

Biogas Monitoring for Upgraded Biomethane

By working with partners worldwide, Geotech is involved in a range of projects at the cutting edge of biogas production and processing. The latest of these is a landmark deal agreed between Marks & Spencer (M&S) and Future Biogas, a major anaerobic digestion plant operator, for the purchase of biomethane certificates.

“ The Biomethane Certification Scheme (BMCS) that M&S has signed up for is an independent certification scheme run by Green Gas Trading (GGT), a private limited company, which hopes to broaden the market and further facilitate links between green gas producers and buyers.



Author/Contact Details:
Amanda Randle
Geotech

Sovereign House, Queensway, Leamington Spa, CV31 3JR, UK
Tel: +44(0)1926 338111
Email: sales@geotech.co.uk
Web: www.geotechuk.com

The deal sees M&S purchase 35,000 Mega-Watt hours (MWh) of certificates, recognising the value associated with the 'bio' element of biomethane produced at anaerobic digestion (AD) plants and valued carbon efficiency associated with biomethane in comparison to average fossil gas supplies. The certificates will help to generate the equivalent amount of energy to heat 15 M&S Simply Food stores all year round, reducing the retailer's carbon footprint by more than 6,400 tonnes. M&S is the first UK retailer to buy biomethane certificates to use in this way.

Early in 2014, ten of Geotech's fixed biogas monitoring systems (the GA3000 PLUS) were supplied by Air Liquide Advanced Technologies (ALAT) to four agricultural waste to energy projects - three in the UK and one in France - for which the company was supplying upgrading technology. One of these customers is Future Biogas which specialises in the construction and operation of biogas plants. Future Biogas uses Geotech's portable and fixed biogas monitoring equipment on the Vulcan Renewables site near Doncaster in the UK.

Geotech's fixed gas analyser, the GA3000 PLUS is ATEX certified, ISO 17025 accredited and an integral part of the smooth running of many AD sites throughout the world. It is designed to be configured to each individual site's requirements, it supports the continual or intermittent monitoring of processes. The BIOGAS 5000 is Geotech's portable gas analyser, used to monitor gases within biogas applications. The unit supports gas analysis by providing consistent and reliable collection of data. It also measures pre and post desulphurisation levels to ensure that the desulphurisation process is working correctly.

The first of the two GA3000 PLUS fixed systems specified monitors biogas at three sample points. The composition of the raw biogas stream is measured and then the gas is measured again by the same system after hydrogen sulphide (H₂S) has been removed. H₂S is routinely removed from biogas to prevent damage to combined heat and power engines (CHP), but at this plant the focus is on upgrading biogas for injection to the grid.

Raw biogas is monitored for % levels of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂). H₂S is also measured in the

range 0-5,000ppm. After H₂S removal the biogas is monitored to check that H₂S is low, using a sensor measuring in the range 50-200ppm.

The second GA3000 PLUS system is used to monitor gas in the final upgrading process. CH₄, CO₂ and O₂ are measured continuously, this time with a 0-100% CH₄ range, as the target methane level is 100%. The GA3000 PLUS system monitors upgraded biomethane after the membrane treatment process but before further analysis (by gas chromatography) and ultimately grid injection.

Future Biogas currently also uses seven of Geotech's BIOGAS 5000 portable biogas analysers for general plant operation and process control. The operator produces biomethane and electricity from biomass in a number of anaerobic digestion facilities across the country. Geotech's monitoring equipment is used to monitor the health of the fermentation and also check the condition of the biogas entering the gas upgrade unit to prevent damage to the upgrading membranes. Typically the methane yield, which can vary depending on the feedstock used, is the gas most closely monitored. Methane is measured to indicate the revenue being generated and that the process is optimised. Small deviations in methane levels can be significant so reliable and accurate equipment is critical. A fast, local response is also particularly important for the fixed monitoring system, which may be linked into site alarms and without which the plant cannot fully function.

Whilst biogas upgrading, for injection to the grid or as a transport fuel, is a fast-growing area, the majority of anaerobic digestion plants are producing biogas which is used to generate electricity by combustion in CHP engines. H₂S levels – before or after H₂S scrubbing – are regularly measured to prevent engine damage. The amount of H₂S present in the biogas is largely determined by the nature of the feedstock and plants which accept mixed or variable feedstocks; these plants face the biggest challenges monitoring and managing H₂S levels. O₂ is also an important parameter: an increase in oxygen, which can cause sudden and serious damage to engines, can be caused by a leak of air into the system.

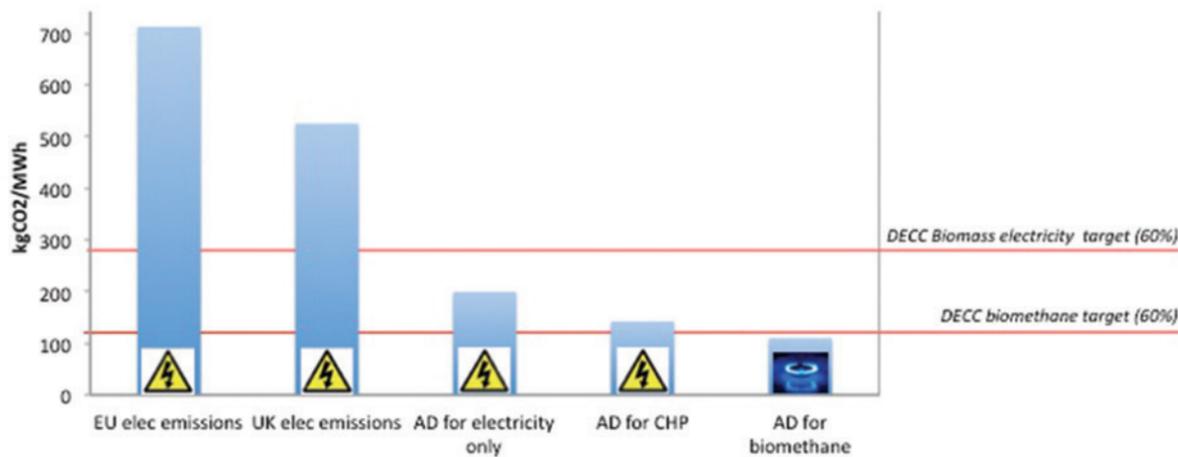
Future Biogas's £8m Vulcan Renewables AD plant produces up to



Air Liquide's upgrading vessel at the Doncaster site



Geotech's portable biogas analyser is used globally.



Caption: Efficient conversion of biogas maximises savings. This graph shows that the kgCO₂ / MWh emitted from biomethane are the lowest and thereby most efficient

35,000MWh a year from locally sourced biomass. This biomass is in the form of non-commercial break crops produced from farms in the surrounding area and also in new innovative forms including wildflower mixes, sunflower and ryegrass mixes. The renewable gas, 'biomethane', produced from the AD process provides energy to 2,500 homes in winter and over 40,000 in summer. In addition to this, the plant reduces CO₂ emissions significantly by approximately 7,000 tonnes each year – the benefits of which are being recognised by Marks & Spencer.

The sustainability of biomethane plants such as this is directly related to the potential greenhouse gas (GHG) savings that biomass feedstocks can offer in comparison to other fossil fuels. Although biomethane production from biomass is more efficient than the use of biogas to electricity, the UK biomethane market is still in its early stages of development. Maximising the GHG savings from the use of biomass requires it to be converted as efficiently as possible into heat and / or power. As shown in the accompanying graph, the kgCO₂ / MWh emitted from biomethane are the lowest and thereby most efficient.

In addition to the renewable energy generated the plant also creates a number of agricultural benefits for the local

community. Farmers in Doncaster have identified that crops for AD fit well with their existing rotations, acting as break crops or providing stubble for vegetables. These break crops can help them to secure better yields from the food crops that follow. This is done through restoring soil fertility, reducing disease and pest pressure and reducing the need for expensive crop protection products.

The AD process also produces a natural, odourless fertiliser called digestate, this organic fertiliser contains all of the



Digester at the Norwich site

nutrient benefits held in the original crop and can be applied to land to aid in the reduction of artificial fertiliser use.

There are also wider political reasonings behind this agricultural shift. UK farmers are currently planning their future cropping patterns in line with a new EU Common Agricultural Policy (CAP) in mind. Policymakers are placing more and more emphasis on the environment, particularly on greening, crop diversification and ecological focus areas (EFA) which farmers must adhere to in order to receive their subsidies. From an energy perspective, the UK government recognises the role of bioenergy stating that "bioenergy can be an important part of the energy mix which will allow the UK to meet its energy and climate change objectives". A site such as Doncaster provides an opportunity for UK farmers to meet their EU requirements as well as supporting overall bioenergy and renewable energy objectives under the EU and Committee for Climate Change.

The Biomethane Certification Scheme (BMCS) that M&S has signed up for is an independent certification scheme run by Green Gas Trading (GGT), a private limited company, which hopes to broaden the market and further facilitate links between green gas producers and buyers. The scheme is backed by the Anaerobic Digestion & Bioresource Association (ADBA), as well as other operators using Geotech's biogas monitoring equipment, (such as Tamar Energy).

To find out more about Geotech's fixed and portable gas analysers please contact us (details on page 8). We will also be exhibiting at ADBA's National Conference in London on 9th December.



The Doncaster site where upgrading takes place

Read, Print, Share or Comment on this Article at: Envirotech-Online.com/Articles



Geotech
GA3000 PLUS

ROBUST FIXED BIOGAS ANALYSIS FOR ANAEROBIC DIGESTION PLANTS

- ATEX certified
- Moisture removal system
- Zero service and calibration downtime
- Up to three gas sampling points
- Global support network

GA3000 PLUS



www.geotechuk.com

sales@geotech.co.uk

+44(0)1926 338111



FTIR Gas Analyser Makes Biogas Stream Monitoring a Breeze



The AIRGARD, from **MKS** (UK), is an ultra-sensitive, FTIR gas analyser designed for continuous monitoring of biogas streams. The analyser is capable of detecting ppb levels of biogas impurities including Siloxanes, Siloxane precursors such as TMS and simultaneously measuring percent levels of other constituents of biogas including Methane, Carbon Dioxide and Water. Total Siloxane values are generated using a patented methodology. AIRGARD is also capable of detecting parts per billion (ppb) levels of most CWAs and TICs below toxic, "Immediately Dangerous to Life or Health" (IDLH) levels within 20 seconds.

email: 1007ad@reply-direct.com

email: 31754pr@reply-direct.com