views on some of the most pressing issues concerning the developing topic of biowastes. The target audience is principally central, regional and local government, the waste management industry, water industry, farmers and agricultural advisers. It will also be of interest to members of the public.

Biowaste is often taken to mean the organic biodegradable fraction of the municipal waste stream, including garden waste, food waste and other biodegradable material such as paper. We have extended the definition to include similar biodegradable wastes from commercial[1] and industrial sources, together with sewage sludge and agricultural manures and slurries. It does not include clinical bio-hazardous wastes.

We believe that biowastes should be treated and recovered to maximise their benefit as a resource, whilst minimising their impact on the environment.

Figure 4: The Environment Agency overarching position statement on biowaste[19]

[17] Biodegradable Municipal Solid Waste
[18] Biodegradable Commercial and Industrial Waste
[19] Composting, sewage sludge and septic tank sludge, MBT CLO and an overarching position statement on biowaste: the position statements are available from http://www.environment-agency.gov.uk/aboutus/512398/289428/2010701/?lang=_e

The position statement for MBT-CLO contains the following key points: increasing production will put pressure on the use of CLO on land; CLO is a generic term covering many materials of varying quality, therefore site-specific assessment is required; some CLO is used on Previously Developed Land (PDL) under a Paragraph 9A exemption and in cover, but most is landfilled and the exemptions review may result in changes from October 2009. The final Agency position on MBT-CLO is that it should not be used for land used for food or fodder crops because of the potential for contamination by chemicals, glass and unknown contaminants, the potential for the accumulation of contaminants in the soil, the variable quality of the output material and the lack of knowledge about the material and its behaviour in the environment. The use of CLO on PDL may be acceptable, but it would depend on the specific CLO and the specific site. There is a need to know more about the risks associated with the use of CLO on land, therefore the ongoing monitoring and assessment of CLO by waste management companies will help to establish an evidence base that may support future changes in the Environment Agency position; confidentiality of data is not helpful in supporting this evidence base. Sampling by Agency officers will need to be established to help to improve confidence; at present some operators are reluctant to allow Agency sampling and this will need to change for the benefit of the industry as a whole.

Several current consultations and forthcoming legislation are also likely to have a bearing on CLO use to land. The Defra soil strategy is out to consultation at present; it includes measures to quantify risks from recycling OM to land and to establish waste to land quality standards. The ongoing Exemptions Review, which aims to provide a more risk-based and proportionate approach to the regulation of waste recovery and disposal operations, is also significant. The forthcoming revised Waste Framework Directive includes proposals that Member States should develop biowaste collection schemes within three years, including binding targets. These activities will ultimately influence the Environment Agency with regard to CLO as well as information supplied by industry.

2.5 The funder's viewpoint:
Andrew Hartley, Bank of Ireland

Several MBT projects have been funded to date under different circumstances: for example Shanks have guaranteed their own market for their outputs and supply the cement industry; the same may also be true of Veolia plant at Southwark. Most MBT projects, however, base their financial arrangements on the assumption that the material is to be pre-treated for landfill, with the LA and the operator sharing the financial benefit of any alternative use developed.

Funders want as much certainty as possible over a project in order to safeguard their investment. In the case of MBT facilities, such certainty includes the final volumes of material produced and the overall cost of treatment, onward use or disposal in order to reduce their risk; however funders will generally take some limited risk on the production process and the output material, i.e. that the plant will produce material of a suitable standard for its specified market. Examples of a specified market include EfW facilities (provided that they are operational or have had planning approved), disposal to a third party (such as the LA, who must then take responsibility for disposal) or disposal to landfill. There is some flexibility for 'change-of-law' rebalancing. The use of CLO on land is at present not seen as a bankable risk due to lack of clarity on the legal/environmental situation.

MBT is bankable provided there is evidence available to demonstrate that the technology and the approach contain minimal risks for the financier. Investors are looking for certainty in outlets, typically for a period of 20 years; there is a very limited amount of risk they are prepared to accept, mostly in relation to technology rather than the security (or otherwise) of the potential market. Consequently if an MBT facility is to be supported it must demonstrate that the outlets do not have unknown risks. Pre-treatment for landfill is seen as an outlet with an acceptable level of risk, and the Bank of Ireland support for Global Renewables in Lancashire is built on a pre-treatment business case. Markets for SRF are seen as intermediate risk, since outlet availability, at least where materials are transported to cement kilns or power generators, are not seen as having sufficient longevity. In this case projects may need a third party prepared to accept these market risks with sufficient resources for the bank to trust. The landfill tax escalator makes the exploration of alternatives to landfill desirable, but the lack of clarity over the position over CLO applications to land means The Bank of Ireland will not accept a

business case based on the application of CLO to land. However, if the business case for pre-treatment is sound, then the application of CLO to land can be seen as a source of additional profit margins.

Financiers would like to see more evidence to support MBT technologies, particularly those that propose to produce a CLO. A UK track record is not essential; information from plants in the EU, USA, Australia and Canada could all be used to supply evidence to support a case. As a result of the uncertainty over the use of CLO on land in the UK and the increasing cost of landfill tax the production of some form of fuel is at present the most secure way forward from the perspective of funding organisations. However, the cement kiln market, which is the most significant outlet for fuel at present, is reaching saturation point so other options, such as energy from waste must be developed to maintain the viability of this market.

3 Discussion

MBT in its various forms is becoming an established municipal waste treatment approach in the UK. Over the next few years the volume of outputs from such facilities will increase, very probably significantly. As MBT becomes more prominent, so the need to clarify what is and is not biostabilised, and what will or will not be possible in terms of the re-use of materials has become critical. This situation has effectively been confirmed by the recent release of the Environment Agency position statements on MBT-CLO organic outputs, which place the onus on the industry to provide evidence to the Environment Agency to support the use of CLO on land.

The workshop identified a number of actions required to support an effective MBT sector. These are listed below, in order of importance as decided by the workshop delegates.

1. The creation or adoption of an organisation to act as a single representative voice for the industry in promoting the acceptance by the regulator of CLO as a soil amendment.
2. The development of an output-based standard for CLO to allow industry to develop materials of consistent quality. Separate standards would be required for each of the three principal end uses, but was highlighted specifically for CLO to land.
3. The development of case studies, field trials and the production of quality data for an evidence base from which to form a risk-based approach. The compilation of evidence of CLO quality and its successful application to land in appropriate circumstances (e.g. already developed land), both in the UK and in comparable locations elsewhere, is important if a case is to be made for wider use of CLO to land, and would address the challenge issued to the industry by the Environment Agency.
4. A revised landfill tax system that reflects the extent of CLO biostabilisation or accounts for its use in cover. *This implies the need for evidence on the measurement of biostabilisation (see also point 7 below).*
5. Engagement of all stakeholders with an interest in CLO, e.g. through a cross-sectoral task force encompassing among others CLO producers, local authorities, regulators, policy, environmental technology, landowners and farmers' representatives.
6. The creation of a precise, modern, official definition of agriculture to update that of the Agriculture Act, 1947.
7. Research to give improved understanding of the behaviour of stabilised MBT-CLO in landfill, in terms of emissions to air and the carbon agenda. Additional issues may include load-bearing capacity and the long-term implications for site closure (e.g. residual methane emissions and discharge of metals and other pollutants in leachate).
8. Improved resources to support a co-ordinated approach to research and evidence needs.
9. Independent scrutiny and/or peer review of the evidence used as the basis for the recent Environment Agency position statement on MBT-CLO.
10. Equal treatment for all biosolids in terms of taxation: at present some materials and/or processes are effectively favoured through economic instruments rather than environmental regulations.

The need for a single representative voice for the industry was by far the most popular theme raised in the workshop. A co-ordinated response to the current regulatory position by the industry as a whole will be more likely to produce more effective results than piecemeal evidence presented by different CLO producers, which may produce an unclear and at worst contradictory message. A range of themes that

might be linked to this representative voice were also highlighted in the interactive sessions of the workshop. These included a discussion on data availability. An important step forward is disclosure; the industry needs to be more open about sharing data As far as is possible, open sharing of data within the industry will help to establish an overall picture of CLO quality and pinpoint areas in which the most effective action might be taken to improve the standard of the material as a whole. This process may also help to improve the perception of CLO.

A second issue related to data is the evidence base used by the regulator for its Position Statement. If this were made available for independent scrutiny it would help identify where the regulator has concerns over CLO quality or where insufficient data are available to make an informed decision. This would help industry sources to target their ongoing research to the requirements of the regulator and potentially improve the chances of acceptance by the regulator.

It was also felt that while industry should find a common platform, there should also be a cross-sectoral body involving all interested stakeholders, such as regulators, waste authorities, the waste management industry, users (owners of PDL, farmers and growers) relevant NGOs and so on. Such a 'task force' would create a platform for an open discussion of the possibilities for CLO and it could focus on several issues:

1. The compilation of evidence to support the risk-based assessment of the application of CLO to land.
2. Demonstrations and small-scale case studies of the use of the material on land in appropriate circumstances (particularly on Previously Developed Land).
3. Compilation of evidence of CLO use from other EU Member States and elsewhere, if relevant to the UK.
4. Further research to add to the weight of evidence in the case for CLO use, or at least clarify how and where it could be used.

A cross-sectoral body would be well placed to advocate further research, funding and to specify the kind of research work that would best serve the needs of the industry as a whole. It may be possible to support research through a Public Private Partnership, although an exact mechanism for how this would be achieved has yet to be elaborated.

The need for an output standard for CLO to improve consistency of material, evidence for a risk-based approach to CLO application to land and the need for a modern definition of agriculture, covering agricultural activities that are not included in the 1947 Agricultural Act definition currently used, were all themes raised that added to the uncertainty in the industry surrounding the end use of CLO on land.

Workshop delegates were concerned about the impact of landfill tax on the economics of MBT-based waste management strategies. Biostabilised CLO sent to landfill is classified as an active material and therefore subject to the higher rate of landfill tax, even if it is used as cover. Incinerator bottom ash (IBA), a by product of mass burn Energy from Waste (EfW) processes must also be landfilled but is classed as an inert waste and is thus landfilled at the flat rate of £2.50 per tonne. As the landfill tax rate for biostabilised waste continues to increase annually, the economics of incineration processes are favoured over MBT processes pre-treating waste for landfill or producing a CLO with limited market opportunities. There is a case for variable taxation of biostabilised material depending on the extent of its biostabilisation, which would help to maintain the economic viability of MBT as a pre-treatment process. The need for cheaper and possibly quicker means of testing biostability, better understanding of the behaviour of biostabilised material in landfill and the need for a level playing field among biowaste materials were all issues raised in the workshop.

Economic issues were also of concern to producers of SRF, in particular the need for certainty over supply and price, as well as better forecasting of gate fees to encourage users into the SRF market and financial incentives in favour of SRF. Improved specifications for SRF, the position of SRF as a lower carbon-intensive fuel, the economy of scale of SRF and the potential impact on the SRF market of the Large Combustion Plant Directive were additional concerns. Although there was notable interest in all of these issues in the voting sessions, none of them were among the most popular (see Annexe B). The issues as defined were quite similar, so it could be argued that the vote was spread and that if

some issues had been combined into one they would have been of similar significance to those of the other the other syndicate sessions.

Significant concerns related to the use of MBT for biostabilisation prior to landfill included the optimisation of landfill design for biostabilised waste (Should such material be mixed with other waste, mono-celled within a landfill or landfilled separately?), the behaviour of biostabilised material once landfilled and the issues over taxation and biostability previously discussed in the wider context. One issue of particular interest to the delegates of the syndicate session was the exact effect of highly biostabilised material (CLO) on the behaviour of a non-hazardous landfill once it is deposited. A distinction should also be made between biostabilised waste and untreated waste, as at present they are treated the same within the landfill regulatory framework. Clearly there are many areas in this aspect of MBT that need to be clarified or resolved. However in the wider context of the workshop the discussion over issues relating to CLO application to land took precedence and produced a greater number of points of discussion.

4 Conclusions

The overall message from the workshop was that all sectors of the industry wished for further clarity over what can and cannot be done with MBT outputs. The recent Environment Agency position statement had set a particular challenge for the re-use of CLOs to land. There was a desire to see both an industry body to promote the appropriate use of MBT outputs, to co-ordinate industry responses to and develop a dialogue with the regulator and a cross-sectoral initiative or task force to include a wider range of stakeholders with an interest in MBT outputs. These bodies would be expected to lead the way with regard to the many issues raised in the workshop regarding CLO applications to land, pre-treatment for landfill and the production of Solid Recovered Fuel.

The need for a graded system of landfill taxation for treated wastes was seen as particularly urgent as the higher rate of landfill tax has begun to increase rapidly in comparison with the rate for inert waste.

More research was required in many areas, including the behaviour of biostabilised waste in landfill, the measurement of biostabilisation and the production of standards for both CLO (to be applied to land) and for SRF. The compilation of evidence of CLO quality and its successful application to land both in the UK and comparable locations elsewhere is an important process to support the case for wider use of CLO to land. As requested by the Environment Agency in its position statement, it is up to industry to convince the regulator of the quality of the material and its suitability for purpose. Open sharing of data among the industry is an important stage in the process of gaining acceptance of CLO as a soil amendment.

One issue raised during the workshop was that while MBT is a common sense waste management approach, putting it through the procurement and financing process is very time-consuming. The issue now may be less a case of whether MBT can be made to work, but whether the technology can be accepted, procured, produced and be fully operational in time for key landfill diversion deadlines. Firm and rapid action is needed to maintain a confident and forward looking MBT sector.

Annexe A: Question and Answer sessions

A question and answer session was held after the first two presentations and also after the final three presentations to allow delegates the opportunity to make an initial contribution to the debate. A summary of these sessions is provided below, classified according to the relevance of the question (Overarching issues, CLO to land, pre-treatment for landfill, MBT for SRF). Not all the questions and comments listed were answered directly but they have also been included. NB Q: question raised; C: comment put forward; A: answer.

Overarching issues

Q: Is the Environment Agency position statement a means of maintaining the status quo or will it will slow down the production of CLO?
A: The lack of a mention of biomass in the position statement gives the impression of maintaining the status quo.

Q: How practical is it for a financier to gain a 25 year guarantee?

Q: Would the banking markets be prepared to accept a two-stage package, i.e. ten years under one method and a second period of a second market plan?
A: PFI projects can be done without a contract in place to take away the material. The likelihood of being able to finance such an arrangement would depend on the strength or certainty of the proposed market actually developing over the time span proposed in the financial package. Shorter term arrangements could be underwritten by the authority, i.e. 10 years of guaranteed disposal followed by LA underwriting subsequent cost of disposal to make up to 20-25 years.

C: A large MBT plant has been established in Istanbul; could this be a source of data to help the Agency cause?
A: The value of the data from abroad would depend on the processes and inputs. It could potentially be very useful.

CLO to land

Q: As well as changing landfill practice: do farming, soil and agricultural practices also need to change?
A: An Ecological Risk Assessment (ERA) has to be part of the application of CLO to land, but agriculture is not really in control of food production as this is affected very strongly by the supermarkets.

Q: Can we have complete clarification of the definition of agriculture? PAS110 has updated the 1947 agricultural act. CLO is struggling in this context. Is there an issue with the transfer of land use back to agriculture and how is the use of CLO affected by this?
A: It was agreed about the comment on the agricultural act and suggested the idea of land returning to agriculture following CLO application should be taken up in the syndicate session.

Q: Why is sewage sludge (a mixed source input) treated differently to CLO and why is source segregated material preferred on the basis of unknown contamination when it is also possible for it to be contaminated in a variety of ways?
A: The Sewage sludge/CLO issue is probably as much down to the history of regulating the material over several years. If they had been established at the same time perhaps it would be different. Source segregation is preferred due to lack of cross-contamination; the notion of risk is the key issue separating source segregation and CLO; it is less likely that contamination will occur, not that it is unlikely.

Q: Risk appraisal processes in the Agency have established that sewage sludge can be applied to land; what is the possibility of a transparent assessment process for the application of CLO to land?
A: It would be very good to have such an assessment, but it is probably a long way off. A lack of knowledge and standards is holding the process back, but there is an effort moving in that direction.

Q: Has the Environment Agency been able to take samples from sites now and how do they compare with, for example, PAS 100?
A: Yes the Agency has been able to sample at 3-4 plants at present but the report is at the draft stage; initial comments are that the data are very variable.

C: The Agency published work last year on the outputs from several MBT plants.

Q: Is there any reason why the agency cannot produce an output based specification?
A: There isn't an output standard 'around the corner' so in the meantime a risk assessment approach is necessary. This may change in time.

C: The evolution of feedstocks (greater recycling, changing domestic tastes) is affecting the quality of CLO; improvements in industrial processes are also leading to improvements in CLO through greater refinement and less contamination. If this trend continues it is likely that CLO quality will improve.

C: The composition of waste is variable and some of it is better suited to different types of management.

Q: In relation to the Exemptions Review and Defra work on outputs to land, if evidence is being collected for this information, how long do people have to provide data to the Agency/Defra?

A: Very little time will be available to influence the debate before the next consultation in July. One alternative would be to respond to the subsequent consultation. The consultation on the Exemptions Review may last for 12 months, which would allow interested parties ample time to provide any evidence should they wish to do so.

Pre-treatment for landfill

Q: Was the £100,000 cost for testing for New Earth Solutions on top of the routine testing discussed in the presentation?
A: Yes.

Q: Very often the regulator is not interested in talking to producers; what can be done?

Q: Can the WRATE tool be modified to include an option for CLO other than it going to landfill?

MBT for SRF

Q: What are the risks of SRF production rather than EfW and what are the gains in recycling in comparison to mass burn?
A1: Traditional recycling is comparable between MBT and SRF production. The advantage of SRF production is removing problematic materials from the fuel stream. The Batteries Directive will slow down the number of batteries going into residual waste but this will take time. Another issue is encouraging energy producers to switch to SRF use.

A2: Some of the major sources of metal contamination are fines. EfW with front end separation is not dissimilar to MBT.

Q: Is the cement kiln market really being exhausted?
A: The cement market does appear to be reaching its limit.

C: The cement industry's perception of the MBT sector that the MBT market is desperate to get rid of SRF and thus the industry is charging high gate fees, a situation that is unsustainable.

C: The cement industry is interested in SRF and is competing for it against other customers, such as power stations. A key concern is consistency of SRF quality; in some cases this is being achieved, but it is not the case across the industry.

C: Defra had a consultation on the composition of SRF in January; through this consultation Defra hoped to establish minimum requirements for SRF. Users and producers need to decide what is suitable for each other.

Annexe B: Identification of MBT development needs

Following the presentations and discussions outlined previously, a range of syndicate group sessions identified the issues in each application considered to be of most importance by the delegates; there were four subjects to discuss: MBT-OM application to land (two groups); the use of MBT-OM as SRF and MBT as pre-treatment for landfill (discussed in the same group) and overarching issues. the results from each session are listed below. In total 27 issues were identified by the three syndicate sessions, once duplication was taken into account (see Table B1). The group was then invited to vote on these issues to refine the results and identify the most important issues from those listed, giving a consensus from the entire group. Each delegate was given a total of ten votes, which they were free to distribute among the issues as they saw fit (i.e. they could give ten votes to one issue, one vote to ten issues or something in between). The distribution of votes is shown in Table B1

Issues raised in each of the syndicate sessions

CLO to land 1 (Chair: Paul Bardos Rapporteur: Bob Barnes):

- Need for guidelines on the use of bioproducts in different environments
- Need for readily available data to support options appraisal
- Sharing of data
- A need for joined up thinking and funding to support it
- Linking input quality to output quality (limited support within the group)
- An action plan
- A common voice for industry
- Peer reviewed case studies of the use of CLO to land

CLO to land 2 (Chair: Peter Mills Rapporteur: Tina Benfield):

Eighteen points were proposed in total, which were classified and reduced to five overarching issues:

- A representative voice
- Stakeholder liaison (with farmers, LA, CLO producers and so on)
- A co-ordinated funding programme aimed at producing valuable overall results
- Benchmarking, shared data and permits
- Short, medium and long-term data requirements, including peer review
- Surety for the use of CLO to land, including the following issues:
    - Standards
    - Fitness for purpose
    - Making use of WRATE
    - Analysis for soil as well as the input to soil
    - Bankability of the approach

MBT for fuel (Chair: Stuart Reynolds Rapporteur: Alex Creecy):

- Potential users need more certainty over quality and supply of fuel
- Economic issues:
- Making sure the price is right
- What is the viable economy of scale? What is the minimum plant size?
- Need to emphasise the value of SRF as a low carbon fuel. Is it possible to generate support for a fiscal instrument to support SRF?
- LCPD will encourage SRF use in 2015 but in the meantime there is a gap
- Operational problems for SRF use in large coal–fired power stations (corrosion, economiser temperature)
- Lack of existing SRF-use capacity

MBT for pre-treatment (Chair: Stuart Reynolds Rapporteur: Alex Creecy):

- Impact on landfill is not properly understood

- Emissions to air
- Carbon impacts
- Need to know about landfill design in order to make the best of biostabilisation. More R&D is needed
- A *de minimus* threshold for biostabilisation or taxation rate changes in order to increase the incentive for biostabilisation
- How does biostabilisation affect landfill gas generation and other economics within the landfill site itself?

Overarching issues (derived from the discussion in all three syndicate sessions):

- Guidelines and specification for bioproducts to different land uses
- Readily available data to support options appraisal
- Funding resources
- Peer review of evidence base for Agency position statement
- Single voice for industry and data sharing within agreed limits
- Joined up thinking and a consistent message from regulators/Defra (and resource?)
- Evidence base for a risk-based approach
- Joined up thinking between regulators
- A single voice for industry
- Guidelines for bioproducts to land

Table B1: the distribution of votes among the issues identified in the syndicate groups

Theme/Issue	Votes	Mean	Median
Overarching issues			
Single representative voice for industry	37		
Engagement of all stakeholders	22		
Resources/funding and a co-ordinated approach	18		
Independent scrutiny/peer review of data used for EA position statement	18		
	95	**23.75**	**19**
CLO to Land			
Output standard for CLO	29		
Evidence base for risk-based approach	28		
Definition of agriculture	20		
A level playing field for all biosolids	14		
A baseline soil standard	12		
Benchmarking available data (open sharing)	12		
Wrap's business plan to include non-source segregated material	7		
Evidence base for the Environment Agency MBT position statement	5		
Short, medium and long-term R&D	5		
Testing regime	2		
Land bank	2		
WRATE applications to account for alternatives to landfill	2		
Permits	1		
	139	**10.69**	**7**
SRF			
Markets: SRF users need more certainty over supply and price	9		
Economic issues: helping SRF users have the confidence to switch by forecasting gate fees and other information	9		
SRF needs to be understood as a lower carbon-intensive fuel: consider fiscal instruments to make it more economically viable	8		
SRF may present operational difficulties for large combustion plants	8		
SRF fuel standard: producers and users need more clarity over specifications	7		
Lack of initial MBT/SRF capacity: Large Combustion Plant Directive Effects in 2015	7		
What is the viable economy of scale (minimum plant size) for MBT/SRF?	4		
	52	**7.43**	**8**
MBT pre-treatment for landfill			
Landfill tax system: consider setting *de minimus* threshold or taxation according to how the CLO is used or how stable it is	24		
Need to gain a better understanding of the behaviour of stabilised MBT-CLO in landfill in terms of emissions to air and carbon agenda	20		
Design of landfill for CLO: more investigation into the best designs and economics and processes going on within the site (e.g. viability of gas generation)	4		
	48	**16**	**20**
Overall	**334**	**12.37**	**9**

In total 334 votes were cast, the mean number of votes being 12.37 and the median value nine (Table B1). The greatest number of votes was cast in the CLO to land category (139) but this was also the category with the greatest number of issues (13). The highest mean number of votes in the four categories was that for the overarching issues (23.73). This was also the category containing the issue

for which the most votes were cast, namely a single representative voice for industry. The three other overarching issues were all widely supported, each of them coming out at between 18 and 22 votes. Within the CLO to land category three issues came out highest with 29, 28 and 20 votes respectively: an output standard for CLO; evidence for a risk-based approach and the definition of agriculture. Other significant votes were made for having a level playing field between all biological outputs from CLO and for sharing of information across the industry.

In the MBT for landfill category two of the three issues were widely supported: 24 votes were cast in support of considering an intermediate level of landfill tax for CLO and 20 votes were cast for a better understanding of CLO behaviour in landfill. The design of landfill sites to suit CLO was not seen as a significant issue across the group.

The issues in the SRF category were the least well supported overall, gaining on average 7.43 votes each. Almost all of the issues gained between seven and nine votes, the exception being the issue of the viable economy of scale, which only polled four votes. The issues defined in the syndicate sessions are quite similar, so it could be argued that the vote was spread and that if some issues had been combined into one they would have been of similar significance to most of the other issues. For example the issues of markets and economics combined would produce 18 votes as opposed to nine votes each.

Table B2 shows the issues in order of the number of votes they polled. Those shown in yellow have more than the average number of votes (12.37) while those in blue exceed the median number of votes (9): these encompass ten and twelve issues respectively. It could be argued that these are the most significant issues involving MBT-CLO at the present time, although none of the SRF issues are included. This could be interpreted as the spreading of the vote across similar issues as previously discussed or it could suggest that the market and regulatory regime for SRF are relatively stable and functioning effectively at present and the majority of concern relates to wider issues and the application of CLO to land. This outcome reflects at least some of the discussion in the question and answer sessions of the morning.

Table B2: the issues identified sorted by number of votes

Theme/Issue	Votes	Category
Single representative voice for industry	37	Overarching
Output standard for CLO	29	CLO to land
Evidence base for risk-based approach	28	CLO to land
Landfill tax system: consider setting *de minimus* threshold or taxation according to how the CLO is used or how stable it is	24	Pre-treatment
Engagement of all stakeholders	22	Overarching
Definition of agriculture	20	CLO to land
Need to gain a better understanding of the behaviour of stabilised MBT CLO in landfill in terms of emissions to air and carbon agenda	20	Pre-treatment
Resources/funding and a co-ordinated approach	18	Overarching
Independent scrutiny/peer review of data used for the Environment Agency position statement	18	Overarching
A level playing field for all biosolids	14	CLO to land
A baseline soil standard	12	CLO to land
Benchmarking available data (open sharing)	12	CLO to land
Markets: SRF users need more certainty over supply and price	9	SRF
Economic issues: helping SRF users have the confidence to switch by forecasting gate fees and other information	9	SRF
SRF needs to be understood as a lower carbon-intensive fuel: consider fiscal instruments to make it more economically viable	8	SRF
SRF may present operational difficulties for large combustion plants	8	SRF
Wrap's business plan to include non-source segregated material	7	CLO to land
SRF fuel standard: producers and users need more clarity over specifications	7	SRF
Lack of initial MBT/SRF capacity: Large Combustion Plant Directive Effects in 2015	7	SRF
Evidence base for EA MBT position statement	5	CLO to land
Short, medium and long-term R&D	5	CLO to land
What is the viable economy of scale (minimum plant size) for MBT/SRF?	4	SRF
Design of landfill for CLO: more investigation into the best designs and economics and processes going on within the site (e.g. viability of gas generation)	4	Pre-treatment
Testing regime	2	CLO to land
Land bank	2	CLO to land
WRATE applications to account for alternatives to landfill	2	CLO to land
Permits	1	CLO to land

A key question would be whether the result of this poll matches the expectation of the delegates prior to today. Most of the issues identified were fairly broad in scope rather than being very specific to a particular industry or issue; most of the interest prior to the event was also broad, so the vote appears to be a reflection of the general mood.

One surprise in the identification and selection of issues was that there was little interest in the idea of developing and expanding alternative markets for outputs from MBT. Most of the interest focused on the expansion and development of existing markets, or those markets that are most likely to be open to MBT outputs. It is possible that there is a desire among the industry to make certain of at least some market options before investigating others, which may be less certain, rather than relying on landfill as the main disposal route.

The view was that there needs to be more time made for discussion over the future, a reflection of the priority given to the need for a single industry voice in the voting. This discussion might lead to more specific issues and answers might emerge. This could be a next step. Specific issues can be acted upon more readily than the broad brush issues identified at this stage. A key issue now is who should be responsible for the creation of a common platform for the industry, from which other issues might be moved forward? The Biocompost to land club (BCLC) is a group organised by ADAS and some of the waste management companies to share data and move the CLO argument forward. It has been a slower process than might have been hoped, but it is moving. The BCLC, the CIWM SIG,

SORP and ESA are four groups are working in this field; can they meet in the near future to work on the development of a common voice? The combination of such groups would bring industry, regulators and the Local Authorities, as well as other stakeholders into one group. SORP is mostly focussed on the dissemination of information, while CIWM is a professional institution, with its own peer-reviewed publication, which gives it a good platform. Any group should avoid being too specific: it isn't just about CLO: more credibility will be gained from covering the whole MBT spectrum.

Annexe C: DELEGATE LIST

Towards Certainty in the Use of Organic MBT Outputs

CIWM workshop in conjunction with r³ Environmental Technology Ltd
Monday 19th May 2008 DBERR Conference Centre, 1 Victoria Street, London

COMPANY NAME	NAME	JOB TITLE
ADAS UK	Dr Paul Gibbs	Technical Manager
Bank of Ireland	Andrew Hartley	Head of Infrastructure
Bedminster International	Ian Hargraves	Chief Scientific Officer
BERR	Jonathan Thomas	Assistant Director
CIWM	Tina Benfield	Senior Technical Officer
Cory Environmental Ltd	Peter Clarricoats	Group Technical Manager
Defra	Melville Haggard	Markets Development Adviser
Defra	Sal Burgess	
Defra	Nick Blakey	
Donarbon Ltd	Mark Shelton	Waste Promotions Manager
East London Waste Authority	Dave Hawes	Contract Manager
Envar Ltd	Steve Dudman	Composting Sales Manager
Envirolink North West	Helen Rawlinson	Market Development Manager
Environment Agency	Terry Coleman	Science Manager
Environment Agency	Bob Barnes	Senior Scientist
Environment Agency	Viv Dennis	Waste Policy Advisor (Biowaste)
Environmental Services Association	Barry Dennis	Deputy Chief Executive
Essex County Council	Alex Creecy	Technical Manager
Global Renewables UK Ltd	Jonathan Singleton	Process Engineer
Global Renewables UK Ltd	Ben Goad	Organic Products Manager
Hills Waste Solutions Ltd	Julian Cope	Commercial Manager
Imperial College London	Professor David Wilson MBE	Centre for Environmental Control and Waste Management
Imperial College London	Sally Donovan	Student
Jacobs Engineering UK Ltd	John Downer	Senior Waste Management Professional
Jacobs Engineering UK Ltd	David Notton	Waste Management Professional
Juniper Consultancy Services	Nadia Boyarkina	Senior Analyst
Kelag Umwelttechnik GmbH & Co KG	Helmut Schneider	Sales Manager
MACE Ltd	Mark Tipton	Senior Project Manager
New Earth Solutions Ltd	Peter Mills	Commercial Director

Norfolk Environmental Waste Services Ltd	Stuart Reynolds	Planning and Permitting Manager
Organic Resource Agency Ltd	Jon Pickering	Senior Consultant
Paton & Associates Ltd	Ian Paton	Consultant
Peter Brett Associates LLP	Gerard Edwards	Associate
Premier Waste Management Ltd	Tony Hitchens	Head of Marketing
Premier Waste Management Ltd	Ashley Cooper	Director Disposal Division
r³ Environmental Technology Ltd	Tony Chapman	Senior Researcher
r³ Environmental Technology Ltd	Professor Paul Bardos	Director
Resource Market Management Ltd	Tim Haines	Director
Sellafield	David Loudon	Waste Strategy Manager
Shanks	Stephen Wise	Head of Organics Waste Development
Shanks	Keith Sinfield	Area Development Manager
Sterecycle Ltd	George Fowkes	Markets Director
Veolia Environmental Services (UK)	Raquel Carrasco	Programme Manager
Veolia Environmental Services (UK)	Richard Kirkman	Head of Technology
Viridor Waste Management	Anthony Nicholson	Director of Environmental Compliance
Viridor Waste Management	Bill Griffiths	National Recycling Manager
Waste Recycling Group	Sabrina Rubio	Project Engineer
Wrap	Dr Nina Sweet	Anaerobic Technical Specialist