

Composting: How do you choose?

Composting is widely recognised as the best method for recycling organic waste and is a cornerstone of achieving the National Waste Strategy and recycling targets. However, the number of choices can be off-putting and not all options are suitable for all situations and waste streams. Costs vary greatly as some are revenue-based and some represent large capital investments. The wrong choice can prove to be very expensive over a long period of time. So how do you make a decision against a background of new legislation, recycling targets, a myriad of ‘solutions’ and increasing pressures on budgets? To help, the following asks some of the key questions and gives some of the most important answers about investing in composting and related systems.

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Introduction

Short term solutions can be installed relatively easily, either to deal with non-hazardous material such as green-waste, or even to deal with food wastes and material subject to The Animal By-Products Regulation (ABPR)¹. For long term plans, major capital facilities with a life-span of 15 - 25 years or more can be constructed. The optimum system does vary from area to area because of location, logistics, length of contract or partnership and the nature of funding (capital or revenue) and environmental constraints. There is a compost system to meet every need and constraint but this is rarely available ‘off-the-shelf’. It is worth examining whether a single system is actually the ideal way to develop operations or whether a scaled approach is best. An interim solution may help introduce the process of composting, for instance in a Local Authority newly starting to collect organic waste for recycling, but as confidence and collection systems expand a calculated move to a capital facility may be the answer. This overview introduces just some of the solutions that are available from Active CompostTM.

To determine the correct system or combination of systems it is best to first identify key drivers:

Do you want to compost greenwaste only?	If yes, go to Section 1
Do you want to compost all kerbside organic waste to meet targets?	If yes, go to Section 2
Do you require rapid implementation?	If yes, go to Section 3
Do you expect to scale-up material for composting over a number of years?	If yes, go to Section 4
Do you anticipate or prefer a large capital project?	If yes, go to Section 5
Do you want to compost wet wastes such as sludge and animal wastes?	If yes, go to Section 6
Are you interested in energy recovery either as gas or electricity from biogas systems?	If yes, go to Section 7
Do you want first to examine the financial model for your composting solutions?	If yes, go to Section 8
What is the next step?	Go to Section 9

¹ For a full analysis of regulatory requirements you must seek detailed guidance. This document addresses only broad issues and may not define all factors that relate to your circumstances.

After you have considered the section that seems best for you it is also worth considering other sections as additional relevant factors may be covered. In planning any compost project it is important to include the peripheral technical, manpower and skills-issues that will be needed such as materials-reception, product processing and sales as well as licensing. Successful projects often work best as a partnership between compost professionals and the waste management sector. For further guidance contact Active Compost Limited for a specific appraisal of your needs. A flow diagram of some of the key issues is shown at the end of this document.

1. Greenwaste composting

Most operations include composting of at least a proportion of greenwaste, that is, vegetable processing waste from a permitted source and parks and garden waste. Greenwaste only can generally be composted outdoors using simple machinery such as tractor loaders and small mechanical turners. Material is generally stacked in long rows (windrows) and turned periodically. However, a number of issues are important. Even greenwaste composting needs to be carried out carefully as it can pose a pollution risk (dust, odour, effluent) if done incorrectly. Proximity to water and to neighbours can govern the way in which composting can be done but it can be a cheap and easy solution for managing low-risk biodegradable waste.

Only garden waste or vegetarian material can be treated in this way. If there is a risk of contamination of inbound material with other types of waste, such as food, then more sophisticated systems must be employed.

Greenwaste composting can generally be carried-out outdoors using relatively simple equipment such as tractor-loaders or tractor-drawn compost turners to aerate windrows. Additional equipment such as shredders and screens may also be required. Typically a manageable greenwaste operation with minimal mechanisation is no more than around 1-2000 tonnes per annum. Set-up costs vary depending on the equipment and site already available. As an indication only, entry-level equipment costs can be around £35k. However, simple operations may be consuming in terms of labour and energy cost per tonne. Simple operations may also result in poor product quality. Large operations can be fully outdoors but only where Regulations permit simple operations. For instance, in the London area a compost facility in Essex receives an estimated 25k tonnes of greenwaste per annum, composted in open windrows. Large windrow operations can be successful but investment in dedicated machinery is essential, for instance large tractors / loaders or specialist windrow turners. When deciding which machinery to use, capital cost may be less important than the long term running and service costs – depending on what financial rate of return is sought.

Active CompostTM in association with a leading fabricator supply a range of the finest British compost turning equipment for hire, lease or capital purchase.

Once a community has begun composting greenwaste it can be difficult to further increase the proportion of material being collected without considerable effort in education and promotion. Many schemes that collect only greenwaste fail to achieve recycling targets and pose management difficulties because of seasonality. As a result, it is not unknown for a second tier of composting, for instance of food waste, to become essential if targets are to be achieved. This then adds cost and complexity to the overall programme.

2. Composting of other organic waste

Unless material to be composted is known to be exclusively greenwaste then it must be assumed to contain 'at-risk' material. This includes foodwaste, animal by-products as defined in The Animal By-Products Regulations (ABPR) and most kerbside collected waste. It is beyond the scope of this guide to describe detailed issues in this respect¹. In principle, any material that contains or may contain animal derived material may only be composted if the system complies with a number of regulatory requirements². In essence, systems must be two-stage of which the first stage must be fully enclosed. Material must also be protected from vermin, treated to specific temperature targets for pre-determined periods of time and evidence recorded. Dirty (feedstock) and clean (product) areas must be separate with no cross-contamination, including restricted vehicle movements. Examples of acceptable two-stage systems would be:

- enclosed halls with two distinct operational areas
- enclosed vessels where people are excluded
- part of either one of the above followed by a fully managed windrow system as the second stage.

Approvals for any layout are agreed by regulators on a case by case basis rather than according to manufacturers' general specifications. Systems that can comply can encompass a wide range of enclosed processes ranging from short-life systems to full capital installations. Size of operation is not a regulatory issue and compliant sites can be large or small providing the management and design criteria are met.

3. Rapid implementation

If there is a need to begin composting operations quickly then technically this can be done relatively easily, with the exception of capital construction of large facilities. Technical solutions can be delivered **within a few weeks** of making a decision to compost organic wastes.

- Greenwaste outdoors can be composted immediately using farm-style equipment.
- If new hard-standing is required, particularly concrete, then approximately 12 - 15 weeks should be allowed to organise contractors and ensure curing of the area before use.
- If vessel systems are essential these can be either short-life systems using disposable containment and therefore on-going commitment to recurrent costs or they can be capital items such as road-transportable box systems that can be easily delivered to site. Any of the various options can be operational within hours of electrical connections being made.
- Rapid systems tend to be modular. Short-life systems can easily handle anything up to 200 tonnes per day (theoretically more than 60k tonnes per annum) while single-box systems typically handle around 20 tonnes per day and can be extended to multiple box arrays.

Note that nearly all compost facilities require consideration and approval by environmental regulators and planners, irrespective of scale of operation. Timings outlined above do **not** include any allowance for this as it will vary from location to location. An exception to this may be on-farm composting that is normal to the operation of the farm itself. Codes of Practice do still apply in this situation and regulators may still demand advance notice and may require to inspect the process.

² Not all animal by-products may be composted – see source documents for clarification

4. Scaling-up of compost operations

One of the problems of beginning a programme of large-scale composting is that in the beginning the amount of material that may be collected for recycling may be relatively small but will in time build to a major flow of material.

If the final level of recyclable material is large it may warrant construction of a large capital facility but in the early years this may be underused. Technical facilities operate most efficiently at or near capacity and so there is a disincentive to begin the process.

Where the quantity of material will significantly increase over a period of time the Active Compost™ approach is to recommend beginning operations with interim resources and then scale-up to maximum requirements in, typically, around 12 months thereafter. This has the following advantages:

- The first level of composting can begin immediately (see Section 3)
- Training and management can be carefully and efficiently planned
- Costly mistakes can be avoided
- The full planning process can be underway concurrently
- Interim operations can remain in operation to act as an overflow facility for peak demand on the main facility when it is subsequently created.

The interim resource can be sized to cope with the main peak annual production, for instance autumn or spring peaks of garden waste in the local community, so that it can match future ‘overflows’ from any capital facility.

5. Large capital facilities

A single large-scale facility can be created to manage all of the compostable waste in a town, city or region. Although these are not common in the UK, around the world very large facilities do exist, for example handling 190k tonnes of MSW plus 100k tonnes of sludge per annum (Edmonton), 75k tonnes per annum (Venlo, NL) 53k tonnes per annum (Montgomery, USA). Similar technology has been used for handling agricultural materials, for instance in the mushroom industry for a number of years (e.g. Theeuwen, NL, 200k tonnes per annum). In this respect the scale of composting envisaged anywhere in the UK is manageable with existing technology. In most cases, large modern sites are heavily capitalised, enclosed, systems whereby the composting operation is carried out within an industrial building. Inside the building the composting may be carried out on an open floor area or, more commonly, within automated facilities closed to personnel. ‘Enclosed’ is interpreted as meaning in such a way that people or animals cannot gain access to compost during processing. Such facilities can be of a number of designs ranging from through-flow vessels to individual batch-reactors. The chosen design is usually selected to optimise capital investment and minimise management and variable costs. There is no one definitive design of enclosed system as the optimum choice depends on a large number of factors. Full environmental controls such as biofilters and water recycling can easily be included and the facility could even gain permission for construction in an urban or semi-urban setting (See site A, below). Where permitted, exhaust air may simply be vented to atmosphere where a well managed process results simply in air-flow that has to be discharged, (See site B, below).



Construction costs and therefore the cost per tonne vary greatly depending on the scale of operation, site constraints and the final process method and layout. To obtain general costings and to work towards site designs, operators should seek guidance from Active Compost™.

6. Wet-waste composting

Many organic wastes such as sludges and foodwastes can be composted providing the correct balance of air and moisture can be obtained but this may not be possible in wet-wastes. Moisture content can be reduced by a number of technologies although this is generally an expensive and problematic process. Nonetheless this may be necessary before material is suitable for composting in static systems such as vessels or compost boxes. An alternative is to compost using a rotational system that keeps material moving, and therefore continuously aerated. This process progressively reduces moisture to give an efficiently composted and useable material quickly and with minimum energy consumption. Rotary composters available exclusively from Active Compost™ are suitable for both farm-scale operations and large processes handling around 30 tonnes per day per modular unit. These units can be operated outdoors or under cover and can be integrated into a MRF³ as part of the organic waste stream.

7. Energy as biogas from organic waste

While composting is, by definition an aerobic process, i.e. material is degraded in the presence of oxygen, related in-vessel processes can also operate in the absence of air and can produce energy. These so-called anaerobic digestion (AD) processes follow a completely different biochemical path. Solid end-products may look similar to compost but the two should not be confused. Nonetheless, solid-phase product of an anaerobic process can usually be matured using a composting process to give an excellent material suitable for application to land. The process will also typically yield liquid fertiliser. Anaerobic digestion also has the potential to extract fine-chemicals from the output, depending on the feedstock and level of technology employed. Most importantly anaerobic digestion will generally produce biogas which is mostly methane and which has a high calorific value. This can be burnt to produce heat or can be used to generate electricity. Whether this can be exploited locally or even sold as electricity to the grid depends on various local factors that your Active Compost™ adviser can help you understand. Biogas production is *not* a waste-incineration process.

AD technology is well suited to relatively high moisture-content material such as slurries, sludges and food waste but this is not exclusively the case. Anaerobic systems can be small or large, short-life or capitalised, and most can be integrated into a composting programme. Some composting set-ups such as short-life plastic enclosure systems can be operated as either anaerobic biogas or aerobic compost vessels.

8. Financing composting

Active Compost™ can rapidly model the various options for composting in your exact location to ensure that both the compliant technological solution and the desired rate of financial return are achieved. Preliminary estimates can be outlined as part of the assessment of how Active

³ MRF: Materials Recycling Facility

Compost™ products and services suit your exact needs. For more detailed dovetailing of systems and products into local situations we can provide consultancy to give clear estimates of the scale of operation that you will need and identify the exact resources and logistics necessary to implement the plan. This can include capital and recurrent expenditure such as energy and labour requirements and an environmental impact assessment. Other factors such as sale of product, seasonality and environmental management all influence operational efficiency and costs and have to be taken into account. This can provide an accurate cost and revenue / expenditure forecast.

Active Compost™ can supply facilities to order or can provide leasing and hire facilities if this is more appropriate. For large projects, finance is available for capital investment and partnerships including build-own-operate arrangements.

9. The next step

Active Compost™ can deliver specialist consultancy to get you started, or we can locate and supply resources. Alternatively we can develop your entire compost project from design and installation to long term contract operation and partnership.

For further information contact us at the following address:

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Disclaimer:

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Acknowledgements: Images courtesy of BW Organics, Thöni GmbH, and Traymaster Ltd are used with permission and their assistance is acknowledged.



Organic Waste: Key treatment options and benefits



