MICROBIOLOGY SOCIETY

BRIEFING

Energy from Food Waste

- In the UK, around 40% of food waste ends up in landfill.
- Biodegradable landfill waste is a major contributor of greenhouse gases.
- Anaerobic digestion (AD) can be used to convert this waste to energy.

SUMMARY

When organic waste, including kitchen and garden refuse, is sent to landfill it is broken down naturally by micro-organisms. This process releases methane, a greenhouse gas (GHG) 34 times more potent than carbon dioxide, and represents the loss of a valuable energy resource.

AD is a technology that efficiently breaks down organic matter (biomass) to produce biogas. The biogas can be combusted to produce electricity and heat, or can be converted to pure biomethane to be used in the mains gas grid, or as a renewable transport fuel.

Until recently, the UK AD industry has largely been limited to sewage sludge and wastewater feedstocks. However, the introduction of financial and policy incentives have seen the industry expand to process farm slurries, industrial waste, food crops and, crucially, food waste.

WHAT IS ANAEROBIC DIGESTION?

AD takes place inside a sealed tank or digester, where a community of anaerobic micro-organisms breaks down the biomass in a controlled environment, producing biogas comprised of methane, carbon dioxide and other trace gases. The processed organic matter remaining after AD is called digestate.

The biogas produced by AD can be combusted on-site in a combined heat and power (CHP) generation process, producing renewable electricity and heat at high efficiency. The most efficient plants are able to run on 8–9% of their electricity output, meaning that more than 90% is available for the national grid.

A typical food waste AD plant can generate up to 900 cubic metres of biogas from one tonne of dry organic matter; this is enough biogas to produce 1,800 kWh of renewable electricity – more than half the average annual consumption of a UK household.

Alternatively, the biogas can be purified to produce high-quality biomethane for use as a renewable transport fuel, or for injection into the mains gas grid. Biomethane is particularly in demand for heavy goods vehicles, for which there is no alternative renewable fuel available at present.

The digestate that remains after AD can also be a valuable output, when used as a biofertiliser. Its use can support food production and can further contribute GHG emission reductions by reducing our reliance on energy-intensive manufactured fertilisers.

TEG ENVIRONMENTAL DAGENHAM PLANT

- £21 million plant located in Dagenham, officially opened April 2014.
- First project funded by the Green Investment Bank.
- Joint food waste AD and green waste composting facility.
- Capacity to process 30,000 tonnes of food waste, collected from households and businesses.

FOOD WASTE TARGETS

Despite the availability of AD technology, of the 14.8 million tonnes of food waste produced by the UK each year, around 40% still ends up in landfill.

To meet EU targets, by 2020 the UK needs to reduce the amount of biodegradable municipal waste sent to landfill each year to 35% of 1995 levels, while also recycling 50% of household waste.

The Vision 2020 campaign claims that achieving zero food waste to landfill could save UK households, businesses and the public sector £17bn per year, reduce GHG emissions by 27m tonnes, and generate enough electricity to power 600,000 homes.

CHALLENGES

Although food waste AD technology is maturing, its full potential is not being realised due to inefficient collection and source segregation of food wastes.

Variable recycling efficiencies between local authorities could be addressed with more centralised and coordinated waste management schemes. For example, regional food waste procurement and treatment hubs introduced as part of the Welsh Government's food waste programme have been effective in securing sufficient waste volumes for AD plants.

It is also important to highlight the resources already available to local authorities. The Food Waste Resources Portal (WRAP) offers research findings and information on waste collection and AD feedstocks to help inform decisions on waste management systems.

A further challenge is that tax incentives to divert waste from landfill have led to reduced collection costs and a preference for cheaper Energy from Waste by incineration, rather than organic waste segregation. Consequently, the AD industry could face feedstock shortages in the future.

FOOD WASTE REDUCTION

Reducing food waste should always be a priority, with food charities acting as the first port of call when dealing unused edible food.

Supermarkets, working with the Food Standards Agency and other relevant bodies, have a big part to play in reducing food wastage. For example, the labelling of products with use-by, sell-by and best-before dates needs to be clearer. Deals and promotions offered by supermarkets also need to be reassessed because these may increase food wastage.

However, a certain level of food waste will always be unavoidable. Fortunately, AD provides an economically viable and sustainable approach for diverting much food waste from landfill and incineration, benefitting both the environment and the UK bioeconomy.

FINANCIAL INCENTIVES

Since the abolition of the Landfill Allowance Trading Scheme a sharp tax escalator on Biodegradable Municipal Waste was introduced to maintain incentive for diverting organic waste from landfill, with a floor placed under the 2014 rate of £80 per tonne.

The Renewables Obligation and Feed-In Tariff schemes, which require energy suppliers to produce a set proportion of electricity from renewable sources each year and pay a tariff per unit to those generating their own clean electricity, have been integral to the growth of the AD industry. Indeed, growth was sufficient to trigger a digression in the Feed-In Tariff incentives in 2014.

Additionally, the Renewable Heat Incentive has been important for driving growth in the market, rewarding AD operators who use the heat generated from CHP on-site.

SELECTED REFERENCES

- **DEFRA (2011).** *Anaerobic Digestion Strategy and Action Plan.*
- **DEFRA (2011).** *Government Review of Waste Policy in England.*
- **Ofgem (2011).** *Factsheet 96: Typical domestic energy consumption figures.*
- **ReFood (2013).** *Vision 2020: UK roadmap to zero food waste to landfill.*
- Food Waste Resources Portal. WRAP. www.wrap.org.uk/content/food-waste-resources-portal.

MICROBIOLOGY SOCIETY BRIEFINGS

The Microbiology Society highlights important issues relating to microbiology to policy-makers and the general public. It does this through a range of activities, including events and issuing topical briefing papers. Through its diverse membership, the Society can offer impartial, expert information on all areas of microbiology. Find out more at microbiologysociety.org.

Contact: Policy Officer, Microbiology Society, Charles Darwin House, 12 Roger Street, London, WC1N 2JU, UK. Tel. +44 (0)20 7685 2400; email policy@microbiologysociety.org.

Thanks to Richard Clubbe, who authored this briefing, and the following individuals for their advice: Charlotte Morton and Matt Hindle (Anaerobic Digestion and Bioresources Association), Andrew Needham (Biogen), Cecilia Fenech and Stuart Wagland (Cranfield University), Jan Gronow (Imperial College London), Dean Pearce (ReFood), Beth Rounsefell (Tamar Energy), Adam Szilagyi and Sam Smith (TEG Environmental), Tal Maynard (Welsh Waste Programme).

Issue date: 12 January 2015