



Composting of Mechanically Segregated Fractions of Municipal Solid Waste – A Review

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Executive Summary

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. Sita Environmental Trust have been supporting a project which aims to collate the large body of existing information about composting mechanically separated fractions of MSW including sampling and sample preparation issues; and then to present this information in a form that is easily accessible to the UK waste management industry, environmental consultants and researchers.

The volume of material is enormous, and only a fraction of it can be referenced in a conventional review. Hence this review operates in conjunction with an on-line bibliography at (www.compostinfo.info), which currently provides access to a bibliography of 1,600 references linked to mixed waste composting. The review is intended to provide a general grounding in the subject and to sign post readers to sources of further information. The review is not intended as a “design and build manual” nor does it provide definitive guidance on legal, regulatory, policy or health and safety issues. Among many findings, the review identified the following key points:

Composting - past and present: past and recent UK and European composting experience shows a cycle of interest and then disinterest in composting of MSW. At present, while it is generally agreed that composts made from source segregated materials are likely to make higher quality composts, there is increasing interest in composting mechanically segregated MSW feedstocks as part of an “MBT” process. MBT, or mechanical biological treatment, allows a range of secondary materials to be recovered, including compost, albeit of a lower grade.

Feedstocks and composition: the physical, chemical and biological characteristics of mechanically segregated MSW are highly variable. Contamination of the compostable fraction by trace elements and “inerts” – i.e. non-compostables - appears to be an intractable problem, with residual inerts and elevated trace element contents remaining in the refined compost. The “best” composts made from mechanically segregated MSW are similar in trace element content to the poorest composts produced from source segregated materials.

Sampling and analysis: MSW is a highly heterogeneous and variable material. Specialist approaches are needed for its sampling, sample preparation and analysis.

Biology of composting: the key biological effects are decomposition including a period of decomposition at elevated (Thermophilic) temperatures. The compost is sanitised by a correctly optimised composting process. The dominant process variables are aeration, temperature and moisture, and it can be difficult to sufficiently aerate the composting mass to control temperatures and so maximise processing rates, without over-drying it.

Pre-processing methods: a wide variety of technologies for compost feedstock preparation (separation technologies such as, hand picking, size separation, density based separation, use of electric or magnetic fields) have been developed over the past 50 years or more. Size reduction plays an important role in pre-processing before composting, with size reduction by screening *without* shredding largely preferred.

Composting techniques: the principal techniques used in MSW composting are turned windrow approaches, open aerated systems, and contained systems (vertical and horizontal reactors and agitated systems). In the past rotating drum reactors followed by aerated piles or turned windrows was the dominant composting approach. Each approach has advantages and disadvantages. However, rotary compost reactors are rarely used for long enough to do more than mix and condition the feedstock, and initiate the thermophilic stage of composting. Operating problems appear to be most frequently reported for vertical continuous or silo type reactors.

Refining and packaging: refining uses similar separations to pre-processes, residual content of inerts may remain a problem. This may be masked by fine milling or pelleting.

Health and safety, emissions and emissions control: the principal emissions and health and safety issues are leachate, odour and volatile organic compounds, dust, bioaerosols and other health risks, vermin / birds / insects and fire risks. These can all be effectively controlled in a well managed and planned composting operation.

Product quality and environmental impacts: The dominant benefit of composts arises from their organic matter content, although they do contain useful amounts of plant nutrients and may have a significant liming effect. Concerns about contents of trace elements and inerts have limited the use of composts made from mechanically segregated fractions of MSW in the past. An emerging concern exists with elevated levels of toxic organic compounds reported where tests have been carried out, although the significance of these is still being debated.

End-uses: composts produced from mechanically segregated fractions of MSW are likely to incur some form of ongoing regulation; possibilities might include soil improvement and soil forming for restoration, daily cover in landfill management, as a pre-treatment prior to landfill and perhaps as a pre-treatment for energy recovery.

Operational and Strategic Issues: MSW composting could play a role in sustainable waste management. However, regulations standards and guidelines for compost exclude products made from mechanically segregated fractions of MSW from “premium grade” markets in the UK. The possible lower grade uses for compost, mentioned above, are currently subject to regulatory uncertainty. This regulatory uncertainty is perhaps the most critical issue affecting the implementation of MBT systems in the UK, and the provision of clear benchmarks and guidance should be undertaken as a matter of some urgency by the regulators and policy departments concerned.

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