Biological Treatments
Fact Sheet 4

This fact sheet focuses on biological treatments. The treatments displayed here all deal with the biological part of your rubbish; which is the garden waste and kitchen waste (also known as organic or biodegradable waste). The fact sheet details three different approaches to composting and a treatment called anaerobic digestion.

Composting
"Composting," means the breaking down of garden and / or kitchen wastes (organic waste) by micro organisms (small organisms) such as bacteria in the presence of oxygen and water, this process is called biodegradation.
Depending upon whether non organic materials (e.g. plastics) are present in the garden and / or kitchen waste, the process can produce compost, soil enhancer or mulch, which all help to improve the condition of soil.

Home Composting
Many people have compost heaps or bins in their back gardens, these can either be made or bought at a discounted rate from your local authority.
The type of bin or heap you have determines what you can put into your bin but most compost bins or heaps can only use garden waste and only vegetable food waste (not meat or fish) as their 'green' ingredients.

Photo: Three different types of compost bin.

Some Local authorities collect garden and / or kitchen waste (including meat and fish) from the kerbside or at Reuse and Recycling Centres/Civic Amenity sites or from local businesses. This green waste is used to make compost on a large scale.

There are two main large-scale composting processes: ***windrow composting*** and ***In-Vessel Composting.***

Home composting is very similar to windrow composting which is a method of composting on a large scale.

Windrow Composting

Photo: *Windrow composting heaps*

This is form of composting has been used for many years and is only used for green and garden wastes. Windrow composting is a simple method that uses no special technology. It is suitable for large quantities of green waste.

The Process
The green waste material is shredded into small pieces, any material that shouldn't be there (such as plastic bags and large stones) is removed and the material is then heaped into long piles as shown in the photograph. The piles are turned over at set intervals (about every 2-3 weeks) to give air to (aerate) the waste, as the micro-organisms in the waste need air (oxygen) to work.

Windrows can be either passively aerated – allowing air to get into the compost by turning the piles, or forcefully aerated by forcing air into the piles of compost using pipes running through or under the piles.

Location
Windrow composting can take place inside a building or outdoors, usually in rural or farm locations. The process can take between 12 to 16 weeks to complete (times can vary depending upon uncontrolled factors, such as temperature). The size of a windrow facility can vary but usually they will be between 1 and 3 Ha.

End Use
Local Authorities can use the final product - compost, on their parks, gardens and reclamation schemes, or it can be sold back to local residents.

In Vessel Composting (IVC)

Garden wastes and kitchen wastes (as well as catering food waste), including meat and fish, can be mixed together in a closed vessel or tunnel for treatment.

The Process

As the waste arrives at the facility it is shredded and screened, this means that any material that shouldn't be there such as plastic bags or bricks is taken out and the remaining material is broken up into smaller sized pieces.

As the waste is enclosed the composting process can be speeded up by pumping air into the waste, by either increasing or decreasing the water content of the waste and by increasing or decreasing the temperature within the tunnel or vessel.

The amount of air or water that needs to be added to the waste during the composting process depends on the composition of the green waste going in to it. For example, if the waste load has a high content of food waste then less water will be needed during the process because the food itself will have a lot of water contained inside it.

Photo: Inside an In Vessel Composter

Regulation

All IVC plants are regulated by the State Veterinary Service this is because (due to foot and mouth) they fall under a regulation called ABPR or the Animal By-Products Regulations. This regulation is in place because the IVC process enables the composting of meat and fish. This means that an inspector from the state veterinary service will visit the plant regularly and take samples of the compost product for analysis. As meat and fish are part of the material going into the plant that high standards of plant hygiene and maintenance must be carried out.

Location

The process takes place inside a tunnel or vessel building; this means that it could be more visible than open windrow composting.

End Use

A higher grade (better quality) of compost is achieved using the IVC method rather than Windrows. Local Authorities can use the final product (compost) on their parks, gardens and reclamation schemes, or it can be sold back to local residents.

Anaerobic Digestion

Another way of treating the garden and kitchen waste part of your rubbish is by using a treatment process call Anaerobic Digestion.

"Anaerobic digestion" means the breaking down of garden and kitchen wastes (organic waste) by bacteria in the absence of air (anaerobic).

The Process

After collecting your garden and kitchen waste from your kerbside or from your local civic amenity site a local authority using this facility would transport it to the site for processing. On arrival at the facility the waste would be shredded and any material that shouldn't be in the waste (contaminants) such as plastics or other household waste is separated. The material is then fed into an enclosed vessel such as the ones displayed in the pictures below, and heated. As the material heats and breaks down a biogas (a green gas) is produced. This gas is made of a mixture of (mostly) methane and carbon dioxide. The gas is captured as part of the process and can be used to generate either heat or electricity. The 'digestion' process also produces a digestate which is a liquid which has some of the green waste (woody fragments) remaining in it. The digestate can be filtered so that the solid and liquid parts are separated and then either recycled back into the process or used as a soil improver or added to compost products, or composted to improve its quality. The end use of the digestate depends on what waste has been used in the process. If food waste containing meat and fish has been used then the digestate will need to be regulated under the Animal By-Products Regulations in the same way that the compost from an In Vessel composter is regulated.

Photo: Anaerobic Digester in Tel Aviv

End Use

The resulting compost like material can be used as soil conditioner and the biogas can be sold as fuel or combusted, e.g. in gas engines to generate electricity.

Location

Photo: Anaerobic Digester

There are currently many Anaerobic Digestion plants across the UK being used to treat sewage sludge by water companies. At the moment there are only two purpose built plants treating household waste – one in Devon and one in Leicester. The plants look no different to other industrial facilities and will be between 1 and 3 Ha in size.

Biological Treatments Impacts

Any new house or industrial facility constructed will have some impact on the environment. This section considers some of the potential environmental impacts that the biological treatments discussed in this fact sheet might have.

Environmental Impacts and Benefits

Disposing of green waste and kitchen waste (biodegradable waste) in a landfill site can cause methane, which is one of the most powerful greenhouse gases to be produced. This is why targets have been set by the EU (European Union) to help us to divert the biodegradable part of our household rubbish away from landfill. These technologies are LAS (Landfill Allowance Scheme) compliant. The compost and digestate produced from all of these processes (after being appropriately treated) can have lots of benefits for your soil, replacing lost nutrients and helping your plants to grow.

Odour

If the composting process is not controlled carefully the waste being treated could start to smell. Each process must be carefully monitored to make sure that they occur at the right temperature and speed. All waste treatment facilities are strictly managed and will have systems in place to limit odour. The In Vessel and Anaerobic Digestion facilities are enclosed and would be fitted with ventilation and filter systems to prevent odour and dust from escaping. The Anaerobic Digestion process is what happens in a landfill site and needs careful control to stop gases from escaping.

Home composting and Windrow composting are similar as they are both open to the air. If the material that is going into the process is strictly monitored then unpleasant odours should not be produced. As with all waste treatment facilities the Environment Agency strictly monitors operation.

Noise

The main noise coming from these facilities will be produced from vehicle movements. As with all industrial facilities hours of operation will be limited to times of the day that will not cause a nuisance to the local community.

Vehicle Movements

The most environmentally friendly way to dispose of your green waste and kitchen waste is by using a compost bin in your back garden or at a personal or community allotment, this means that your waste requires no vehicle movements or limited vehicle movements to reach its final destination. Windrow composting, In Vessel composting and Anaerobic Digestion require some vehicle movements so that your waste can be collected either from the kerbside outside your house or from your local civic amenity site. All vehicle movements produce carbon dioxide, which is another green house gas but is 21 times less strong than methane, so the treatment of organic waste is beneficial.

During the planning stages for the facility the number of proposed vehicle movements will be taken into consideration and the access to the site and its impact on the local community will also be considered.

Emissions & Health

Composting uses a natural process that goes on all around us in the environment. As such the emissions from composting processes are also emitted from natural processes (e.g. plant decay). Fungal spores are prevalent in the air that we breathe, and so, properly controlled in vessel composting plants will not significantly raise background levels of spores etc.

One of the emissions produced is carbon dioxide gas. This is released by vehicle movements needed to collect garden and kitchen waste from the kerbside and from civic amenity sites and businesses (catering waste) and take it to the facility. This can be reduced by using alternative fuel sources to power the collection vehicles.

Dust and Bio-aerosols (biological particles) could be produced as the waste is transferred from the collection vehicles into the facility and from movements within the facility. The impact of this is limited by staff working at the facility wearing the correct protective equipment and by the facility having enclosed collection areas and ventilation systems.

Gases (carbon dioxide and methane) are produced during the Anaerobic Digestion process. These gases are captured and can be used for energy and heat production.

Water run-off from composting processes is carefully monitored and facilities have special equipment to capture and treat it. The closeness to watercourses and underground water will be taken into consideration during the planning process. Again, this is closely monitored by the Environment Agency.

Visual Impact

As can be seen from the pictures these facilities look no different to other industrial facilities. Many of them are already in operation around the country. Planning conditions will suggest that any new facility that is built should be in keeping with the surrounding area whether that is an industrial estate or a rural setting to ensure that it does not stand out.

Costs

If the biodegradable fraction (green waste and kitchen waste) of our rubbish cannot be diverted from landfill then the EU will fine the UK for every tonne of organic waste it continues to send to landfill. To avoid the fines and to find more sustainable (reducing waste produced, recycling, composting and recovering energy from waste instead of disposing of it in Landfill) ways of dealing with our waste local authorities are considering a number of different options to treat their waste. There is no right or wrong combination of options and each local authority might have a different set of facilities depending on local circumstances. These facilities will cost a lot of money and it is important that all the options are evaluated when the decisions are made. The cheapest option is not necessarily the best and what seems like a good option for the present might not be a good choice for 10 or 20 years time.

The cost of a treatment facility can be dependant on many things – the cost of land, whether the current collection system that your local authority has will need changing, what other facilities your local authority is considering and whether this option will work well with them are just a few of the considerations.

Where does this fit in?

Biological treatments deal with one part of your rubbish – the green and kitchen waste. Other technologies are still needed to treat the other materials that we throw away as part of our weekly rubbish. These treatment facilities can either be built on a site on their own or can be positioned next to each other on a larger site. The location and type of facility that your local authority chooses will be dependent on a number of factors including available land, transport access, how close the site is to local houses and how much it will cost.

What can I do?

You are producing the waste that your local authority has to deal with and treat. To help your local authority and the environment there are a number of ways you can make a difference. Firstly by thinking about the rubbish that you produce at the moment – how can you reduce it? Can you recycle or compost more of your waste? Secondly, take an interest in what your local authority is considering. They will be making some tough decisions soon and how your waste will be treated over the next 20 to 30 years. Take part in any consultation process, find out more about what they are considering and tell your neighbours! We all produce rubbish and we need to start taking responsibility for how we dispose of it. To find out more about what your local authority are considering get in touch with them or read their proposed waste strategy. Your opinion counts!

For additional information visit:
www.wasteawarenesswales.org.uk

recycle for Wales
ailgylchu dros Gymru
www.wasteawarenesswales.org.uk

Asiantaeth yr Amgylchedd Cymru
Environment Agency Wales

WLGA · CLILC

Llywodraeth Cymru
Welsh Assembly Government