In the next issue

In our first issue we looked at how rainwater can be collected and re-used for domestic and commercial use. There is another potential source of water that could be re-used and recycled – industrial wastewater. In our next issue we'll look at ways of treeating industrial effluent to a standard where it can be re-used. All in:

BWC Business Issue 3

Blackwell Water Consultancy Ltd News

• BWC signs effluent treatment consultancy contract

Blackwell Water Consultancy Ltd has recently signed a contract to provide consultancy about treating high-strength effluent. The client produces a small volume of strong waste comprising a very complex mixture of chemicals. Our brief is to identify suitable treatment technologies.

• Blowing our own trumpet.....still

We've created a download section on our web-site. Over the coming months we'll post technical articles that are free to download. As a starter, we've included a paper about estimating the organic load of effluent, something closely related to the theme of this issue.

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BWC Business

In this issue

Welcome to the 2nd edition of BWC Business

This is our second edition and we hope you find it useful and informative. We'll publish an issue every three months, with the next one due week commencing 14th December, 2009. Each issue will have a main feature on one topic. This month it's wastewater problems in the food industry. In December we'll look at how industrial effluent can be recycled and re-used.

Who we are

Blackwell Water Consultancy Ltd is based in north-east England but operates throughout the UK. We give advice to businesses in all parts of the UK economy about the efficient and sustainable use of water.

This covers everything from assessing domestic fixtures and fittings to designing entire treatment plant. Our website has more information about what we do.

Food for thought.....

We all do it. We all have a salad drawer or fruit bowl with mouldering fruit and veg. Many of us will have out-of-date produce in our cupboards and fridges. What do we do with it? Unfortunately, much of it ends up the same way as other household rubbish - in landfill. This may be a little unfair to the those of us who do our best to compost as much food waste as we can but what about food waste from industry and commerce?

Supermarkets, restaurants, hotels and pubs all throw away significant quantities of food waste each year and on-site composting for that type of premises isn't practical, either from the point of view of the space needed or the speed of composting itself. We all know that rotting food produces gas and there lies one method of treating and disposing of food waste – *digestion*.

For those who have worked in the water industry the term digestion is common-place. It refers to the process of allowing certain types of bacteria to break down solid material, destroy pathogens and produce useable gas. On water works and sewage works digesters usually process the waste sludge from treatment.

Certain types of digestion, however, are ideally suited to converting food waste to gas that can be used to provide heat and power.

In this issue we consider food-related waste from two parts of the food industry:

- The end-user, i.e. Unused food or food "scraps"
- Waste arising from producing food

While food is clearly biodegradable, the effluent that arises from producing it can be very concentrated and so difficult or costly to treat. In this issue we'll look at some of these issues from the point of view of some of the most common foodstuffs.

Some of the UK press have recently (15th September, 2009) latched on to the idea that the UK government may want to issue every household in the country with a "slop bucket" - in other words a container for waste food. The intention is to divert domestic food waste from landfill. We'll look at where it could be diverted to and what can be done with it when it gets there. Of course, a simpler and cheaper method is for us all (yes, that includes us at BWC) to waste less food!

Industrial strength digestion.

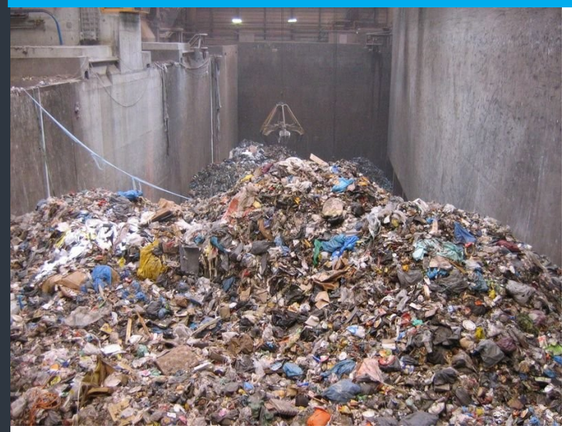
For many of us, digestion is a word we associate with ourselves and our bodies rather than an industrial process. Using the same principles as our bodies, however, to treat organic waste is an old and well-proven industrial trick.

Many sewage and effluent treatment processes use bacteria to remove contaminants and organic matter from wastewater. These are natural processes that have simply been controlled to enable them to be used on an industrial scale. Digestion, in all its forms, is no different.

The commercial application of digestion is certainly not new. Scientists in the late 18th and early 19th centuries noted how flammable gas was present in lake sediments and livestock manure. In 1895 an early digestion process was used in Exeter to produce gas for street lights.

It was during the 1930s and the Second World War that detailed research into digestion revealed just how it was accomplished by nature and how it could be refined on a large-scale.

Now, in the early 21st Century, over 200 hundred years since pioneering scientists like Robert Boyle and Humphrey Davy noted the potential of biogas, we're revisitng an old , immensely useful and sustainable technology.



Seeing food waste as a valuable and sustainable resource

The problem of food waste won't go away quickly. Homes and businesses will be throwing away unwanted food for years to come

A recent article by the Institution of Chemical Engineers (IChemE) quoted figures from the Dept. Of Environment, Food and Rural Affairs (DEFRA) about the contribution of gases emitted by landfill sites and their contribution to climate change. In 2007, stated DEFRA, landfill sites were responsbile for 41% of the UK's emissions of methane to the atmosphere.

This is a very sigificant contribution and much of it is derived from decomposing food waste. But methane, while a potent greenhouse gas, is a useful fuel and as we all become more conscious of energy efficiency and sustainability in general, methane from food waste is a small but significant source of energy that is being exploited with greater frequency.

The UK government is overhauling regulations and legislation relating to the handling and processing of food waste, to speed up the introduction of technology that can help to divert such waste from landfill. One such technology is anaerobic digestion.

Anaerobic means "in the absence of oxygen". There are certain hardy bacteria that thrive in these conditions and, when "fed" with organic waste, will produce a mixture of carbon dioxide and methane that can be used as a fuel. Anaerobic processes can occur naturally in soil and lake or pond sediments but the commercial application of the concept requires careful design and control.

The Process

The process takes place in a sealed tank known as a digester. This is effectively the "stomach" of the operation.

Organic material is first shredded and then it is added to the sealed tank. Shredding increases the surface area of the waste and helps speed up the biological reactions.

The temperature of the digester is controlled closely and most processes operate between 35 - 60°C. Three biological reactions (acidogenesis, acetogenesis and methanogenesis) gradually convert the waste to methane and a solid-liquid mixture called digestate.

The digestion process effectively renders a number of harmful bacteria inactive and so greatly reduces the possibility of any illness to humans.

Digestate can be used as a soil conditioner and, since the biogas is separated from it, it can be spread to land in the knowledge that it won't emit greenhouse gases.

> "0.4% of the UK's energy needs could come from anaerobically treating food waste"

The Benefits

A study by Friends of the Earth (FoE) suggests that using anaerobic digestion to process only domestic, household food waste could produce enough electricity to supply 164,000 homes. Using food waste from supermarkets, restaurants and other commercial premises could increase this figure further. It's estimated that about 0.4% of the UK's electricity demand could be generated by using this type of process to treat food waste. This may seem like a small amount but it would divert organic waste from landfill and recycle it into a useful energy source.

Sustainable food manufacture

In this issue we've talked a lot about using waste food to generate energy. What about the waste, and particularly the wastewater, that arises from one of our biggest industries - food production?

Food producers account for a significant volume of fresh water used and wastewater produced in the UK. In some water supply areas in the UK almost half of the industrial water users are in the food (or related) industries. For example, water is needed for irrigation, washing crops that have been picked, washing animal carcasses and for hygiene cleaning in factories.

The organic content of food waste, and particularly that from dairy and meat processing activities, is very high and this presents specific problems for treating the effluent.

For example, in many meat processing facilities, scraps are flushed down floor drains using hoses. Not only does this waste water but the meat, which has a high organic content, adds to the strength of the site's effluent and so increases effluent disposal costs.

Simple alternatives, such as sweeping or vacuuming scraps not only reduces effluent strength but saves water.

Similarly, the dairy industry has profited from improving cleaning procedures to reduce effluent strength. Milk also has a high organic strength but has been seen in the past as "harmless" waste stream. The high load leads to high effluent treatment costs and by reducing and optimising water used during cleaning, significant savings can be made. A concerted programme of waste minimisation may well save several tens of thousands of pounds each year.

Q&A – where can I find out more about digestion?

Q: I need a useful guide to digestion!

A: A good starting point is www.anaerobic-digestion.com This site has a range of excellent articles and papers about anaerobic digestion but is more for the effluent treatment engineer. Friends of the Earth (FoE) produced a very good summary of anaerobic digestion, including figures about electricity generation and CO_2 emissions reductions. Try www.foe.co.uk/resource/briefings/anaerobic_digestion.pdf.

Q: Does digestion only process food waste?

A: Certainly not. While food waste is an important feed stock for anaerobic digestion processes, they can also take waste paper, animal manure and grass cuttings.

Digestion processes cannot, however, cope easily with wood. This is because most bacteria struggle to digest lignin, a significant component of woody materials.

Simple ways to reduce water use in food processing.

Some very simple measures can have a significant impact on water use in food processing factories.

For example, ensuring cleaning hoses are fitted with trigger sprays means that water is only delivered when needed and hoses will not be left running contiuously. Computer control of cleaning ensures consistency and optimised water and detergent use. As we've already noted, dry methods of collecting waste are simple, cheap and can significantly reduce water consumption.

The most powerful way to reduce water use, however, is to get the message through to all staff. Encouraging participation in water minimisation programmes can have enormous benefits to the efficiency of the operation and to the attitude of the staff towards utility costs.

BUSINESS IMPACT

Effluent treatment costs are based on volume, organic load and solids content of the wastewater. Removing particles of material, however small, and reducing the volume of effluent and its organic load will reduce trade effluent bills.