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COST-EFFECTIVE MANAGEMENT OF ORGANIC WASTE FROM THE FOOD & DRINK AND HOSPITALITY SECTORS

COST-EFFECTIVE MANAGEMENT OF ORGANIC WASTE FROM THE FOOD & DRINK AND HOSPITALITY SECTORS

This Good Practice Guide was produced by Envirowise

Prepared with assistance from:

WRAP (Waste & Resources Action Programme)
Enviromentor Ltd
Active Compost Ltd

Unless otherwise indicated, all photographs are courtesy of Active Compost Ltd

SUMMARY

The food & drink and hospitality sectors produce large amounts of organic waste each year. What to do with food and other organic wastes is an increasing problem for UK businesses. Food waste is governed by considerable legislation and its disposal is becoming increasingly expensive.

This Good Practice Guide is intended to help food & drink manufacturers, retailers, caterers, hotels and other hospitality outlets to choose the most appropriate and cost-effective options for managing their organic waste based on the waste hierarchy.

The Guide will help you make decisions about the right choice for treating your organic waste against a background of legislation, available technologies and budget. Above all, the Guide will help you reduce your waste disposal costs and the amount of waste you send to landfill.

The Guide describes:

- key drivers for change (legislative, economic, stakeholder and media pressures);
- how to adopt a systematic approach to reducing the amount of organic waste produced in the first place (ie waste minimisation);
- the issues associated with recycling organic waste;
- the technologies available for the treatment of organic waste (composting, anaerobic digestion, physico-chemical and thermal);
- industry examples illustrating the cost savings and other benefits of adopting sustainable waste management in the food & drink and hospitality sectors.

The Guide includes an action plan for the management of organic waste based on the waste hierarchy (eliminate, reduce, re-use, recycle, dispose). It also gives details of the free advice and help available from Envirowise and other organisations.

Further free information and advice are available from:

- Envirowise via its Advice Line (**0800 585794**) or website (**www.envirowise.gov.uk**);
- WRAP (Waste & Resources Action Programme) via its Helpline (**0808 100 2040**) or website (**www.wrap.org.uk**).

CONTENTS

INTRODUCTION

Around 15-18 million tonnes[1] of food and drink waste are produced in the UK each year from three sectors generating more or less equal amounts, ie:

- **industrial, eg food manufacturing and processing;**
- **commercial, eg retailers, hotels, restaurants, pubs, clubs, resorts, takeaways and caterers;**
- **domestic.[2]**

What to do with food waste is an increasing problem for UK businesses (see section 2). Food waste is governed by considerable legislation and its disposal is becoming increasingly expensive. Solid organic[3] waste from the food[4] and hospitality sectors generally has a high water content and thus is relatively heavy, making waste disposal priced by weight a disproportionate cost.

The nature of food waste means it is likely to degrade very quickly and consequently can begin to:

- smell;
- become a breeding ground for bacteria and fungi;
- attract vermin such as rats and seagulls.

Food manufacturers, retailers, caterers, hotels and other hospitality outlets, therefore, need to consider ways in which food waste can be removed as quickly and efficiently as possible.

When considering treatment options for wastes that are organic in nature such as food waste, the emphasis is on technologies with a low environmental impact and the sustainable use of resources. These criteria exclude disposal to landfill. Although organic wastes will break down over time in landfill, they do not produce any useful products. They also generate methane and other greenhouse gases.

1.1 THE PURPOSE OF THIS GUIDE

This Good Practice Guide is intended to help businesses that generate organic waste or by-products, such as food processors, food retailers, hotels and caterers.

The Guide will help you make decisions about the right choice for treating your organic waste against a background of legislation, available technologies and budget. Above all, the Guide will help you reduce your waste disposal costs and the amount of waste you send to landfill.

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1 Source: WRAP (Waste & Resources Action Programme).

2 Outside the scope of this Guide: visit www.recycle.com for advice on home composting.

3 The term ‘organic’ is used here to describe any material that is capable of being broken down by bacteria or other living organisms, ie it is biodegradable and potentially liable to decay (putrescible). It does not refer to materials that have been produced to an ‘organic’ standard (eg without the use of artificial fertilisers or pesticides).

4 Food manufacturing, wholesaling and retailing.

- Section 2 summarises the key drivers for change.
- Section 3 explains how to adopt a systematic approach to reducing the amount of organic waste produced in the first place (ie waste minimisation).
- Section 4 outlines the issues associated with recycling organic waste.
- Sections 5-7 describe the technologies available for the treatment of organic waste from the UK food & drink and hospitality sectors.
- Section 8 contains industry examples illustrating the cost savings and other benefits of adopting sustainable waste management in the food & drink and hospitality sectors.
- Section 9 presents an action plan based on the waste hierarchy. It also gives details of the free advice and help available from Envirowise, national governments, regulators and other organisations.

Please note that the legislation mentioned within this publication was checked for accuracy before going to press. However, legislation is constantly changing and being updated. For information on current environmental legislation, please contact the Envirowise Advice Line on 0800 585794.

Please check with the appropriate regulator (eg the environmental health department of your local council) that all food safety and hygiene requirements are being met with respect to the management of your organic waste and any proposed changes.

WHY TAKE ACTION?

The food sector is subject to many pressures that are driving change, specifically in relation to waste production and management. Legislative, economic, stakeholder and media pressures are all major drivers to:

- **reduce the disposal of organic waste to landfill;**
- **increase the use of other forms of waste management including composting (see section 5), anaerobic digestion (see section 6) and other treatment methods (see section 7).**

2.1 LEGISLATIVE PRESSURES

2.1.1 Animal By-Products Regulations

The Animal By-Products Regulations (ABPR)[5] lay down rules for the collection, handling, transport, storage and disposal of animal by-products not intended for human consumption. These include catering waste,[6] former foodstuffs[7] and other animal waste.

The main aim of the ABPR is to control the risk of disease to both animals and the public. Animal by-products are, therefore, allocated to one of three categories according to the risk they pose and this category determines the waste management options permitted. Catering waste, former foodstuffs and raw meat and raw fish from food manufacturers and food retailers are usually Category 3 materials (the lowest risk).

2.1.2 Landfill Regulations

The Landfill Regulations set requirements designed to:

- improve the design, construction and operation of landfill sites;
- restrict or prevent the landfilling of certain types of waste, eg liquid wastes are banned;
- reduce the amount of biodegradable municipal waste (BMW) which is landfilled.

From 30 October 2007, all waste must be treated in some way before it is landfilled and it is illegal for a landfill operator to accept untreated waste. Treatment could mean simply segregation and sorting by the producer, waste management contractor or landfill operator.

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5 In England, ABPR 2005 (SI 2005 No. 2347) came into force in September 2005 replacing ABPR 2003. Parallel domestic regulation has been applied in Scotland, Wales and Northern Ireland since October 2003.

6 Defined in EU Regulations as 'all waste food including used cooking oil originating in restaurants, catering facilities and kitchens, including central kitchens and household kitchens'.

7 Defined in EU Regulations as 'former foodstuffs of animal origin, or former foodstuffs containing products of animal origin, other than catering waste, which are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects which do not present any risk to humans or animals'.

2.1.3 Producer Responsibility Obligations (Packaging Waste) Regulations

The Producer Responsibility Obligations (Packaging Waste) Regulations aim to reduce both over-packaging and packaging waste sent to landfill. In 2005, around 55% of packaging waste was recycled (including composting) and 5% was recovered through energy recovery.[8] Packaging waste is a particularly important issue in the hospitality sector.

More details of the legislation governing waste from the food & drink and hospitality sectors are given in the Appendix.

Need more information or advice?

Call the Envirowise Advice Line (0800 585794) or visit its website (www.envirowise.gov.uk).

- **Visit the NetRegs website (www.netregs.gov.uk).**
- **Contact the local office of your regulator:**
  - **Environment Agency in England and Wales (www.environment-agency.gov.uk);**
  - **Scottish Environment Protection Agency (SEPA) in Scotland (www.sepa.org.uk);**
  - **Environment and Heritage Service (EHS) in Northern Ireland (www.ehsni.gov.uk).**

2.2 ECONOMIC PRESSURES

Since it is biodegradable, food waste attracts the higher rate of the landfill tax. This continues to rise and currently stands at £32/tonne (1 April 2008).

The landfill disposal of mixed waste is becoming increasingly less economically viable owing to a combination of:

- annual increases in the landfill tax;
- higher charges by operators to recoup the costs associated with stricter rules governing landfill design and operation;
- the requirement for pretreatment.

Landfill costs have previously doubled approximately every ten years.

[8] Source: e-Digest Statistics about: waste and recycling, Department for Environment, Food and Rural Affairs (Defra) (www.defra.gov.uk/environment/statistics/waste/).

2.3 STAKEHOLDER PRESSURES

The long-term future and sustainability of a business are linked to its ability to:

- reduce its impact on the environment;
- improve its environmental performance (even beyond complying with legislation).

Businesses are increasingly expected by their stakeholders (customers, investors, suppliers, etc) to make a commitment to minimise and manage waste. There are adverse consequences for under-performance in rapidly changing and globalising markets.

2.4 MEDIA PRESSURES

The increasing media attention that the food sector has attracted has focused on the growing market share of major retailers and the impacts on their suppliers, producers and distributors.

The environment is now high on the corporate agenda. In 2006, major retailer Tesco predicted that the battle to win customers would not only be won on value, choice and convenience, but also on environmental performance and responsible behaviour in the community.

FIRST STEPS: PREVENT AND REDUCE WASTE

Although organic waste management or treatment is important, it is not the most efficient use of resources. Waste minimisation is all about reducing waste at source, ie not creating it in the first place.

If waste can be avoided, you won't need to treat it.

The waste hierarchy (see Fig 1) is a useful framework that has become a cornerstone of sustainable waste management. It sets out the order in which options for waste management should be considered based on environmental impact.

Eliminating and reducing waste at source will save you money and should always be the first considerations. Re-use is next before recycling and composting.

Fig 1 Waste hierarchy

- **Measure**. The first step in the process of managing organic waste is to make an inventory of your materials and processes to identify ways in which waste can be minimised. Once you've mapped out and quantified wastes, it's time to look at how to cut them.
- **Obtain support**. Successful waste minimisation depends on the support and commitment of everyone in the business, including senior management. Form a team of interested people to make it happen.
- **Prioritise**. It's in everyone's best interest to target major sources of waste first, yielding early successes and savings.
  - Look at the largest quantities going to waste.
  - Look at the highest net costs.

- **Welcome ideas**. Simply asking for ideas from those who work close to the problem can work wonders. Talk to the key people involved in handling and dealing with each waste stream. Be prepared to challenge and question existing practices. Ask:
  - Why is there so much waste?
  - Has anyone looked at this as a problem before?
  - Is there a process that could be updated?
  - What do you think could be done to cut waste?
- **Come up with some options**. The team, with expert contributions from those directly involved, should be able to come up with a list of actions to reduce or eliminate waste. If it helps, hold an informal brainstorming session to get ideas. Concentrate first on ideas at the top three levels of the waste hierarchy.

Action points

- **Estimate the costs and savings of different initiatives as accurately as possible.**
- **Divide your strategies into quick fixes and long-term solutions. Both are vital for success.**
- **Devise an action plan for the short, medium and long term with dates, costs and targets.**

To be successful you need to:

- **Be systematic**. Think in the short, medium and long term. Some changes will occur almost overnight. Some are going to take much longer and need careful planning.
- **Measure, measure, measure**. Quantify cost savings, payback periods and quantities of waste reduced.
- **Keep communicating**. Broadcast your successes. It will help to motivate staff and keep the board supportive.

Examples of companies that have adopted a systematic approach to organic waste minimisation are given in section 8.

Free advice from Envirowise

Visit the Envirowise website (www.envirowise.gov.uk) or call the Advice Line on 0800 585794 for free advice and publications on how to:

- **identify and measure your main waste streams;**
- **implement a systematic approach to waste minimisation.**

NEXT STEP: CONSIDER RECYCLING

Once you have exhausted options for reducing and re-using waste, the next step in the waste hierarchy is to recycle waste. Recycling usually requires different waste streams to be segregated, and separating organic waste streams from others is no exception.

Organic waste is not always welcome by waste management companies because:

- it is heavily regulated;
- wet wastes such as food wastes are liable to decay and, therefore, potentially smelly;
- wet wastes present a high pollution risk, particularly to water;
- natural degradation can make landfill unstable;
- uncontrolled production of landfill gas is hazardous and damaging to the environment;
- it can be costly to transport.

However, there are a number of relatively straightforward methods to treat organic material for recycling. Section 8 includes examples of companies that have recycled organic waste using different treatment technologies.

On-site treatment can substantially and quickly reduce the mass of material and, therefore, the cost of disposal. If treated fully and appropriately, organic waste can become a valuable resource as useful compost, energy or fertiliser. However, those businesses processing food or involved in catering cannot risk creating problems such as microbial hazards or odour. On-site solutions must, therefore, be both safe and 'biosecure'.[9]

Various environmental regulations determine what can and cannot be done to recycle organic waste. **The Animal By-Products Regulations (ABPR) are key and guidance should be sought on how these apply to you.** Some regulations, including the ABPR, are implemented differently in England, Wales, Scotland and Northern Ireland. The rules also vary depending on whether you are:

- processing your own waste;
- processing and exporting products;
- getting someone else to process your waste for you.

Since organic waste is highly regulated, it is important to understand whether:

- your treatment choices comply with current legislation;
- anyone to whom you transfer waste is using appropriate technology.

[9] A 'biosecure' process is one that prevents biological contamination and the spread of infectious organisms.

There are significant costs associated with any method of disposal as well as substantial penalties for being ill-informed, so there can be real cost benefits in modern treatment, recycling and waste reduction. In general, the cost of disposal is higher the more regulated the organic waste (see Fig 2). Sections 5 - 7 describe various technology options for treating organic waste.

Fig 2 Disposal costs for organic waste increase with degree of regulation

Less regulation

- Forest and timber wastes
- Landscape waste such as grass clippings, tree surgery off-cuts and brash
- Fruit and vegetable wastes, off-cuts and trimmings
- Agricultural wastes
- Some industrial wastes that are biodegradable (typically those that are nitrogen/carbon rich)
- Catering wastes
- Out-of-specification whole food products (with or without packaging)
- Packaging, paper and card contaminated with food residues
- Meat and meat products including shellfish
- Water treatment solids and residues
- Slaughterhouse waste

Higher cost of disposal

Free information and advice on environmental regulations governing organic waste

- **Call the Envirowise Advice Line (0800 585794) or visit its website (www.envirowise.gov.uk).**
- **Visit the NetRegs website (www.netregs.gov.uk).**
- **Contact the local office of your regulator:**
  - **Environment Agency in England and Wales (www.environment-agency.gov.uk);**
  - **Scottish Environment Protection Agency (SEPA) in Scotland (www.sepa.org.uk);**
  - **Environment and Heritage Service (EHS) in Northern Ireland (www.ehsni.gov.uk).**

COMPOSTING

Composting is the breakdown of organic material under aerobic conditions (ie in the presence of oxygen from the air) to produce a safe, stabilised, humus-like compost. The changes are caused by a wide range of micro-organisms (eg bacteria and fungi) present naturally in the organic material. The temperatures achieved during composting from the considerable amounts of heat generated within the mass are sufficient to destroy any human, animal or plant pathogens present.

Most organic waste can be composted but the choice of method depends on the:

- nature and amount of the waste;
- level of regulation that applies.

Materials such as garden waste (so-called green waste) can be composted relatively simply outdoors, eg windrow. It may be necessary to place putrescible material in some sort of contained process vessel to minimise odour and to prevent leakage of any liquid element that may be produced.

The ABPR require the use of a contained system if the organic waste includes regulated material - particularly meat and meat-derived products.

5.1 HOW MUCH WASTE DO YOU HAVE?

5.1.1 Small amounts

Relatively small amounts of waste (eg leftover food from a small restaurant) can be treated in a 'back-door' composter similar to the home compost bins widely available to householders. Such 'home' composting is relatively lightly regulated providing any product is used only on-site, eg for mulching flower beds around a hotel or kitchen.

- Ensure the composter is vermin proof.
- Blend putrescible material with garden wastes and other materials (eg cardboard) to reduce the risk of smell.
- Aerate simple compost boxes by turning the contents (eg using a garden fork) regularly. Wastes placed in the top of a compost box and turned will degrade naturally into useful garden compost within a few months.

'Home' composting is applicable even to relatively large sites such as office canteens, student residences or prisons. For larger institutions, a contained system is recommended simply to make it easier for staff to use and to keep the process clean during day-to-day tasks.

The cost of 'home' composting on a small scale ranges from only a few pounds to around £8,000 to £10,000 for a contained and automatically managed composter.

For more information, see:
www.defra.gov.uk/animalh/by-prods/wastefood/compost.htm

5.1.2 Large amounts

For larger quantities of green waste, composting can generally be carried out outdoors using relatively simple equipment such as tractors/loaders or tractor-drawn compost turners to aerate windrows. Additional equipment such as shredders may be required.

As an indication only, entry level equipment costs can be around £35,000. However, simple operations tend to be labour-intensive and have a high energy cost per tonne; they may also result in poor product quality. Large windrow operations are more likely to be successful but require investment in dedicated machinery, eg large tractors/loaders or specialist windrow turners. When deciding which machinery to use, capital cost may be less important than long-term operating and servicing costs.

Although large-scale composting is not appropriate for most businesses, there may be opportunities for partnership with neighbours. Examples include a landscape business that composts its own waste together with tree surgery waste or a farm willing to compost rejects from a local vegetable processing plant.

5.2 ABPR REGULATED WASTES

Various requirements apply if material to be composted is covered under ABPR.[10] In summary:

- most systems must be two-stage, of which the first stage must be fully enclosed;
- material must be protected from vermin;
- material must be treated to specific temperature targets for predetermined periods of time and evidence of this recorded;
- dirty (feedstock) and clean (product) areas must be separate with no cross-contamination, including restricted vehicle movements.

The layout of composting systems to be used for ABPR materials is agreed by the regulators on a case-by-case basis rather than according to manufacturers' general specifications. Systems that can comply cover a wide variety of enclosed processes ranging from short-life systems to full capital installations.

Size of operation is not a regulatory issue. Provided the management and design criteria are met, compliant sites can be large or small.

Complying with ABPR is a requirement for any commercial waste food processing. The only exception is for catering waste composted on the premises on which it originates, provided that the material produced is used only on that premises, and that livestock are not kept on the premises.

Advice should always be sought from the regulator when considering composting ABPR regulated wastes.

[10] Not all animal by-products may be composted.

5.3 QUALITY COMPOST

BSI PAS 100 is the current standard for the production of quality compost. It applies to composted materials produced at centralised, on-farm and community composting facilities. For more information, see: www.wrap.org.uk/composting/production

Uncertainty over what constitutes 'waste' has inhibited the development and marketing of materials produced from waste that could be used beneficially without damaging human health and the environment. WRAP has worked with the Environment Agency and key players in the composting industry, including the Association for Organics Recycling and the Environmental Services Association (ESA), to develop a Quality Protocol for compost (England and Wales only). It sets out the criteria for the production of quality compost from different types of source segregated biowaste such as food and garden plant waste. It has been published by the Environment Agency (see www.environment-agency.gov.uk/subjects/waste/1019330/1334884/1713670/?lang=_e).

ANAEROBIC DIGESTION

Anaerobic digestion (AD) is the treatment of organic material under anaerobic conditions, ie in the absence of oxygen (air). The digestion process involves microbial degradation of material but uses a different group of naturally occurring micro-organisms to composting.

6.1 OUTPUTS FROM ANAEROBIC DIGESTION

The process generally has three outputs (see Table 1).

Table 1 Outputs of anaerobic digestion

Output	Description
Digestate	A wetted, solid material that usually requires maturing or composting before it can be used, eg applied to soil.
Liquid	May be rich in nutrients and can be used as a fertiliser.
Biogas	Can be used to generate electricity or burnt as a renewable fuel. Generally contains around 60% methane. Carbon dioxide is the other main component.

An important difference between composting and anaerobic digestion is that biogas is released during the fermentation process. Biogas is generally suitable for use in a number of, but not all, gas engines and is often used in combined heat and power (CHP) units to generate electricity and heat (see Fig 3).

Fig 3 Typical containerised CHP unit for biogas

6.2 SYSTEM DESIGN

There are various proprietary designs of digesters, each suited to different circumstances. Anaerobic digestion has been used for many years for the treatment of wastewater - particularly to stabilise sludge in the wastewater industry.

Anaerobic digestion systems for solid wastes use similar processes to those for wastewater, and the digester can be placed horizontally or vertically depending on the site. The temperature range of the digestion, which may be close to ambient or high temperature sub-sterilisation (thermophilic[11]), also defines the type and regulatory compliance of a digester.

[11] Thermophilic temperatures are typically in the range from 45°C to 80°C.

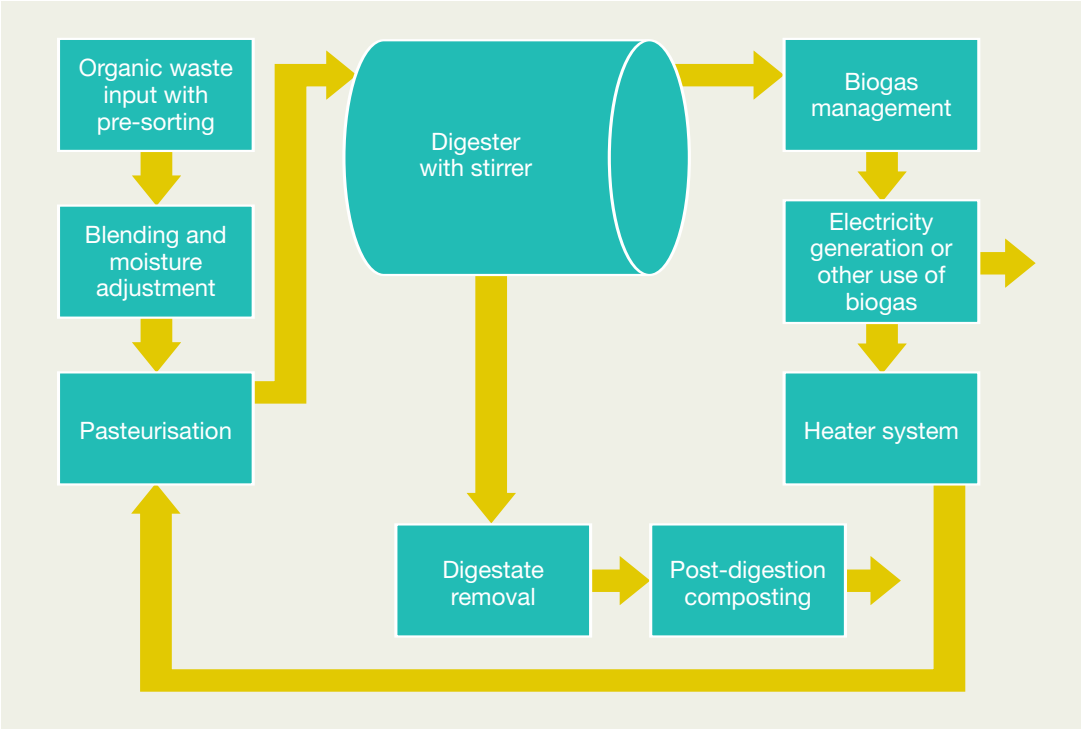
Fig 4 Anaerobic digester suitable for treating 5,000 tonnes/year of biowaste (including food)

The engineering design of an anaerobic digestion system is merely a way of providing the optimum conditions in which micro-organisms can flourish and degrade the waste. This requires:

- a balanced and predictable internal environment;
- control of the rate of input/output and process conditions such as temperature and acidity (pH).

Fig 5 shows a generic digester layout.

Fig 5 Schematic of a typical anaerobic digestion process



There are an increasing number of examples of anaerobic digestion for food waste and related materials in the UK but they are not yet common. Fig 6 shows some examples from around Europe.

Fig 6 A selection of anaerobic digestion plants

With permission Thöni GmbH

With permission Thöni GmbH

Photo courtesy of Alkane Biogas

Photo courtesy of Greenfinch

A Biowaste anaerobic digestion fermenter, Röppen, Austria

B Containerised complete Thöni anaerobic digestion fermenter suitable for factory locations

C Anaerobic digestion solutions for farm and urban wastes, Holsworthy, Devon, UK

D Farm-based anaerobic digester, Corsock, Galloway, Ireland

E Green waste and biowaste anaerobic digestion fermenter, Passau, Germany

Photo courtesy of Kompogas AG

6.2.1 'Wet' digestion

This type of digester has been used for many years, particularly in the stabilisation of sludge for the wastewater industry.

The proven technology is robust and relatively simple to operate. It is best suited to a continuous flow of material such as wastewater sludges or process material from a factory operating all year round.

The capital cost is relatively modest as handling equipment for sludges and liquids is straightforward. However, large-scale digestion vessels require substantial agitation systems.

The digestion of dense materials such as food waste and similar solids/semi-solids requires a reduction in the size of the feedstock particles and their dilution in a large volume of water (otherwise they would interfere with the system and risk damaging the agitation mechanism). Consequently, any solid output has to be dewatered.

Any failure to mix the material effectively or to remove solids has a significant effect on the rate of reaction and thus the performance of the digester.

Liquid outputs can be recycled within the process to some extent to reintroduce the bacteria into the system and reduce water use.

6.2.2 'Dry' digestion

High solids processes - also referred to as dry anaerobic digestion systems - do not dilute wastes into large quantities of flowing liquid. However, the name is something of a misnomer as the material is still able to flow despite its relatively high dry matter content.

The waste is processed at 20-40% moisture, generally as a pumpable mass blended to the correct consistency using specialist equipment and injected into the digester. Such systems do not use agitators but may have a slow-speed turner to encourage release of the biogas generated within the mass.

Dry digestion systems are more tolerant of inert materials and impurities, and the layering seen in wet systems does not tend to occur.

Since the inherently uniform mass moves through the reactor in a plug-flow pattern, the input/output relationship can be predicted and conditions such as pasteurisation can be guaranteed.

Relatively little liquid is required and the materials balance can be adjusted using recycled presswater from the digestate. Virtually no liquid make-up is required and the liquid output is modest. This liquid tends to have a relatively high nutrient content and is a useful fertiliser.

The plug-flow nature of the dry digestion process allows top-up heating and makes it possible to treat/control parts of the reactor as separate zones. This allows recirculation of liquid and different heating levels in different zones. This, in turn, makes it easier to guarantee and record passage through a pasteurisation zone.

Dry digesters can be horizontal and may have a void above the digestion mass, which can act as a buffer for low pressure biogas production and storage. This removes the need for additional gas management and separate storage vessels.

6.3 BIOSECURITY

Traditional wastewater anaerobic digestion systems operate at a relatively low temperature of around 35°C. At these temperatures the mass is transformed substantially, coupled with biogas release. However, the material may or may not be subject to hygienisation whereby potentially harmful micro-organisms and parasites are eliminated through microbial action and chemical/biochemical degradation.

A more satisfactory approach and one demanded by regulators for the organic wastes covered by this Guide is to subject the material to a controlled pasteurisation process involving temperatures of typically 55°C or more, up to 70°C. Such relatively high temperature (thermophilic) processes are higher rate than lower temperature (mesophilic) processes. They tend to have a higher biogas yield but demand a higher level of control and energy input. They may also require more complex engineering. In practice, the requirement for energy may be insignificant because it is often possible to use waste energy from on-site electricity generation using a gas engine.

In the UK, thermophilic systems can comply with the treatment parameters required by law for wastes that are Category 3 or higher. Mesophilic and ambient systems would require the incorporation of a pasteurisation stage to meet the ABPR requirements.

OTHER TECHNIQUES FOR THE TREATMENT OF ORGANIC WASTE

A number of other techniques are available for the treatment of organic waste but, because they tend to be large-scale solutions, they are rarely suitable for adoption by individual companies. Equally, there are emerging techniques that are likely to become of interest at a small commercial scale but are not yet sufficiently proven for large-scale adoption. Both types are described briefly below.

7.1 PHYSICO-CHEMICAL METHODS

7.1.1 Rendering

Rendering is a term used to describe the partial recovery of materials from animal by-products (including former foodstuffs) by crushing and grinding, followed by heat treatment to reduce the moisture content and kill micro-organisms.

Renderers process most animal by-products from the meat production chain that do not end up on the consumer's plate. In the UK, more than 1.75 million tonnes of animal carcasses are processed each year by rendering to give 250,000 tonnes of fat and 400,000 tonnes of protein meal.

Some tallow,[12] depending on its grade or quality, is used in animal feeds. However, most tallow is used to produce materials that are, in turn, used in industries as diverse as paint manufacture and tyre production. Some types of tallow are used as a fuel. The fat and animal protein derived from poultry by-products and feathers (which are processed in dedicated plants or lines) is used extensively in pet food.

Further information

More information on rendering is given in the series of factsheets, *About Rendering*, published by the United Kingdom Renderers' Association (UKRA) and available on its website at: www.ukra.co.uk/rendering.php

7.1.2 Autoclaving

Autoclaving is a conventional combination of heat treatment under pressure and has been used for many years as a sterilisation process. Heat is applied to material either directly as steam or by heating the vessel such that this releases steam from the moisture content of the material to be treated. This, in turn, increases the pressure within the closed vessel.

If abraded (eg in rotary autoclaves), organic waste such as food and vegetable residues, paper and cardboard etc will result in an organic 'wool' or fibre when treated in an autoclave.

[12] Tallow is the rendered, heated and dried fat from cattle and sheep.

7.1.3 Hydrolysis

Hydrolysis is a process whereby chemical bonds are broken by the 'insertion' of water between the atoms in the chemical bond. Hydrolysis can be catalysed by enzymes, metal salts, acids or bases (eg potassium hydroxide).

Hydrolysis destroys the protein/amino acid framework of organic waste and is particularly suited to high-risk wastes such as clinical or high-level animal by-product (ABP) wastes.

7.1.4 Microwave treatment

Microwave treatment of organic waste tends to be small scale (eg in modules up to 2,000 tonnes/year) and is predominantly used to sterilise high-risk material, such as clinical waste. In this context, the term 'microwave' is often also used to cover similar emitter technologies such as radio frequency (RF) treatment.

Microwave systems are either batch or through-flow, and may be used alone or in combination with steam injection systems. Steam injection releases the moisture in the mass, increasing the efficiency of the microwave process and helping to raise its temperature to pasteurisation levels.

7.2 THERMAL PROCESSES

7.2.1 Incineration

Incineration is a controlled combustion process. It does not generate usable by-products, but heat recovery is possible and, therefore, the potential to generate electricity.

Many organic wastes have a high moisture content, relatively low calorific value and may require drying prior to combustion. This means that there is little or no energy surplus from the incineration of high moisture materials such as sludges and slurries, and only limited energy gain from materials such as green waste or forest residues.

The wastes are converted to gaseous constituents and a non-combustible residue. The gases are released to the atmosphere and the residue is usually disposed of to landfill.

Incinerator plants that burn only animal carcasses or parts of carcasses must be approved under the Animal By-Products Regulations but are exempt from the more onerous controls of the Waste Incineration Directive. However, plants that burn other ABPs (eg former foodstuffs, catering waste and manure), processed products (meat and bone meal, tallow) or other waste not of animal origin must be authorised under the Waste Incineration Directive.

Further information

For more information and guidance on ABP incineration plants and regulatory controls, visit www.defra.gov.uk/animalh/by-prods/incinerators/index.htm

7.2.2 Pyrolysis

Pyrolysis is the thermal destruction/decomposition of material occurring in the absence of oxygen. It is also the first step in combustion and gasification processes where it is followed by total or partial oxidation of the primary products.

The products depend on the process parameters.

- Lower process temperature and longer vapour residence time favour the production of charcoal.
- High temperature and longer vapour residence time increase the biomass conversion to gases.
- Moderate temperature and short vapour residence time are optimum for producing liquid biofuels.

In fast pyrolysis, biomass degenerates to yield mostly vapours and aerosols and some charcoal. After cooling and condensation, a dark brown liquid is formed which has a heating value about half that of conventional fuel oil. Although related to traditional pyrolysis processes for making charcoal, fast pyrolysis is an advanced process with carefully controlled parameters to give relatively high yields of liquid. The main product, bio-oil, is obtained in yields of up to 75% (dry matter) together with by-products of char and gas. These are used within the process to provide the process heat requirements, so there need be no waste streams other than flue gas and ash.

Fast pyrolysis involves:

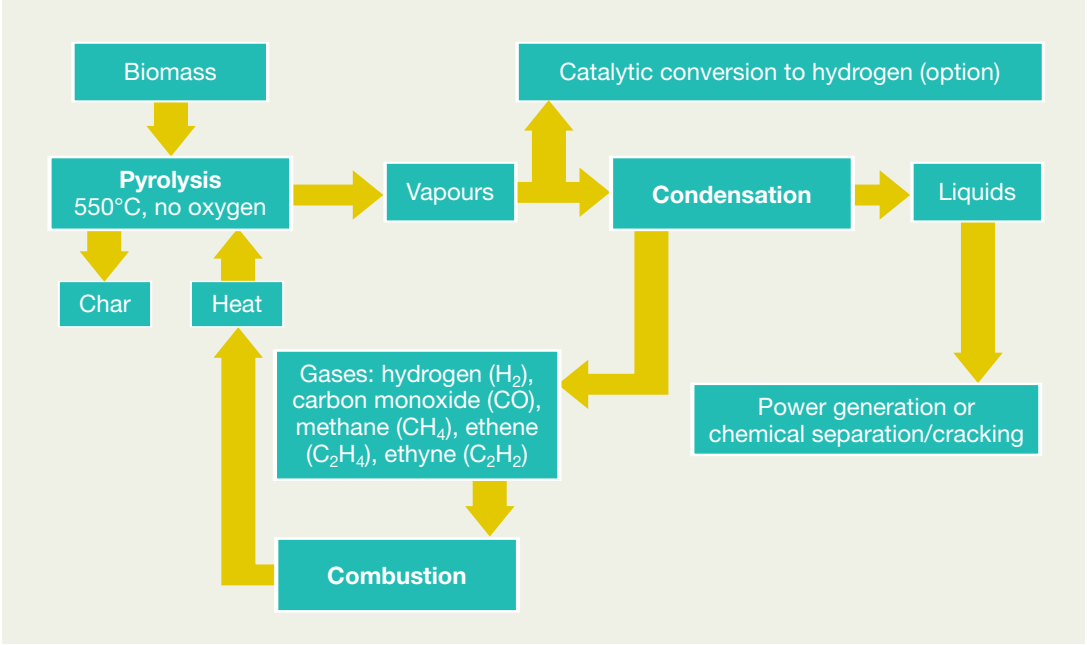
- drying the feedstock to typically less than 10% water content in order to minimise the water in the product liquid oil;
- grinding the feed to give sufficiently small particles to ensure rapid reaction;
- pyrolysis reaction;
- separation of solids (char);
- quenching and collection of the liquid product (bio-oil).

Virtually any form of organic waste can be considered for fast pyrolysis. Although most work has been carried out on wood owing to its consistency and comparability between tests, at least 100 different biomass types have been tested in the laboratory. These materials range from agricultural wastes such as straw, vegetable and oil-crop wastes to energy crops and forestry by-products such as bark, as well as solid wastes including sewage sludge and leather wastes.

For example, waste cooking oil is used to produce biodiesel sold commercially as a raw material for transport fuel. Waste cooking oil can also be burnt in a suitably authorised power station to generate electricity or used as a raw material for other uses such as in the oleochemical industry.

Fig 7 shows potential products from the pyrolysis of biomass.

Fig 7 Biomass liquefaction and energy sources from pyrolysis



7.2.3 Gasification

Gasification is closely linked to pyrolysis. When biomass is heated with no more than around one-third of the amount of oxygen needed for efficient combustion, it gasifies to a mixture of carbon monoxide and hydrogen (synthesis gas or syngas) potentially with carbon dioxide and methane. The amount of oxygen and other conditions determine whether the biomass gasifies.

Biomass/biowaste gasification can improve the efficiency of:

- large-scale biomass power facilities such as those used for forest industry residues;
- specialised facilities in the pulp and paper industry.

Both types of facility are potentially major sources of biomass power.

7.2.4 Plasma gasification

In plasma gasification,[13] waste is fed to a reactor where it is exposed to an electrically generated plasma at a temperature of around 20,000°C. The waste is heated to over 2,000°C, causing organic compounds to break down to form molecules such as hydrogen, carbon monoxide, carbon dioxide, water vapour and methane. These gases flow continuously from the reactor to gas cooling and cleaning equipment. Ash and other inorganic material present in the waste melt to form a complex liquid silicate.

The gas from the reactor has a low to medium calorific value and is, therefore, suitable as fuel for a gas-fired generation unit. It can also be used as a feedstock for chemical processes such as methanol production.

[13] For a more detailed explanation, visit www.safewasteandpower.com/process.html

INDUSTRY EXAMPLES

8.1 MINIMISING ORGANIC WASTE

8.1.1 Catering supplier Pasta King

Food preparation at Pasta King's Devon factory consists of blending a unique tomato base sauce and custom-made béchamel sauce with other ingredients and packing the sauce for supply to caterers. The company made reducing waste a fundamental element of a recent rethink of its tomato processing line. This has two main stages:

1. The pasta sauce is blended in the preparation area with other ingredients (eg chicken, mushrooms and seafood) and vacuum sealed in a pouch.
2. The pouches are packed into cardboard boxes for supply, together with boxes of dried pasta, polystyrene cups and serving equipment.

The tomato sauce was previously purchased in 3 kg steel tins, which resulted in a high packaging to product ratio. In addition, the cost of cleaning the tins and the quality of the resulting effluent (which would have had a high organic load) made the cost of recycling prohibitive. The tins were, therefore, disposed of as general waste to landfill. In 2004, over 217,000 tins were landfilled.

At the end of 2004, Pasta King made changes to the production process and, after negotiations with its supplier, started to buy tomato sauce in 195 kg steel drums. The drums are emptied into a portable vat and the plastic liners placed in the general waste bin. The 'clean' drums are sent off-site for recycling.

The vat is taken into the kitchen where it is connected to a depositor system. Using a foot-operated switch, an accurate set volume of sauce is pumped from the vat directly into a pouch. This system has replaced the manual filling process, which was inaccurate and laborious.

Other ingredients such as chicken and seafood are now weighed carefully using accurate scales before being added to the pouch, which is then sealed. The previous manual mixing process was typically inefficient and resulted in high levels of wastage through spillage and over-filling.

Increased efficiency

Each tin contained residual sauce, which was disposed of together with the tin. Switching to re-usable drums is estimated to have saved £33,100 in the first year from reduced sauce wastage alone. For every 16-tonne delivery, 1 tonne of sauce was lost in yield. In addition, the faster and more accurate pouch-filling process has reduced unit labour costs and the lower packaging to sauce ratio allows a greater quantity to be supplied in a single load. This alone saved six articulated lorry loads in 2005.

Reduced waste disposal costs

The new process has substantially reduced the quantity of waste sent to landfill. In 2004, before the implementation of the improvement programme, the company sent

approximately 59 tonnes of steel tins and 37 tonnes of waste tomato sauce to landfill. With the drum and plastic liner system, 2.7 tonnes of plastic liner were sent to landfill in 2005 and 2,712 drums were taken away at no cost for recycling. Before the process changes, a waste contractor emptied the company's compactor 2 - 3 times per week at an average cost of £638/month. The compactor now only needs emptying every fortnight at an average cost of £347/month - a reduction of 46%.

The changes cost £150,000 but, with annual cost savings of £120,800 from reduced raw material and waste disposal costs, the payback period was only 15 months. Unit production costs have fallen by 33%. At the same time, production was increased by 49%.

More information

For full details of this and other waste minimisation initiatives at Pasta King, see Envirowise Case Study CS619 *Process improvement at catering supplier slashes production costs*.[14]

8.1.2 Salad supplier Natures Way Foods

Sussex-based Natures Way Foods, a member of the Langmead Group, supplies washed and ready-to-eat salad and salad meals to supermarkets and companies in the food service sector. The company carried out a waste review, invested in technology and improved working practices to minimise waste.

In the preparation hall, the outer leaves and core of the lettuces are removed and the inner leaves separated. The product then passes to the processing hall where it is washed, dried and packaged into plastic bags. The salad bags are then sealed and packaged for dispatch.

Waste minimisation initiatives included:

- **Reducing product wastage**. Any incorrectly sealed plastic bags and underweight bags are classed as 'rejects' and are retrieved. The bags are opened by operators and the product reclaimed. The salad is then repackaged to minimise wastage and the reject plastic packaging is segregated for baling and recycling. This method of reclaim and rework, together with improved batch forecasting to reduce overrun and investment in 'de-coring' technology, has reduced wastage significantly leading to an increase in product yield of 80%.
- **Composting green waste**. All green waste from the production process is collected for composting off-site. Although there is a charge for this service (£25,600 in 2005), this is considerably cheaper than disposal to landfill (estimated at £69,600/year), an annual saving of £44,000/year. The compost product is used as a soil conditioner on land owned by Langmead Farms which is considered suitable for organic farming. Annual applications have improved water retention, resulting in an improved weight per head of lettuce. Any leftover conditioner is used on wheat stubble for subsequent crops of lettuce.

[14] Available free of charge through the Advice Line (0800 585794) or www.envirowise.gov.uk

More information

For full details of the waste minimisation initiatives at Natures Way Foods, see Envirowise Case Study CS620 *Salad supplier increases yield and saves money by reducing waste*.[14]

8.2 TREATING ORGANIC WASTE

8.2.1 Swiss supermarket chain Migros

Migros is Switzerland's largest supermarket chain with more than 500 stores. It is a co-operative retailer and spans a number of sectors such as food, fuel, insurance and restaurants. Recycling food waste from the Migros network was seen as an important step forward in corporate responsibility.

The company worked with Kompogas AG and Erdgas Zurich AG to set up an operation to collect wastes from its hypermarkets in the Zurich area for recycling and energy recovery. Food waste such as out-of-date products and restaurant waste is collected by Migros and transferred to Kompogas for anaerobic digestion. The waste is digested in enclosed vessels, producing biogas, useful compost and liquid fertiliser. Fig 8 shows a typical Kompogas digester.

The biogas is processed to form compressed natural gas (CNG) so that it can be used as a vehicle fuel. From 1 tonne of food waste, Migros generates 130-150 m^3 of biogas (equivalent to 70-80 litres of petrol), 500 kg of compost and 300 litres of liquid fertiliser. Alternatively, the biogas can be used to fuel a CHP plant to generate electricity or processed for input to the gas main.

Migros runs a fleet of delivery vehicles using the biogas generated by its own food wastes (see Fig 9). The programme has reduced fuel costs by around 30% compared with running the fleet on diesel, with 100% reduction in food waste and 100% reduction of each vehicle's carbon dioxide footprint for delivery. Although the capital cost of the vehicles was around 4% higher, this was quickly offset by the saving in running costs.

Fig 8 A typical Kompogas anaerobic digester

Fig 9 Migros CNG-fuelled delivery vehicle at a gas filling station

Spurred by the success of Migros, other major food companies around Zurich (including McDonald's restaurants) now participate in food waste collection, digestion and biogas generation and CNG vehicle operation.

8.2.2 Tower Hotel in central Scotland

The Tower Hotel dominates the skyline of Crieff in Perthshire, central Scotland. Since taking over the hotel, the new owner Gilbert Edgar has made a major effort to improve the business's environmental impact with a concerted programme to segregate and recycle all the main waste streams, including:

- glass bottles;
- cardboard;
- paper;
- cans;
- kitchen waste and garden waste;
- vegetable oil;
- plastic milk bottles.

Within three months, the hotel was able to replace the 1,100-litre Eurobin collected twice weekly with a 360-litre bin collected once a week. This reduced annual disposal costs by £897. In the first year, some 35 m^3 of materials were recycled (18 m^3 glass, 4.5 m^3 cardboard, 1.25 m^3 paper, 5.25 m^3 cans, 2.5 m^3 organic kitchen waste, 0.45 m^3 vegetable oil and 2.5 m^3 plastic milk bottles). The total weight of these materials was 1.5-2 tonnes/month (some 25 tonnes/year). Glass is the main contributor (70% by both weight and volume).

Compost options

Under the previous ownership, vegetable waste had been composted along with weeds, grass and bush trimmings in three 'New Zealand' boxes at the bottom of the hotel's garden. After 12-18 months, the mature compost was dug into the vegetable plot at the beginning of each year.

However, this type of 'garden' composting is not generally suitable for the inclusion of food waste. In addition, the legislation governing commercial composting is quite complex. Where food residues and meat-related materials are concerned and where any resulting compost could come into contact with livestock or be moved to a neighbour or sold, then a slightly more sophisticated process may be required.

Aiming yet higher with its recycling efforts, the Tower Hotel worked with a local composting specialist to install a Rocket® enclosed in-vessel composter to accelerate and sanitise the composting process.

Vegetable waste from food preparation in the kitchen is carefully separated and collected in small (6-litre) kitchen caddies lined with biodegradable BioBags (liners made from corn starch). The BioBags are removed at the end of each shift for placing in the in-vessel composter together with an equal volume of garden waste.

A small quantity of a commercial enzyme supplement is sprayed onto the food waste to ensure optimal microbial performance. To be sure the material is hygienically treated, staff monitor the temperature inside the composter regularly.

The composter operates at a temperature of over 60°C. Heat levels are maintained by careful monitoring of inputs, temperature variation and moisture content and by automatically controlled frequent turning of the mix inside the vessel. The Rocket® uses less than four units of electricity per day and turns out composted material in around 14 days. The BioBags also break down, adding to the compost. The composter output is screened for size; material greater than 25 mm is returned for further composting and the finer fraction is stored for maturation for a further two months before use in the hotel grounds on both borders and the fruit/vegetable plot.

In the first year after its installation in July 2006, the Rocket® processed some 2.5 m^3 of vegetable waste (approximately 1.25 tonnes) from the hotel kitchen. Including garden waste, a total of 8.5 m^3 of waste weighing 2.5 tonnes has been processed (food waste constituted 28% by volume and 50% by weight) to give 3.4 m^3 of compost weighing 1.5 tonnes. Composting, therefore, achieved a 60% reduction in volume and a 40% reduction in mass. Analysis shows that the end-product compost is a useful material containing 1.5% nitrogen, 0.5% phosphate and 1% potash.

The number of waste bins awaiting uplift has fallen and smells have been eliminated because the bins now contain very little in the way of potentially odorous rotting matter.

The benefits to the hotel of the composting operation include:

- useful compost product for use on-site;
- lower waste disposal costs;
- reduced odour and health risk;
- reduced impact on the environment.

TAKE ACTION

Your approach to organic waste management is important. There are a number of choices but not all options are suitable for all situations and waste streams. To help you decide, use the questions below based on the waste hierarchy to give you answers about the best opportunities for organic waste minimisation, composting and related systems.

9.1 FOLLOW THE WASTE HIERARCHY

1. **Elimination** is the most cost-effective means of waste minimisation with the lowest environmental impact.
   - Are you purchasing the correct amount of raw materials?
   - Are raw materials of suitable specification for use?
   - Are raw materials pre-processed before you receive them to remove excess materials or obvious wastes?
2. **Reduce** the amount of organic waste where it cannot be eliminated.
   - Can processes be optimised to reduce organic wastes?
   - Can product yield be improved?
   - Can reject products be retrieved for reprocessing?
3. **Re-use** organic items as many times as possible to maximise their beneficial use.
   - Can organic waste streams be segregated?
   - Is there a neighbouring business that could re-use these materials?
   - Could the waste be fed to animals? But check first (see box below).

Can organic wastes be fed to animals?

Wastes subject to ABPR must not be fed to animals. These include catering wastes, former foodstuffs of animal origin or former foodstuffs containing products of animal origin.

For further information and a full list of banned wastes, visit:

- **www.defra.gov.uk/animalh/by-prods/wastefood/caterwaste.htm**
- **www.defra.gov.uk/animalh/by-prods/wastefood/formerfoodstuffs.htm**

Check with your local authority before feeding any food waste (including bread, cakes, pastry, biscuits, pasta, cereal and vegetable matter) to livestock.

4. **Recycle** what you can only after you have exhausted steps 1 to 3. These options are subject to the requirements of the ABPR.
   - Can you compost waste in a ‘back-door’ composter? Hotels, small restaurants, schools and organisations that can use the compost in their grounds should consider this option.
   - Are there waste management contractors that offer a composting or biogas facility? Significant opportunities exist for ABPR Category 3 wastes including raw meat and fish, former foodstuffs of animal origin and catering wastes.
   - Can wastes be reprocessed to manufacture new products such as waste vegetable oils for biofuels or waste animal fats for tallow?

5. **Disposal** of waste should only be considered as a last resort when steps 1 to 4 have been exhausted. Disposal represents the highest cost option and has the greatest environmental impact.
    - Certain very high risk wastes classified under the ABPR must be incinerated or rendered.
    - All other food wastes not subject to the ABPR and catering waste can be landfilled.
    - All organic waste must be treated prior to landfill. This could mean simply segregation and sorting by the producer, waste management contractor or landfill operator.

9.2 FREE HELP AND ADVICE FROM ENVIROWISE

For further information on organic waste minimisation and treatment options, contact the Envirowise Advice Line on 0800 585794.

Envirowise offers independent, practical and proven guidance through:

- a dedicated free Advice Line (**0800 585794**);
- information resources from case studies to good practice guides;
- events, seminars and exhibitions;
- an informative website (**www.envirowise.gov.uk**).

9.3 OTHER SOURCES OF INFORMATION

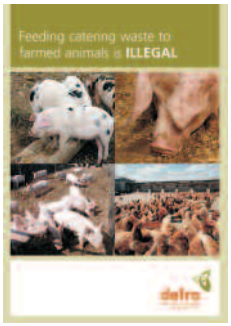
EU legislation on animal by-products (ABP) is implemented in slightly different ways in England, Wales, Scotland and Northern Ireland. The Government websites giving guidance on ABP are listed in Table 2.

Table 2 Government websites with information about animal by-products

Government	Website
Department for Environment, Food and Rural Affairs (Defra)	www.defra.gov.uk/animalh/by-prods/default.htm
Welsh Assembly Government	http://new.wales.gov.uk/topics/environmentcountryside/ahw/animalbyproductswaste/?lang=en
Scottish Government	www.scotland.gov.uk/Topics/Agriculture/animal-welfare/policies/PolicyInfo/AnimalByProducts/Introduction
Department of Agriculture and Rural Development (DARD) Northern Ireland	www.dardni.gov.uk/index/animal-health/animal-by-products.htm

Useful guidance documents and posters can be downloaded from the Defra website, including:

- www.defra.gov.uk/animalh/by-prods/wastefood/formerfoodstuffs.htm
  - *Think before you bin!*
- www.defra.gov.uk/animalh/by-prods/wastefood/caterwaste.htm
  - *Feeding catering waste to farmed animals is illegal*
  - *Catering waste must be disposed of safely (poster)*



- www.defra.gov.uk/animalh/by-prods/guidance/index.htm
  - *Disposal of animal by-products, including former foodstuffs of animal origin, from food outlets*
  - *Guidance on the treatment in approved composting or biogas plants of animal by-products and catering waste*

Table 3 lists other useful sources of information about the management of organic waste.

Table 3 Other useful sources of information

Organisation	Contact details
WRAP (Waste & Resources Action Programme)	Tel: 0808 100 2040 Web: www.wrap.org.uk
Environment Agency	Tel: 08708 506 506 (general enquiries) Web: www.environment-agency.gov.uk
Scottish Environment Protection Agency (SEPA)	Tel: 01786 457700 (Corporate Office) Web: www.sepa.org.uk
Environment and Heritage Service Northern Ireland	Tel: 028 9056 9353 (general waste enquiries) Web: www.ehsni.gov.uk
Association for Organics Recycling	Tel: 0870 160 3270 Web: www.organics-recycling.org.uk
Chartered Institution of Wastes Management	Tel: 01604 620426 Web: www.ciwm.co.uk
Renewable Energy Association	Tel: 020 7747 1830 Web: www.r-e-a.net
NetRegs	Web: www.netregs.gov.uk
Recycle Now	Web: www.recyclenow.com
Remade Scotland	Web: www.remade.org.uk

LEGAL EAGLE

Animal By-Products Regulations (ABPR) 2005

The Animal By-Products Regulations 2005 lay down rules in England for the collection, transportation, storage, handling, processing and disposal of animal by-products not intended for human consumption.

- Raw meat and raw fish were banned from landfill in 2003.
- Animal by-products are defined within three categories according to risk. Catering waste, former foodstuffs and raw meat and raw fish from food manufacturers and food retailers will usually be Category 3 materials - the lowest risk.
- It is important to make appropriate storage and collection arrangements for Category 3 materials because, if they decompose to the extent that they pose a health risk, they will need to be treated as Category 2 material and should not then be treated in a composting or biogas plant or used in pet food manufacture.

For more information see the Defra website (www.defra.gov.uk/animalh/by-prods/default.htm).

The Devolved Administrations are responsible for ABP policy in Scotland, Wales and Northern Ireland where separate sets of regulations apply.

Producer Responsibility Obligations (Packaging Waste) Regulations

Under the Packaging Waste Directive, the UK must recover 60% of all packaging waste by 31 December 2008 as well as meeting a number of other targets for individual packaging materials.

- Any company involved in the packaging supply chain that has a turnover of more than £2 million, or which handles more than 50 tonnes of packaging each year, has an obligation under the Regulations and is said to be 'obligated'. This obligation depends on the amount of packaging it places on the market.
- Companies must purchase enough packaging waste recovery notes (PRNs) or their export equivalent (PERNs) to meet their obligation.
- Obligated companies can sign up to compliance schemes that organise PRNs and other legal requirements for them, or purchase PRNs/PERNs themselves from accredited reprocessors and exporters.
- PRN/PERN prices are determined by supply and demand.

For more information see the NetRegs website (www.netregs.gov.uk/netregs/275207/275453/).

Landfill Regulations

Under the Landfill Regulations, waste producers must segregate waste to ensure they do not send banned wastes to landfill sites.

Waste producers are responsible for making sure that landfill sites receiving their waste have an appropriate licence or permit for managing that waste type.

Since October 2007, liquid wastes have been banned from landfill.

For more information see the NetRegs website (www.netregs.gov.uk/netregs/275207/663559/).

Duty of Care

Waste materials (including organic waste) produced as part of your business or within your workplace are regulated by law. As a business, you have a duty to ensure that any waste you produce is handled safely and in accordance with the law. This Duty of Care applies to anyone who produces, imports, carries, keeps, treats or disposes of controlled waste from business or industry or acts as a waste broker in this respect.

Your business has a 'duty' to take all reasonable measures to ensure:

- all waste is stored and disposed of responsibly;
- waste is only handled or dealt with by individuals or businesses authorised to deal with it;
- a record is kept of all waste received or transferred through a system of signed Waste Transfer Notes.

For more information see:

- NetRegs website (www.netregs.gov.uk/netregs/275207/275430/);
- Defra website (www.defra.gov.uk/environment/waste/legislation/duty.htm).

Waste Management Licensing

You may need a Waste Management Licence if you:

- deposit waste;
- keep waste, ie store waste that you did not produce;
- treat waste (including recycling and using mobile plant);
- dispose of waste.

Whether you need a licence will depend on the:

- duration of storage;
- types and quantities of wastes handled;
- activity carried out on site.

Even if your activity is exempt from licensing:

- you may need to register with your environmental regulator;
- your activity will still be subject to controls to prevent pollution and harm to human health.

You must meet additional requirements if you collect, transport, store, handle, process or dispose of animal by-products or catering wastes that are not intended for human consumption.

If in doubt about whether your activity requires a Waste Management Licence or an exemption, and if that exemption needs to be registered, contact your environmental regulator.

Visit NetRegs (www.netregs.gov.uk/netregs/275207/276510/1677021/) for more information.

For the latest information on environmental legislation governing the management of organic waste and any regional variations, contact the Envirowise Advice Line (0800 585794) or your local regulator.

Envirowise - sustainable practices, sustainable profits. Envirowise is a Government-funded programme dedicated to putting the sustainable use of resources at the heart of business practice. It is managed by AEA Technology plc and Serco TTI. Envirowise is funded by Defra, the Scottish Government, the Welsh Assembly Government and Invest Northern Ireland.

Envirowise offers a range of free services including:

- **Free advice from Envirowise experts through the Envirowise Advice Line.**
- **A variety of publications that provide up-to-date information on waste minimisation issues, methods and successes.**
- **Best practice seminars and practical workshops that offer an ideal way to examine waste minimisation issues and discuss opportunities and methodologies.**

envirowise ADVICE LINE 0800 585794

Harwell Didcot Oxfordshire OX11 0QJ **E** advice@envirowise.gov.uk **www**.envirowise.gov.uk