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Mechanical Biological Treatment

Challenges and opportunities

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- MBT: a new name for an old approach
- MBT in the UK
- SWOT
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Mechanical Biological Treatment

- Umbrella term for systems that use mechanical and biological processes to sort and treat MSW
- An old approach with a new name and a more targeted application
  - An integrated approach yielding: materials, composts, energy (e.g. RDF)
  - Great interest in the 1970s, e.g. in the UK: Byker and Doncaster
  - Use of biodegradation as a pre-treatment for landfill?

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Unit (Component) Processes

- **Mechanical**
  - Screening
    - Size
    - Density
    - Shape
  - Electromagnetic
    - Ferro-magnetic
    - Eddy currents
  - Shredding
    - Pre-treatment for screening
    - Pre-treatment for biodegradation
    - Pelleting / Milling
  - Drying
  - Mixing
  - Others (e.g. pulping)
- **Biological**
  - Aerobic (thermophilic)
    - Composting
    - Drying
    - “Digestion”
    - Maturation / curing
  - Anaerobic (thermophilic / mesophilic)
    - For methane
    - For ethanol
  - vermicomposting

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Broad Classes

Front end	pre-shred or pre-screen
Materials separation	wet, dry
O/P Materials	Fe, nonFe, paper, plastic, fuel, aggregate
Bio-process & refining	Aerobic, anaerobic, hybrid
O/P of bio-process	“compost”, aggregate, low OM fraction, high CV fraction, methane

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Many Possibilities

- In practice particular combinations work efficiently
  - E.g. pre-shred + wet separation + AD
  - Pre-screen + dry separation + compost / RDF
- Combinations are driven by the nature of the input and the availability of applications for outputs

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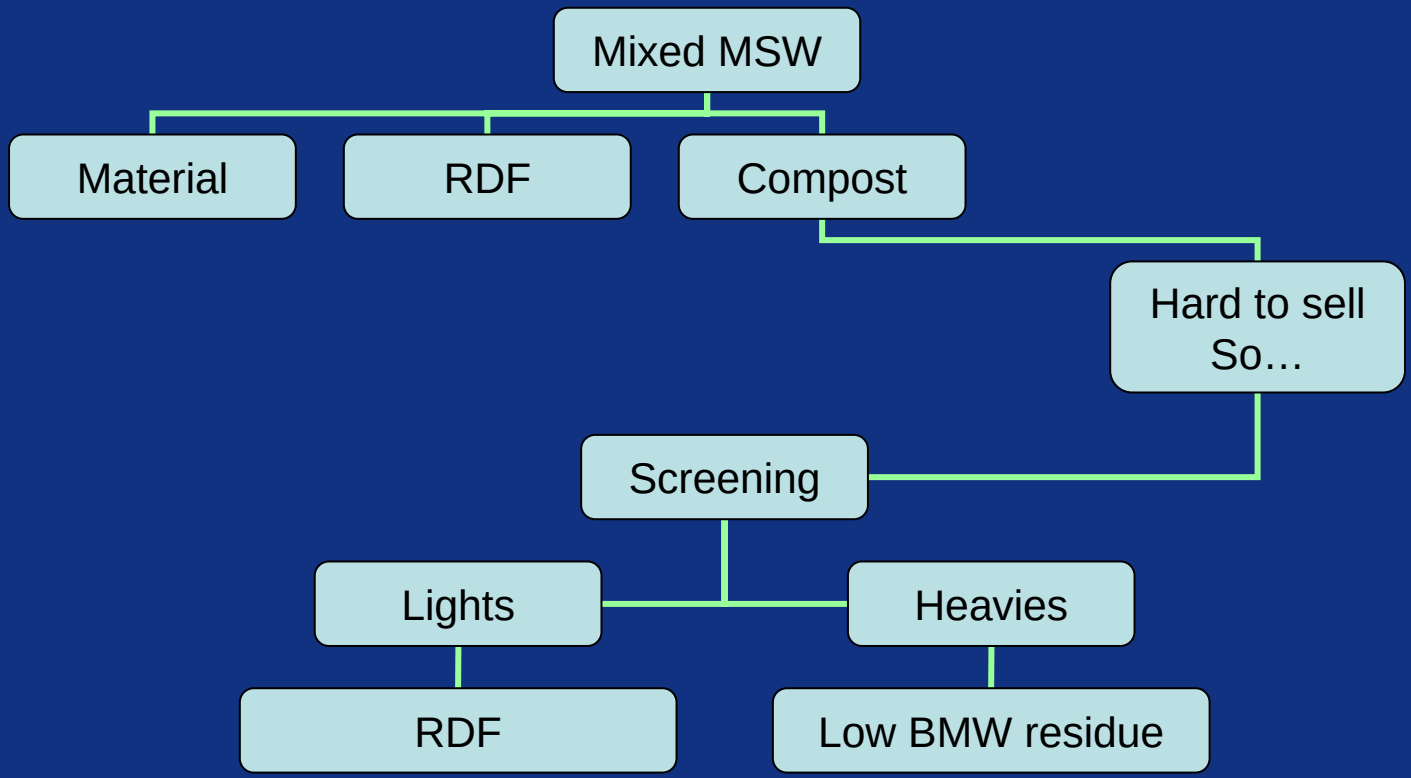
For example…



MBT in England

- Greenpeace and Lib Dem favoured
- Can recover value from and treat MSW residuals
- Potentially an effective solution for LAs
- Significant institutional obstacles
- Clash of perceptions – having ones cake and eating it
  - Don't want landfill, don't want thermal ➔ MBT only
  - Don't want low grade products ➔ lack of investment in developing MBT opportunities
  - Don't think low grade products contribute to recycling targets ➔ so why bother with MBT
  - MBT may not even be sufficient for landfill pre-treatment
- If there is less landfill and MBT is too difficult only incineration is left

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Rate of Recycling in England

Over 1 million tonnes MSW composted in 2002/3, and 17.7% recycled in 2003/4

Defra 2004 5

1.66 million tonnes overall composted in 2001/2 in the UK

TCA 2004

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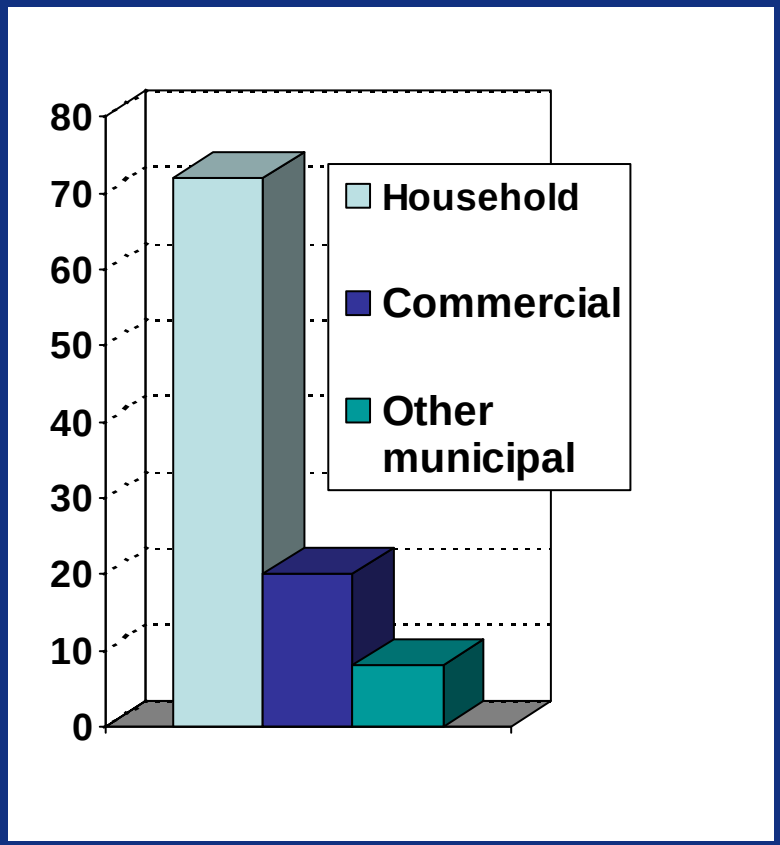
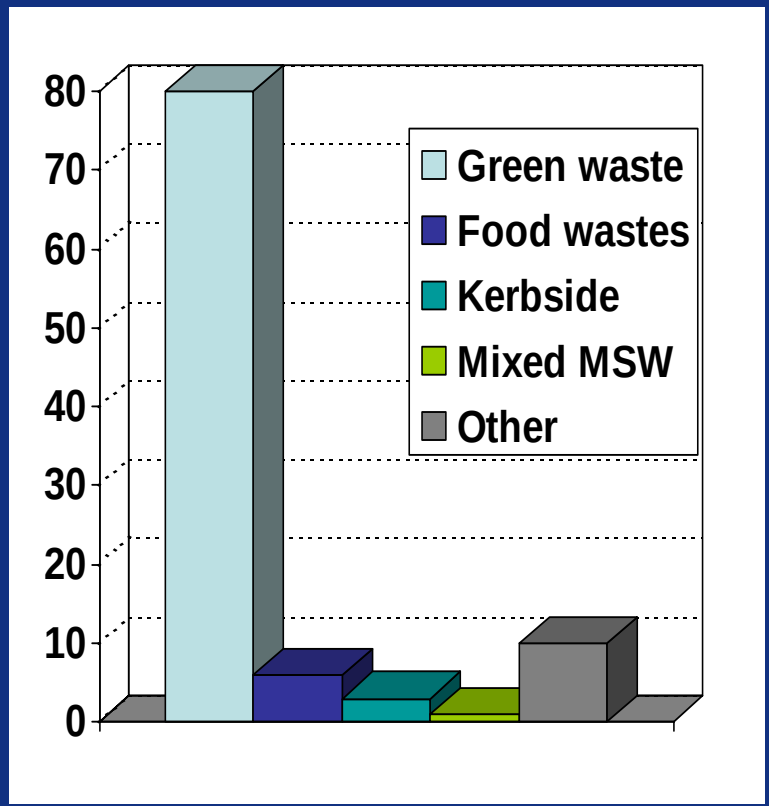
Not much MBT in the 2001/2 TCA Survey, as of 2005, 2 major facilities in Neath and Leicester. Many LAs interested)





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Information

1. ENDS Report 361, Feb 2005 pp 25-28, www.endsreport.com
2. DTI (2005)Eligibility of Energy from Waste - Study and Analysis. The Options for, and Implications of, Amending the Renewables Obligation Eligibility Rules for Energy Recovery from Mixed Waste. Ilex Energy Consulting March 2005 DTI, London, UK. www.dti.gov.uk
3. Juniper Consultancy Services (2005) Mechanical-Biological Treatment: A guide for Desion Makers,Proceses, Polices and Markets. Sita Environmental Trust, Falfield, South Glocs, GL12 8PT. http://www.juniper.co.uk/Publications/downloads.html
4. www.compostinfo.info also for Sita Environmental Trust

SITA Environmental Trust MBT Composting Bibliography

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Composting Mixed Waste / MBT Composting

This complete review - but not the bibliography - can be downloaded as a PDF (1,625 kB),
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Over recent years there has been a resurgence of interest in composting of Municipal Solid Waste (MSW). A large amount of source segregated wastes are now composted across Europe, and the compost is used routinely by many users from domestic users to commercial users.

Source segregation leaves behind residual organic materials. Composting combined with mechanical separation processes may provide a means of recovering lower grade composts and other recyclates both from the residual wastes, and from general waste collections, where for economic, social or other reasons composting of source segregated materials is not carried out. This combination of mechanical and biological treatments has come to be known as "MBT", and this technique is seeing an increasing number of applications across Europe.

However, while "MBT" is "new", mixed waste composting is not, and a large amount of information has been collected about the performance of composting, sampling and separation systems for mixed waste composting. It appears that not all of this information is being exploited by MBT developers, who may therefore be at risk of repeating research that has already been done, or perhaps even repeating mistakes from the past, or not carrying out adequate sampling and analysis.

SITA Environmental Trust have supported a project, carried out by r^3 environmental technology limited and AEA Technology PLC, to collate the large body of existing, and apparently forgotten, information

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Author:
Juniper Consultancy Services

Year: 2005

Full Reference:

Juniper Consultancy Services (2005) Mechanical-Biological Treatment: A guide for Desion Makers,Proceses, Polices and Markets. Sita Environmental Trust, Falfield, South Glocs, GL12 8PT. http://www.juniper.co.uk/Publications/downloads.html

Report Section:

Abstract:

This major review assessed the prospects for the use of MBT, in particular in the UK. The main challenge for MBT use is in finding viable uses for MBT products: recyclates, 'composts' and fuel fractions. The 'compost-like' output from MBT is unliekly to find significant use as a soil improver or in growing media or other conventional compost markets because of concerns of its composition, and its exclusion from PAS 100. The authors suggest that a major use is in landfill managment, but this may not count towards either recycling or biodegradable BMW diversion under current UK policy and regulations. The authors claim that the material could find use in land restoration, and other less sensitive uses for example on riadside verges. There are also major challenges to the use of biologically dreid fractions as marketed alternative fuels, again related to concerns over composition and the current policy and regulatory 'climate'. Dedicated site heat stations, CHP etc may provide outlets for both conventional refuse derived fuel and biodried fuelfractions. The report concluded that MBT could potentially be used as a stabilsation process prior to landfill. However the current policy and regulatory 'climate' for this application was unclear in the UK, preventing firm conclusions. They further concluded that this apparoach, while used in mainland Europe, was likely to be unattractive in the Uk for economic and sustainability reasons.

Nonetheless MBT was seen as a major part of modern waste managment options, with potentially greater attractiveness than incineration, providing end-uses for materials can be developed and maintained. The need for standards

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Some of the conclusions about the likely attractiv More
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Pre-Processing Methods

Pre-processing is applied during MSW composting for one or more of the following reasons.

- **To increase the proportion of compostable materials in the feedstock** – Glenn 1991 – MSW contains a high proportion of non-compostable or poorly compostable material, hence composting the whole MSW stream is inefficient and leads to a very low grade of compost. See also the Critical Review Section, *Feedstocks and composition - Physical characteristics*.

- **To improve feedstocks for other recovery options** Removal of compostable materials (and materials removed in parallel such as glass) can improve the efficiency of down stream sorting processes to recover energy and dry recyclables in mechanised plant (Anon 1991, Barton 1983, 1984 and

More >>

References (8)

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r3/AEA bibliography

References (40)

All references related to this section that we have a listing for whether or not they are mentioned in the text above.

Reader's references/comments

Comments (0) **References** (0)

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SWOT

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Strengths

- Well characterised technologies with extensive past experience
- Potential to generate large volumes of recyclates and divert large amounts of BMW from landfill
- Greenhouse “positive” – well not actually proven yet
- Not landfill / not incineration!
- Design to fit local circumstances
- Adaptation is possible
- Failures are less likely to be catastrophic
- Potential to address wider environmental issues, e.g. soil carbon

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Weaknesses

- A lot of past work is ignored / much re-inventing of wheels is in progress
- History of poor operational control; lack of validated performance information and verified demonstration studies, plus some major failures
- Products are typically “low” grade
- Disconnect between system suppliers / designers & (a) feedstock suppliers, and (b) those who can use outputs
- Lack of application of “technical” knowledge to process design, and a lack of investment in “science” – classical problems in a low margin industry
- Environmental impacts may not be much reduced compared with landfill / incineration

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Opportunities

- Versatilility – design to fit local circumstances
- Flexible – can “bolt on” processes to a “core” system
- Volume – may be a major MSW treatment route
- Co-treatment opportunities (e.g. with sewage sludge, with trade wastes etc)
- Verifiable and measurable outputs (and emissions)
- A range of “lower grade” uses

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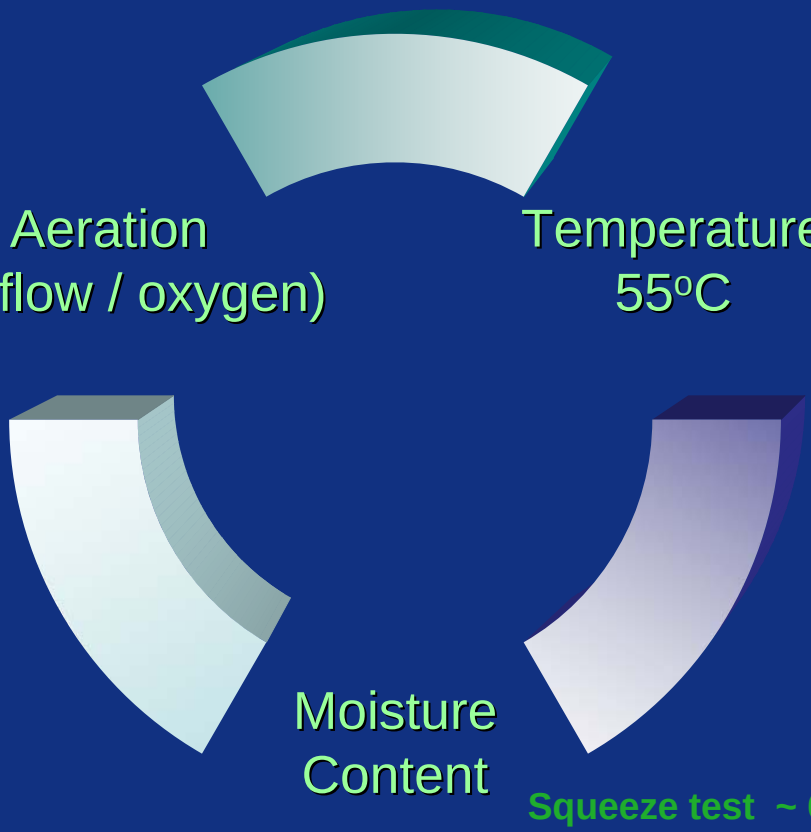
What Are Lower Grade Materials

- Composts produced from less easy feedstocks, such as mixed MSW or from process residues, e.g. green waste compost oversize
- These could be capable of beneficial use
  - Land restoration
  - Contaminated land remediation
  - Non-food crops, e.g. energy forestry
  - Habitat management
  - Soil manufacture
- No clear benchmark
  - Concerns over contaminants for some materials
  - No consensus on what constitutes “benefit”
- No use may not be sustainable development

Threats – Inappropriate design and operation

- Process risks
  - Stability
  - Sanitisation
  - Emissions
  - Robustness
- Product risks
  - Biological (pathogens)
  - Chemical (toxic substances)
  - Physical (inerts, sharps)
  - Fitness for purpose (e.g. appearance, conductivity, heterogeneity)

Key Process Dynamics



ABP regs may want more

Air to control temp is >> air needed for microbial processes

Squeeze test ~ 60-70%

See

www.compostinfo.info

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Threats - Institutional

- Lack of bench marks / standards – what is “beneficial use”
- Lack of recognition of its use in recycling targets – e.g. for recycling in landfill (e.g. displacement of virgin materials for cover and drainage)
- Confusion over its “sustainability” and its impacts as a process
- Lack of verified demonstration projects
- Lack of transparency in process claims
- Lack of investment in developing end-uses / enhanced products

Challenge - Avoiding a Climate of Uncertainty

- Not good for those who might use or develop uses for recovered materials
- Not good for investors in systems
- Not good for optimising processes from a sustainable development standpoint
- Not good for those looking for security in waste management
- ➔ a missed opportunity for MBT
- Good for the incinerator lobby

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How?

- Making explicit the optimal role for MBT in modern waste management
  - What is the likely quality of outputs given the likely economics
  - How can those outputs be used acceptably
  - How do they fit in with landfill and energy recovery
  - What is the most “sustainable” way forward for dealing with residual wastes given the limited choices available
- MBT needs a CLEAR role in waste management policy with regulations and rewards that do not contradict this
- The use of MBT materials must be compliant with other policy interests (e.g. soil protection, risk management)
- This policy statement is an absolute pre-requisite

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From the Policy

- Acceptable uses
- Acceptable operations

➔benchmarks and standards

➔flagship projects and demonstrations

➔ clarity and stability

➔ the technical specification: what must be achieved

➔ markets for process and products

We have seen this work for “green compost” in the UK

- Clear policy
- Standards (PAS-100, HACCP, ABP)
- Process case studies
- End use case studies
- It’s not been perfect but steady progress is being made

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Policy Needs

- Good technical information
  - Process inputs, outputs and emissions
  - Process cost versus product quality
  - End-uses of materials – in particular biological treatment residues
  - Risk assessment / sustainability appraisal
  - Some good case studies

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Conclusions

- MBT could have a major role in modern waste management. It offers a sustainable technology closing the loop between human wastes and soil. Technologies are widely available
- A clear policy view on the most beneficial way of using MBT, based on costs and benefits, is a pre-requisite for its use
- This must be followed by the setting of clear standards and the development of a transparent demonstration and technical information programme
- It may be premature to make large investments in the absence of such a clear policy position, which leaves incineration as the only viable alternative to landfill

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r³ interests

- Information, research, feasibility studies
- Integration of composting and land restoration and use
- Example projects
  - www.compostinfo.info
  - AquaTerra
  - Lower grade composts project
  - Markham Willows Project