

Food waste recycling

Power from potato peelings

Food waste is generated by virtually every household and has to be got rid of, but a debate is raging about how this should be done. In some parts of the country, food waste bins have been used for a few years now...but what is a food waste bin like and what happens to the collected scraps?

In most places which collect this type of refuse, households have two food waste bins. The smaller one is designed to be kept in the house and have the rubbish put into it as it is generated. The bin is lined with a compostable liner rather than a standard plastic bag. These are not inexpensive and are made from a special plastic which can decompose much like the food waste. These bags are then emptied into the larger bin which is kept outside. This has a lockable lid to keep out animals. In warmer weather the inside bin needs to be emptied more frequently to prevent smells and flies, but it is not unpleasant.



A kitchen food waste container

There are various ways of dealing with the collected waste. In Oxfordshire, the food waste is collected and then sent to an **anaerobic digestion** plant for treatment.

Anaerobic digestion

Anaerobic digestion uses **methanogenic bacteria** to break down the food waste. This produces biogas which is mainly methane. The gas is collected and can be used as a fuel, to produce transport fuel or to generate electricity. At the Oxfordshire plant, electricity is generated from the methane on site.

On arrival

Delivery lorries bring the waste onto the anaerobic digestion site. They enter a large building which has a negative pressure (which ensures air will tend to enter rather than leave) and doors which open and close very quickly. The air in this building is changed 2 or 3 times an hour and is passed through a filter and an alkali scrubber to remove acidic gases before being released. This helps to prevent any bad smells escaping and polluting the local atmosphere.



A lorry load of food waste arrives at the plant

Key words

composting

bacteria

anaerobic digestion

methane

methanogenic means
methane-producing

The food waste then needs to be treated prior to being fed to the bacteria. This is necessary to separate out contaminants such as plastics which the bugs cannot digest as well as to break the food down into small pieces. The solid waste is passed through a macerator. This breaks all of the incoming material down into smaller bits and produces a gloopy 'soup.' The gloop is left in a settling tank where the heavier fragments sink to the bottom and can be removed. This includes denser materials such as metals, glass and grit.

Blending

The material that is fed to the bacteria needs to be carefully controlled to ensure that they stay in optimal health to achieve the best break down of the material. To achieve this, the materials which will be fed into the digester are analysed regularly.



Food waste being macerated

As the processing facility can accept a wide variety of wastes, the material going into the digester sometimes needs to be supplemented with **silage**. This is an energy crop which helps to stabilise the composition of the material. It also produces a high yield of gas.

The material is then pasteurised by being heated to 70°C and the temperature held there for an hour. Similar to the process for pasteurising milk, the aim of this is to kill unwanted bacteria and reduce the risk to health. The sludge can be passed warm into the digesters to help keep the bacteria in them at optimal temperature.

The digesters

Anaerobic digestion relies on living organisms: bacteria. If they are not looked after well they will die and the plant will cease to function. New cultures of suitable bacteria can take 3 months to grow.

The digestion takes place in large concrete tanks and here the methane begins to be produced. The tanks hold up to 4200 m³ of waste and are heated to the optimal temperature of about 40°C. The tank has a double membrane for the roof. This allows the methane to be stored above the digesting material. The inner membrane fills and empties as methane levels rise and fall while the outer membrane is fixed and protects the interior from the weather.

The waste is chopped up again and re-mixed before spending further time in a digester. Altogether waste spends around 120 days being digested.

Box 1 - What they say

'The government has no plans to force households to put food scraps into slop buckets.'

Caroline Spelman,
Government Environment
Secretary

'Calling the food waste container a 'slop bucket' is ill-worded and provocative for a system which is sensible and positive.'

A voter

What do you think?



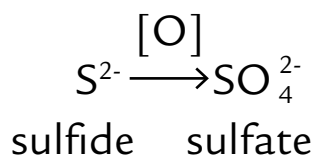


Two of the digesters at the anaerobic digestion plant

Generating electricity

The point of the plant is not just to get rid of food waste, but to turn it into something useful. The gas is used in the generation of electricity in gas turbines. The biogas produced in the digesters is not pure methane, though. It naturally contains other gases which contaminate it and may harm the turbines. These include sulfides such as hydrogen sulfide which must be removed before the gas is pumped to the turbines.

The sulfides are removed by being oxidised to sulfates:



The sulfates will form solids which will not contaminate the gas. The sulfides can be oxidised to sulfates by adding oxygen or another suitable oxidising agent into the methane.

When it is clean enough, the gas can be passed to the generators. The gas turbine engine burns the methane from the biogas to drive a generator. The output of the generator is dependent on the speed at which the gas turbine turns. The electricity produced is used for all the power needs of the plant and also supplies enough energy to the national grid to power 4200 homes.

If more gas is produced than the gas engines can cope with then the excess biogas is burnt at a flare stack some distance from the plant.

The gas engines have a cooling system and hot water from this is used to heat the pasteurisation tanks and to keep the digesters at the optimal temperature.

The gas engine is in a soundproof building to minimise noise disruption to those living nearby.

It is estimated that wasting food costs the average family with children £680 a year.



The effect of the digested waste as a fertiliser. The dark green area shows the strong growth where the fertiliser has been sprayed.

The left over waste is kept in special tanks. When it conforms to regulation standards and at the right time of year it can be used as a fertiliser on agricultural land. This then helps a new generation of food crops to grow, which in time end up in kitchen waste bins....

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