Monitoring Gas from Bio-digesters

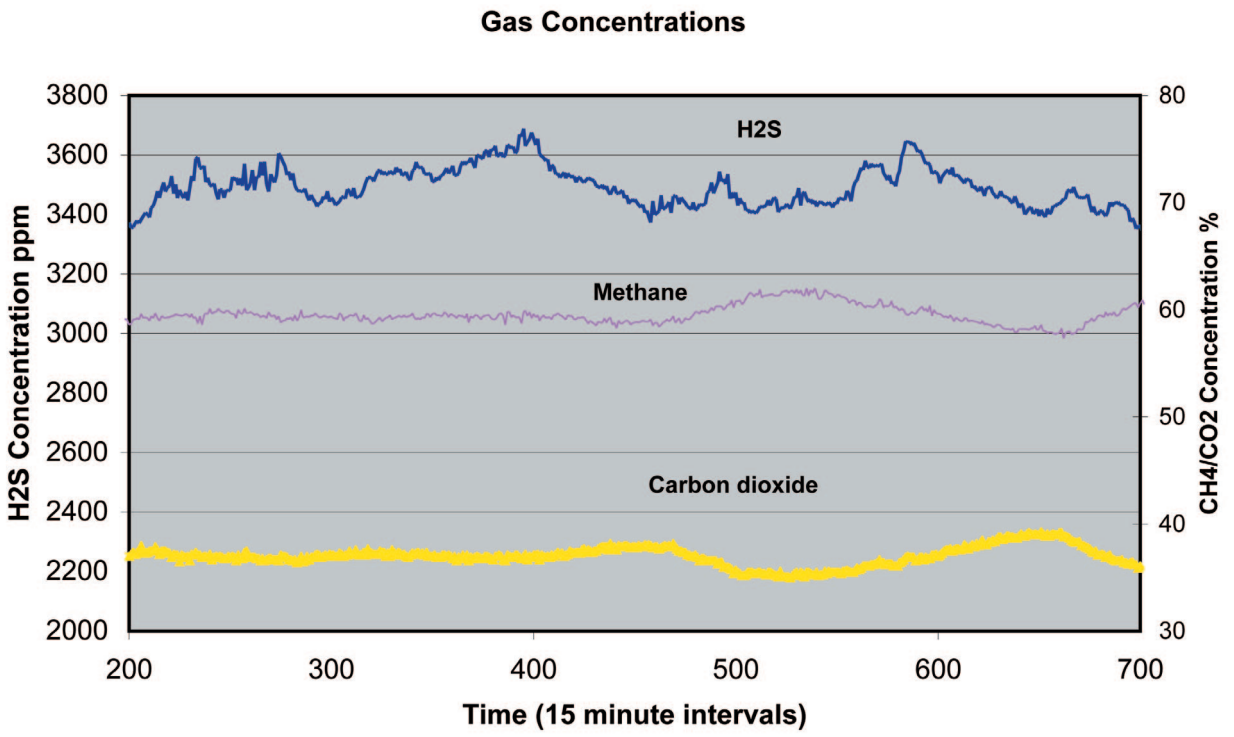
By Dr Roger James Riley

Bio-digesters are used extensively to process sewage sludge and other waste streams in order to reduce the disposal problem. As a by-product of this process large quantities of methane gas and carbon dioxide are produced. It is common practice to simply flare off this excess methane gas. This is rather like burning dollar bills, since with some investment the methane can be used to generate energy that can pay for part or all of the running costs of the plant.

The methane can be used as fuel for a gas engine in a CHP system which can generate heat for the digesters and electricity, either to power the plant or for sale to the grid.

One of the problems of using the gas to generate electricity is that the gas quality can vary. The efficiency of the engine will depend on the methane concentration, and this can vary depending on the digester cycle. More worryingly, the digester gas can contain high concentrations of hydrogen sulphide. This is a very corrosive and dangerous gas. Too high a concentration of hydrogen sulphide can seriously damage an engine and any repair will be an expensive business.

It thus makes sense to continuously monitor the gas composition. This can give information about the efficiency of the digestion process, can help in correctly running the generator engine, and can give a warning of high hydrogen sulphide concentrations before the engine is damaged. The monitor can even switch the gas stream to a hydrogen sulphide scrubber if the concentration goes over a pre-set limit.



Systems have been installed on a number of plants in the UK. These have been monitoring the concentrations of CH4, CO2, O2 and H2S as well as the gas pressure and temperature. H2S concentrations up to 5000ppm can be measured. In addition they can measure and record the gas flow rates, something that has never been easy due to the low pressure and flow characteristics of digester gas, and it's high humidity. Gas flow can also be corrected for changes in the gas concentrations. All data is recorded and can be downloaded locally or remotely.

Some typical results are shown in the graph. The graph shows a high H2S concentration and some variation in the CH4 and CO2 concentrations.

Case study

Geotechnical Instruments Tap into Biogas

Geotechnical Instruments Ltd has recently provided a series of Fixed Position Biogas Units equipped with thermal mass flow meters to biogas specialist Biogas Technology based in Sawtry, Cambridgeshire. The units are monitoring biogas constituents (CH4, O2, CO2, and H2S) as well as flow and pressure on numerous water treatment plants for a large UK water utilities company. The systems have been developed to monitor high concentrations of hydrogen sulphide, up to 0-5000ppm, and are also designed to interface with the thermal mass flow meter to give a precise reading of Biogas flow.

Biogas Technology have been very impressed with the units, as Ian Gadsby, Managing Director, comments "*The key requirements of the contract demanded a robust, reliable and accurate system that could be easily installed in variable locations and left alone to operate and record data for days on end. I am happy to say that Geotechnical Instruments Limited were able to listen to our needs and deliver to these requirements without problem.*"

The system is part of the variety of Biogas analysers that Geotechnical Instruments can offer, which range from an economical hand-held analyser to a Fixed Position Plus which transfers data to a secure web page.

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