

Alternatives to Landfill



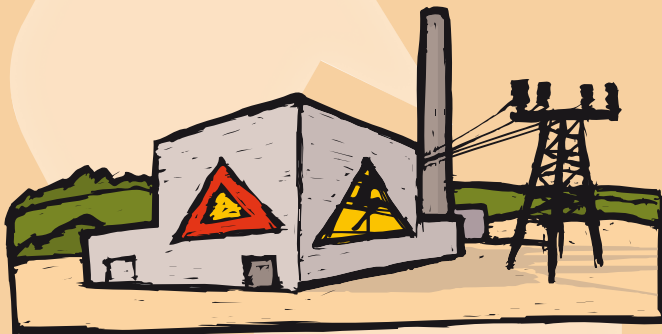
There are a growing range of established and new technologies, which offer an alternative to landfill, and recover value from the waste.

Thermal Treatment

Energy from Waste Plants (EfW)

What is an energy from waste plant?

Incineration of waste can be done with or without the recovery of energy. Incineration at energy from waste plants minimises the amount of rubbish going to landfill by reducing it to ash. This has the advantage of only a fraction of the original rubbish needing to be landfilled and the burning of the waste materials is used to generate electricity. This method of creating electricity has a minimal environmental impact



How does an energy from waste plant work?

The Process

The rubbish lorries enter the plant and tip the contents of the trailer into a huge pit, which is used as a storage area for the rubbish (now fuel) that will feed the boilers. It is important that the burning rubbish produces an even temperature so the rubbish is mixed when it is in the storage pit by a grab (the kind sometimes seen suspended from cranes). The grab then passes the waste to the grate feed chute

The most widely used process is 'mass burn' technology. This is where the rubbish is burnt on a moving grate. Air is normally injected both above and below the grate to make sure that the rubbish is burnt properly

The inside of the boiler's combustion chamber is filled with metal pipes, which are filled with water. The heat produced by the burning of the rubbish heats the water in the pipes and turns it into superheated steam (400°C). The steam is used to turn the blades of a turbine. The rapid rotation of the turbine is used to turn an electromagnet in a generator, it is this turning of the electromagnet that produces the electricity. Normally about 10% of the electricity produced is used in running the plant with the rest being available to sell outside¹

The steam, which has turned the turbines, is then cooled by fans turning it back into water. The water is then returned to the pipes to begin the process once again

After everything has been burnt the combustion chamber contains mainly ash - this ash is known as 'incinerator bottom ash'. The ash is tipped off the end of the grate into a water filled 'quench pit'. It is then removed for further treatment before it can be recycled. The 'incinerator bottom ash' is graded into different sizes and is sold to the construction industry where the material is used instead of primary aggregate for road building and other projects

Atmospheric Emissions

Controls over emissions from EfW plants are very strict and many measures are taken to stop pollution from occurring. Lime is injected into the gases produced from the burning rubbish to neutralise the acid gases; this is known as scrubbing. Carbon is also injected to remove some other nasty elements like mercury which is extremely poisonous. Special filters called electrostatic precipitators are used to remove the very fine dust known as 'fly ash'

Due to the level of contaminants in fly ash it qualifies as a 'special waste' and must be handled and disposed of in a controlled manner to a hazardous waste landfill site

Finally any combustion gases are dispersed into the atmosphere through the smoke stack. The height of the chimney helps to ensure that remaining pollutants in the gas stream do not reach the ground in a concentration which could possibly be harmful

The amount of waste at the end of the process amounts to 10% of what it was at the beginning and it has generated electricity, which can be sold on to customers. Energy from EfW plants reduces the need for fossil fuels such as oil and coal. The rubbish has a calorific value a third of that of coal. Every 1MW of power generated by EfW plants cuts carbon emissions by 1,000 tonnes, but it takes 14,286 tonnes of waste to generate 1MW of power

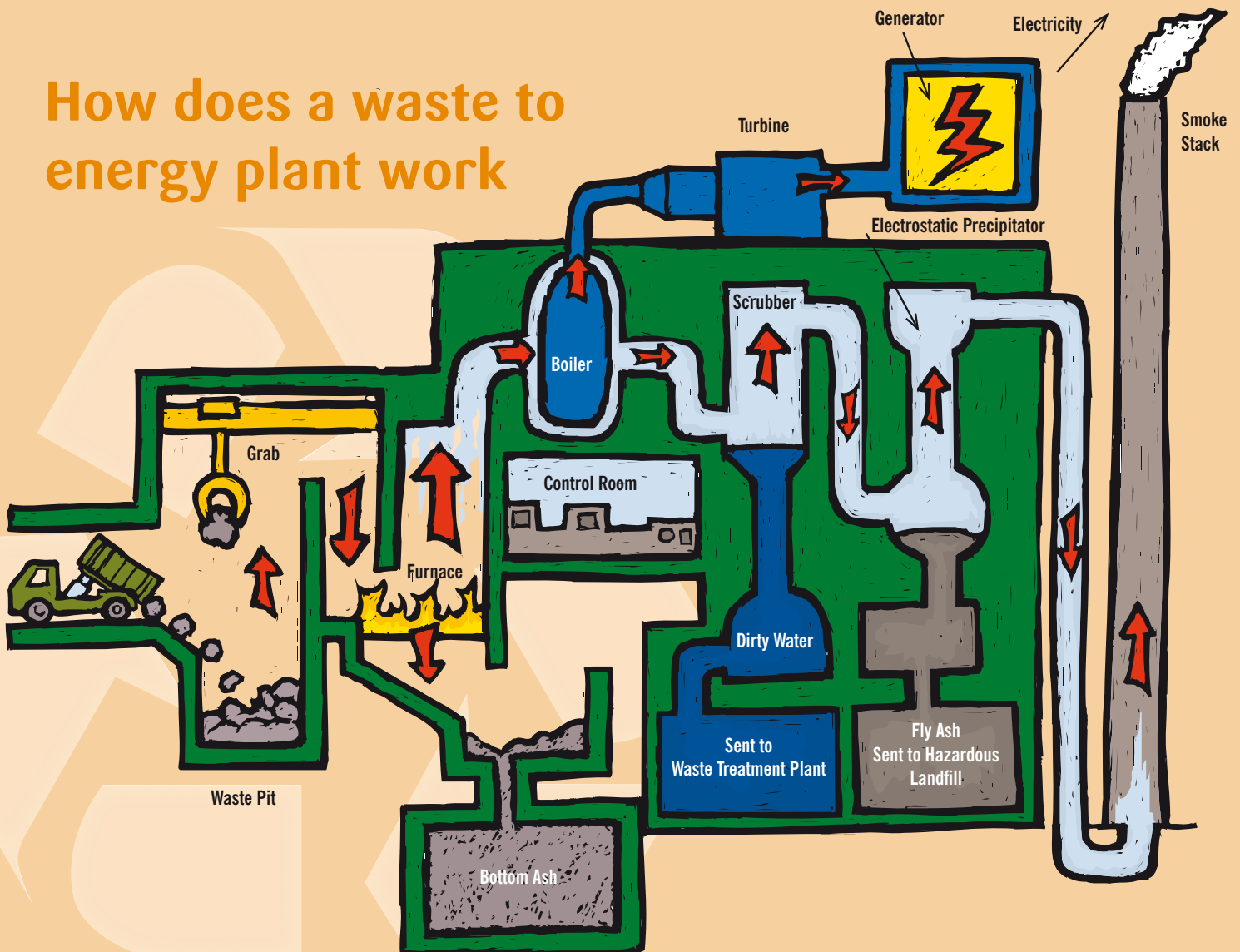
Weblinks

- <http://www.sita.co.uk/what-we-do/energy-from-waste>
- Description and video of the process
- <http://www.integra.org.uk/facts/extrafacts/energyinc.html>
 - The Process
 - History
 - Current Developments
 - Alternative Technologies
 - Emissions

References

- ¹ www.integra.org.uk/facts/extrafacts/energyinc.html

How does a waste to energy plant work



Pyrolysis

Pyrolysis is a thermal process where high temperatures (of around 500°C) are used to break down waste in the absence of oxygen

The process produces three end products; char (or ash), bio-oil and a synthetic gas. The solid char contains valuable carbon and mineral materials, which can be processed further to release this energy. The bio-oil can be used to fuel power stations and the gas is a clean fuel, which has a high calorific value

Gasification

Gasification is a similar process to pyrolysis whereby the same three products are produced. Gasification however uses higher temperatures of around 2000°C and unlike pyrolysis uses controlled amounts of oxygen and water in the process

Gasification produces a gas called Syngas, which can be used as an alternative to fossil fuels, such as coal, in generating electricity

Biological Treatment

Anaerobic Digestion

Anaerobic Digestion is a process similar to composting which can treat all of our organic material

Organic waste is taken to a specialised processing plant and placed in an enclosed chamber for 10-25 days under controlled conditions. Anaerobic means in the absence of oxygen, which is the main difference between this process and composting. The absence of oxygen makes the waste decompose rapidly due to the bacteria that thrive in these conditions. This process produces biogas and a solid material called a digestate

Biogas can be used as a fuel to make electricity. Many sewage treatment facilities use this process and the gas produced is used to heat and power the sewage plant

The digestate can be separated out into fibre and liquor. The liquor can be used as agricultural fertiliser and the fibre is used as soil conditioner



MBT - Mechanical and Biological Treatment

MBT systems fall into 2 categories:

Mechanical Treatment followed by Biological Treatment

Mechanical treatment removes glass, plastics and metals from household waste, these materials can then be recycled. The remaining fraction will then consist mainly of organic waste, which then enters the next stage of the process

The biological treatment can incorporate anaerobic digestion or composting. The volume of organic waste is reduced to produce a compost-like product, although this would not be the same quality as the compost you use in your garden

Biological Treatment followed by Mechanical Treatment

The waste is shredded and dried, it is then mechanically sorted. Metals are removed using magnets and sent for recycling. Glass and grit are also removed and can be used for aggregate

The dried organic waste can be used as landfill cover or can be made into pellets, which can be used as fuel