CIWEM Chartered Institution of Water and Environmental Management

Policy Position Statement

Mechanical biological treatment of waste

Purpose

A Mechanical Biological Treatment (MBT) system is a type of waste processing facility that combines a number of different technologies from the sorting of dry recyclables such as plastics and metals with a form of biological treatment such as composting or anaerobic digestion. MBT plants are designed to process mixed household waste as well as commercial and industrial wastes.

This Policy Position Statement discusses the concept of MBT of waste, reviews its contribution and role in helping to deliver sustainable waste management, and considers the operational, policy and environmental issues relating to this established technology. Competing technologies such as Mechanical Heat Treatment (MHT) are not considered within this statement although MHT plants and their outputs should be regulated in the same way as MBT plant.

CIWEM's position:

1. CIWEM encourages the implementation of waste options that promote the top end of the waste hierarchy, creating greater resource efficiency and optimise recycling. MBT should be seen as a means to improving waste hierarchy performance.
2. CIWEM considers that there are several potential benefits for waste management which may be offered by MBT. These include:
3. Assisting in meeting targets for the reduction of biodegradable municipal waste sent to landfill.
4. Providing a 'second chance' to recycle mixed waste streams even where kerbside recycling is already employed, contributing to recycling targets by collecting a further fraction of residual recyclable material.
5. Producing a more consistent fuel for use in low carbon and renewable energy technologies that can deliver improved environmental outcomes when compared to incineration of untreated waste.
6. CIWEM welcomes the ongoing development and improvement of MBT systems and considers that they will continue to have a role to play in increasing the recovery of recyclable materials, diverting waste from landfill and lowering the carbon intensity of our waste management solutions.
7. There remain a number of uncertainties which are currently restricting the use of MBT. Its viability as an alternative to technologies, such as direct incineration of residual waste, depend on how markets and policy develop for the pre-treatment of wastes prior to

thermal treatment and the strength of markets for MBT end-products such as refuse derived fuel and biologically stabilised products for application to land.

8. CIWEM considers that the Government must continue to address the issue of markets for refuse derived fuel and minimise the existence of obstacles to such markets in the UK if it wishes to avoid losing a source of renewable and low carbon energy production. At present significant quantities of refuse derived fuel are exported to Europe so their use in energy generation does not contribute to UK renewable energy targets.

9. CIWEM supports the development of quality standards for low-grade land applications for all compost-like outputs, including those from MBT of municipal solid waste.

10. CIWEM is aware of the actual and perceived nuisance issues concerning a number of MBT plants in the UK and supports the continued development of common design standards and Environmental Permitting conditions for these facilities.

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Glossary

BMW	Biodegradable Municipal Waste
CLO	Compost Like Output
MBT	Mechanical Biological Treatment
MHT	Mechanical Heat Treatment
MSW	Municipal Solid Waste
RDF	Refuse Derived Fuel
SRF	Solid Recovered Fuel

Context

MBT has risen to prominence in waste management thinking and practice over recent years as the demands of the EU Landfill Directive have become clear to those authorities tasked with collecting and disposing of waste (particularly municipal waste).

MBT was originally conceived as a way to further treat residual Municipal Solid Waste (MSW) and reduce its biodegradable content to allow EU Member States to meet Landfill Directive Targets and requirements. The process also has the benefit of capturing additional recyclable waste missed by existing or proposed kerbside separate collections and other materials suitable for recovery such as secondary aggregates that would otherwise be missed.

The term MBT is used to describe not one specific process, but rather a combination of different technologies brought together in an integrated process, thus it is important that technical specification and capacity of plant including quality and quantity of outputs is understood when discussing different MBT options. An MBT plant combines mechanical processes to separate the dry recyclables such as plastics and metals, with biological processes to handle the organic-rich fraction of the incoming waste and other physical processes such as moisture reduction.

In addition to the separation of dry recyclables from the incoming waste stream, the plant can be designed to produce:

- An energy-rich Refuse Derived Fuel (RDF) or Solid Recovered Fuel (SRF) (that which meets standards) making it suitable for use in a range of thermal processes. The MBT process can optimise the proportion of biogenic carbon in the fuel that qualifies for Renewable Obligations Certificates (ROCs) when used in suitable energy plants.
- A secondary aggregate suitable for use in construction.
- A stabilised Compost-Like Output (CLO) that can be used in low grade land application.
- Biogas that can be used for energy production when the biodegradable portion of the waste is subjected to anaerobic digestion.
- A biologically treated material with its biodegradable content reduced to a level that, when landfilled, will allow the waste disposal authority to meet its Biodegradable Municipal Waste (BMW) allowance under the Landfill Directive.

The residual component, depending on the type of treatment employed, is typically landfilled.

The capacity of MBT facilities ranges from very small plants treating 25,000 tonnes/year or less, to large scale integrated facilities with capacities of over 200,000 tonnes/yeari. Given the variety of systems available, capital costs have been shown to vary widely in the range of £50 million to £125 million for facilities with capacities of 80,000 tonnes/year to 225,000 tonnes/year. The number of MBT plants in the UK is increasing, with 19 permitted by the end of 2010 with a combined capacity of 2.7 million tonnesii. Further developments are underway in England, Scotland Wales and Northern Ireland to deliver additional capacity over the next two to four years.

A number of companies in Europe and elsewhere are able to deliver MBT systems and components. These suppliers range from equipment makers, supplying parts for simple combined shredding/separation and biological treatment operations, to project developers and turnkey suppliers delivering plants with an integrated energy recovery capability.

The further commercial development of MBT processes in the UK is largely dependent on a number of factors including:

- the social and political hostility towards dedicated energy from waste facility applications
- policy drivers for pre-treatment of waste prior to energy recovery
- the opening and maturation of a long term market in alternative fuels in the UK
- a long term market in biologically stabilised products destined for application to land
- a demonstration that MBT has a role to play in meeting sustainable development objectives.

Key issues

The MBT concept should perhaps be more accurately termed Mechanical Biological Pre-treatment (as it is described in Germany and Austria) because an MBT plant is not a final disposal solution such as a landfill. The success of MBT in delivering optimal levels of diversion

and achieving the aims of the waste hierarchy1 rely on both producing a quality output at each stage and establishing markets for these outputs. The industry has adapted to market drivers such as an export market for fuel to Europe, a price premium for high quality recyclables and a push back on the use of CLO on land and adapted the MBT systems to suit.

Performance of MBT plant

Recycling

Even successful kerbside recycling schemes leave large quantities of material in the residual waste (i.e. that which is not collected separately for recycling) which could be recycled. Some MBT systems are able to recover a further 15% to 20% from residual waste for recycling if metals, inert materials and plastics are removed. Materials are extracted according to their value and mass diversion from landfill, with metals and hard plastics being commonly extracted as well as a trend towards glass and aggregate recovery for use in construction products. Metals are the easiest materials to remove using these systems and could boost local authority recycling rates by around 5%. However individual recycling rates depend on the waste composition and the individual MBT technology used.

The recyclable material extracted from a black bag MBT qualifies as recycling and therefore contributes to national and local targets. The choice and quality of materials to recover has been driven by local authority contracts and the Carbon Metric in Scotland as well as the quality standards and pricing models available from reprocessors. The drive for quality is of great benefit to the resource recovery market as a whole and in some cases has resulted in the modification of older MBT plants to extract materials of an increasingly higher quality and purity. Similarly carbon metrics are used, that target materials that have the greatest carbon saving when recycled, to drive down the overall carbon footprint of the industry.

Fuel Production

The production of fuel that meets particular quality standards also has benefits and has provided flexibility in the output market given the lack of facilities in the UK permitted to use such RDF/SRF. Although the co-combustion of RDF/SRF is a relatively new market in the UK, it has been steadily developing as a key industrial partner to the waste industry in Europe. There is competition from other waste streams such as hazardous secondary liquid fuels and tyres; gate fees are competitive, but energy intensive industries will provide a local market for fuel.

As a young market there are also some potential risks to understand for the end users of RDF/SRF either in co-firing or as a single fuel source. The composition and calorific value of waste derived fuels can vary both geographically and seasonally and as such the development of certification and standards is required to ensure consistency. A CEN Technical Committee

1 The Waste Framework Directive requires that the hierarchy applies as the priority order in waste prevention and management legislation and policy. It aims to extract the maximum practical benefits from products and to generate the minimum amount of waste. For further information see CIWEM's report Less is More www.ciwem.org/lessismore

(TC343) has developed standards for SRF which defines envelopes for a number of parameters such as calorific value, chlorine content and mercury content, however there is no defined standard for RDF. The standard is usually set by the end user, however the change in local authority procurement over recent years to let a fuel production (waste services) and fuel use (energy generation) contract has pushed the requirement for set fuel standards.

MBT plants in Europe have been configured over time to meet the fuel requirements of end users, both for traditional energy from waste/combined heat and power schemes and industry users such as cement. In the UK capacity for using RDF/SRF is not matched by outputs from MBT and at the present time there is some overcapacity in European energy facilities that has generated an economically viable export market for RDF/SRF produced in the UK. Between 1 January 2011 and 24 February 2012, 290,000 tonnes of RDF/SRF was exported to European facilities, mainly to the Netherlands and Germanyiii.

These exports are permissible under law, however the energy recovered from the biogenic component of the waste does not contribute to UK renewable energy targets and is a lost resource to the UK. The Government has a role in promoting the development of domestic infrastructure to make use of this RDF/SRF and support the UK market and is taking some steps to promote energy from waste to ensure that the UK benefits from the energy generated from UK waste.

Compost Like Output

MBT systems have the ability to divert BMW from landfill, either through the partial bio-stabilisation of waste streams reducing their biodegradable content or through the production of an organic rich waste stream composted to produce CLO. There is still debate around the use of organic rich CLO material from MBT Plants. This does not (or is unlikely to) qualify as composting under the DEFRA definition for recycling and composting targets, however it does have useful benefits in applications such as landfill restoration, landscaping or fuel crop production. CLO has a role in saving the need for higher quality material in these instances.

The CLO will only qualify as 'composted' under recycling appropriate criteria for use in the intended application, and although a number of waste management contractors and technology providers have demonstrated that there is a market for these materials, the current guidance states the criteria for composting should be "a product that has been sanitised and stabilised, is high in humic substances, and can be used as a soil improver, as an ingredient in growing media or blended to produce a top soil that will meet British Standard BS2882 incorporating amendment no.1". It also states that it is "unlikely that products of a Mechanical Biological Treatment process will meet this definition". However, if the definition could be achieved then the product would contribute towards recycling and composting targets. In practice the consistency of CLO to meet the composting standard is the issue given the variability of the incoming waste stream.

Landfilled Outputs

The EU Landfill Directive and the UK's implementing act, the Waste and Emissions Trading Act 2003, establish targets for the diversion of BMW from landfill. Initially, the Landfill Allowance Trading Scheme credits provided each local authority with individual targets for diversion,

however as of April 2013 these have been phased out as there are sufficient fiscal drivers (Landfill Tax etc) to divert BMW from landfill to other treatment and recovery infrastructure.

The Environment Agency has developed an established methodology to determine the stability of outputs from MBT Plants sent to landfilliv. This methodology determines the change in biodegradability (essentially the ability of a waste to produce methane and other greenhouse gases) between an input feedstock and treated BMW outputs and is used to determine the amount of biodegradable material input to landfill and hence the progress against BMW diversion targets. The guidance on sampling MBT inputs and outputs (including fuel) can also be used for other purposes, e.g. to look at long term trends in the variability of the composition of feedstock and residues, and to provide a measure of the efficiency of a process, specifically to look at process improvement achieved by retrofits.

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Note: CIWEM Policy Position Statements (PPS) represents the Institution's views on issues at a particular point in time. It is accepted that situations change as research provides new evidence. It should be understood, therefore, that CIWEM PPS's are under constant review and that previously held views may alter and lead to revised PPS's. PPSs are produced as a consensus report and do not represent the view of individual members of CIWEM.

References

i DEFRA. 2013. Mechanical Biological Treatment of Municipal Solid Waste – Waste Technology Brief

ii DEFRA. 2013. Mechanical Biological Treatment of Municipal Solid Waste – Waste Technology Brief

iii Environment Agency. 2012. *RDF exports permitted by the Environment Agency*

iv Environment Agency. 2009. Guidance on monitoring of MBT and other treatment processes for the landfill allowances schemes (LATS and LAS) for England and Wales. http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/scho1009breb-e-e.pdf