## WASTE TERMS, FIGURES AND COMPOSITION

**Household Waste:** all waste, including recyclables, collected at the kerbside by the district councils, and at bring sites and household waste recycling centres operated by the county council. It also includes garden waste, litter and household clinical/hazardous waste.

**Municipal Solid Waste (MSW):** includes household waste and other waste such as grass and leaves from municipal parks and gardens, rubble, fly-tipped materials, bulky household waste, commercial and industrial waste.

**Biodegradable Municipal Waste (BMW):** the part of MSW which can be degraded by plants and animals. It includes food and garden waste, paper and card, and a proportion of other wastes such as textiles.

**Residual Waste**: the amount left over after recycling and composting.

*As the waste planning authority*, Buckinghamshire County Council has to plan for all waste, 2.5 million tonnes of waste a year. The total figure is made up of:

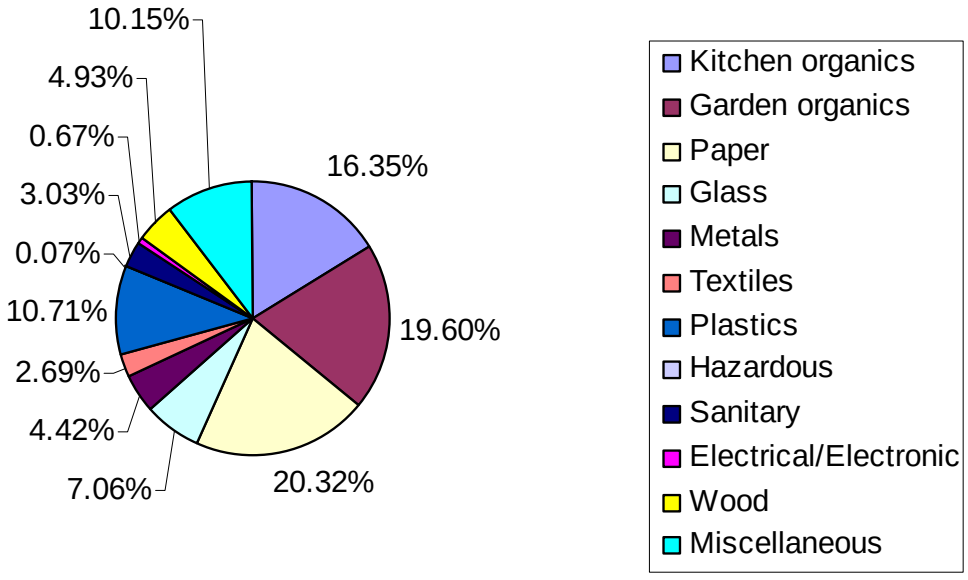
- 0.94 million tonnes of commercial/industrial waste
- 1.04 million tonnes of construction/demolition waste
- 0.26 million tonnes London waste (which we are obliged to take, like the other counties that neighbour London, although we expect this London waste to reduce long-term)
- 0.27 million tonnes of municipal waste.

*As the waste disposal authority*, Buckinghamshire County Council has to dispose of or treat 270,000 tonnes of municipal waste produced in the county.

Our waste disposal strategy is recycling-led and the priority for the council is to recycle and compost as much waste as possible. Our current performance is good at 43% but we still have ambitious recycling targets of 45% by 2010/11, 55% by 2020/21 and hope to achieve 60% by 2025/26.

Around 70% of our current household waste is biodegradable (food, paper, cardboard and garden waste) and so it is affected by the UK's Landfill Allowance Trading Scheme. This means that the council must find other ways to dispose of this waste left over after recycling and composting instead of sending it to landfill. Any of this waste sent to landfill will incur fines of £150 for every extra tonne sent. Waste composition for Buckinghamshire is based on a calculation using data from a waste audit undertaken in District Councils and HWRCs. For 2007/08 our waste was made up of:

### Bucks Districts & HWRCs waste composition audit 2007/08



## What do Energy from Waste facilities look like?

We cannot say what the EfW facilities being proposed by Covanta and WRG will look like because the designs for these will not be finalised until the planning application stage. However, we can show you some photographs from other EfW plants around the world. These demonstrate the wide range of design possibilities from the sleekly modern in the UK and France, through neo-classical in Japan to the unique Vienna plant designed by Hundertwasser, in the centre of the city.

In 2005 there were 418 EfW plants operating in 18 western and central European countries. These sites process around 58.5 million tonnes of waste a year. They generated enough energy to supply seven million households with electricity and 13.4 million households with heat a year. To provide the equivalent energy from conventional power generators would mean that up to 32 million tonnes of fossil fuels would have to be used. (CEWEP)

Countries known for their high recycling rates also use EfW. For example, Denmark has 30 EfW plants and recycles 40% and incinerates 50% of their waste with the rest going to landfill. In the Netherlands, there are 11 EfW facilities, they recycle 50% and incinerate 40% of their waste. Around 23 EfW plants already operate in Britain.

Marchwood, Hampshire

Rouen, France

Saitama, Japan

Spittelau Incinerator, Vienna, by Nicolas Janberg

# New Waste Technologies Explained

## Anaerobic Digestion (AD)

Anaerobic digestion is a biological process where biodegradable wastes like garden and kitchen waste, are converted into a 'digestate' (containing biosolids and a liquid) and biogas. The wastes are decomposed by bacteria in the absence of air; this is a key difference compared to composting techniques. In AD systems, the biodegradable material is broken down in an enclosed vessel under controlled conditions. The decomposition of the material leads to a methane-rich biogas which can be collected and burned as a fuel to produce electricity. The solid/liquid digestate can be used as a biofertiliser subject to quality checks. AD is most suitable for source-separated kitchen waste as the process required wet feedstock (waste). It is not well suited for mixed MSW as the process is sensitive to fluctuations in waste composition and acidity/alkalinity (pH).

## Advanced Thermal Treatment (ATT)

There are a wide variety of Advanced Thermal Treatment systems incorporating emerging technologies to treat municipal solid waste (MSW). These systems involve pyrolysis and/or gasification processes.

**Pyrolysis**: this often incorporates gasification. It is a thermal process which breaks down organic-derived materials in waste under the action of heat in the absence of oxygen. Only carbon-based material can be pyrolised (e.g. plastics, paper). Where MSW is to be treated, it needs to be pre-sorted to remove non-organic materials (such as metals) and may be mechanically processed too, to homogenise the resulting waste before it is processed by the system. Pyrolysis produces a synthetic gas called 'syngas' which may be condensed to produce an oil. The gas and oil may be used as a fuel. Flue gas cleaning measures are required for pyrolysis facilities. The process also produces a solid (Pyrolysis char) which may need specialist disposal or additional processing, for example by gasification.

**Gasification**: in this process, air or oxygen is used to partially burn the waste to achieve higher temperatures. It is equivalent to the process that was used to produce town gas from coal. Additionally, water is added to the gasifier, either as steam or as water included in the waste feedstock. At these high temperatures, the water 'cracks' into hydrogen and oxygen. The oxygen reacts further with the carbon in the feedstock waste. The difference between pyrolysis and gasification is the high concentration of hydrogen in the gas produced by gasification. As with pyrolysis, the gas produced can be burned to generate electricity.

**Plasma Gasification (PG)**: plasma uses high temperatures to convert waste. The heat source is the result of collisions between charged particles giving off heat and an arc of light (similar to lightning) called Plasma. There are five distinct categories of plasma systems for waste management purposes, including plasma gasification (not to be confused with plasma pyrolysis). Plasma gasification has two variants, depending on whether the plasma torch is within the main waste conversion reactor or external to it. PG is carried out under oxygen-starved conditions and its outputs are a glass-like material (vitrified slag), synthetic gas (syngas) and molten metal. PG generates secondary wastes such as gaseous emissions which would usually have to be abated. Systems designed to produce clean syngas generate a liquid effluent requiring treatment. The outputs from PG may be used as follows: the vitrified slag may be used as an aggregate in construction; the syngas may be used in energy recovery systems or as a chemical feedstock; and the molten metal may have a commercial value depending on quality and market availability.

## Energy from Waste (EfW)

Energy from Waste is a general term for facilities that combust waste under monitored, controlled conditions to reduce its volume and its hazardous properties, and to generate electricity and/or heat. The majority of EfW plants in the UK are designed to take significant quantities of municipal solid waste (MSW) with no need to pre-treat the waste before processing. EfW plants have process control measures for emissions and extensive equipment for continuous cleaning of flue gases. There is also a requirement to deal with the residues of the combustion process. There are two main residues from thermal treatment systems: the bottom ash, which is the solid remains of the waste after processing; and the flue gas treatment residues also called Air Pollution Control residues (APC). Some of these APC residues are classified as hazardous waste because they are extremely alkaline, not because they are toxic. Although applications to use these residues are

emerging, they currently have to be disposed of as hazardous waste. The bottom ash may be recycled into appropriate construction applications and metals may be recovered from it too.

Within EfW, there are three main types of technology applied: Moving Grate, Fluidised Bed and Oscillating Kilns.

**Moving Grate Plants**: most modern EfW plants tend to be of this type where the waste is slowly propelled through the combustion chamber by a mechanically moved grate. Waste continuously enters at one end of the chamber and ash is continuously discharged at the other. As the waste moves through the chamber, it undergoes complete combustion.

**Fluidised Bed Technology:** involves pre-sorting MSW to remove heavy and inert objects like metals, prior to processing. The waste is then mechanically processed to reduce the particle size. Combustion is normally a single stage process and consists of a lined chamber with a granular, bubbling bed of an inert material such as coarse sand. This bed is 'fluidised' by air being blown vertically through it at a high flow rate. Waste moves through the combustion chamber by the action of this fluidised bed. This technique is widely applied to sewage sludge.

**Oscillating Kilns**: these move waste through the combustion chamber by a 'rocking' or oscillating action, shuffling the waste through a sloping combustion zone.

## Mechanical Biological Treatment (MBT)

Mechanical Biological Treatment is a generic term for several integrated processes commonly found in other waste management operations such as materials recovery facilities, sorting and composting plants. In its simplest form, MBT provides drying and bulk reduction for mixed waste prior to landfill. Other MBT systems are designed to treat and separate out municipal solid waste (MSW) in useable proportions for materials and/or energy recovery. MBT plants are designed to handle raw MSW. Depending on the configuration, MBT plants may produce the following outputs: biogas, soil conditioners, recycleable materials and refuse derived fuel (RDF). Where outputs are designed for soil conditioning, they will be subject to regulation.

## Mechanical Heat Treatment (MHT)

Mechanical Heat Treatment is a pre-treatment system and may use a thermal or steam-based process before the mechanical separation of municipal solid waste (MSW) into more useable fractions. A common way to treat the waste is to use an autoclave.

**Autoclave**: this technology has been used for many years to sterilise hospital waste. It is basically a steam treatment process and may be used where, for example, shredded MSW is processed in a pressurised steel drum under the action of steam. This reduces the waste to a 'flock', with metals and glass partially cleaned for extraction as recyclable materials. The process may melt plastics making them more difficult to recycle in some cases. The remaining material may be sorted and thermally treated as a type of Refuse Derived Fuel (RDF) or used as a raw material in recycling applications, if and where markets are available for this application.

You will find more information about new waste technologies on the internet at:
http://www.defra.gov.uk/environment/waste/residual/newtech/index.htm

Processing and treating unsorted municipal waste will always produce a residue (either treated waste or ash) requiring landfill disposal. For information about the differences between municipal and household waste please see the Waste Terms, Figures and Composition information sheet.

## Glossary of Waste & Waste-related Abbreviations

| | |
|---|---|
| AD | Anaerobic Digestion (in the absence of oxygen) |
| APC | Air Pollution Control |
| ATT | Advanced Thermal Treatment |
| BMW | Biodegradable Municipal Waste |
| CA | Civic Amenity Site |
| DEFRA | Department for Environment Food and Rural Affairs |
| EA | Environment Agency |
| EC | European Commission |
| EfW | Energy from Waste |
| EIA | Environmental Impact Assessment |
| EPA | Environmental Protection Act |
| HWRC | Household Waste Recycling Centre |
| IPPC | Integrated Pollution Prevention and Control |
| IVC | In-Vessel Composting |
| LATS | Landfill Allowance Trading Scheme |
| MBT | Mechanical Biological Treatment |
| MRF | Materials Recovery Facility |
| MSW | Municipal Solid Waste |
| RDF | Refuse Derived Fuel |
| WCA | Waste Collection Authority |
| WDA | Waste Disposal Authority |
| WID | Waste Incineration Directive |
| WPA | Waste Planning Authority |
| WRAP | Waste and Resources Action Programme |