

Application of Gas PTi

Background

Biogas produced from various feedstocks can be supplied as fuel gas to gas engines and small gas turbines to generate local electricity or to fuel local combined heat and power systems. Biomethane plants condition the biogas to make it suitable for injection into the national gas transmission system or into a local gas distribution network. This generally involves either CO₂ removal or Propane enrichment to adjust to the correct Calorific Value (CV) and Wobbe for downstream users. Ensuring a correct and stable CV is important for the continued plant operation as examination of plant output will be made by the national grid operator and possibly by the government Energy Regulator.

GasPTi has been developed to provide a low-cost, accurate and rapid measurement of gas properties so that operators can monitor and compensate for variations.

Issues

The key issue for biogas production is to have a fast response to gas quality fluctuations such that air/fuel ratio can be adjusted rapidly before damage occurs to downstream gas engines or turbines.

The key issues for biomethane plant is to ensure a low-cost, fit-for-purpose solution is provided for rapid and accurate gas quality measurement. Accuracy for CV and Wobbe is important in terms of entry points into national transmission systems.

BioMethane Plant Applications

There are a number of different applications for gas quality measurement on biogas and biomethane plants:

- Combustion and ignition control on biogas engines
- Anaerobic digester plant output monitoring prior to gas clean up
- Gas clean up (CO₂ removal or LPG enrichment) and plant export to grid
- Downstream monitoring on transmission or distribution network to ensure adequate pipeline mixing

Solution

GasPTi is a unique integration of gas sampling, gas conditioning and gas analysis which is mounted directly on the pipeline to give rapid and accurate monitoring of gas quality and is ideally suited to biogas and biomethane applications. It has the added advantages of low cost, easy installation and configuration and low maintenance on remote sites. GasPTi will respond to CV changes in less than 10 seconds at an accuracy of CV error $\leq \pm 0.5\%$ and it can also provide Motor Octane Number or Methane Number if needed for gas engine control. The GasPTi instrument allows near real-time analysis and, unlike traditional gas chromatographs, ensures that out of specification gas is diverted within seconds.



Figure 1 - Gas PTi - Sampling, conditioning & analysis.



Figure 2 - Biomethane Installation



Figure 3 - PTi pipeline mounted installation

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Conclusions

1. Financial viability of biogas and biomethane plants requires low-cost CV monitoring.
2. CV measurement must be fast and accurate.
3. GasPTi provides low-cost, rapid and accurate CV data which can be used for process control.
4. Unlike gas chromatographs, GasPTi does not require a highly skilled workforce for installation, configuration and maintenance, making it an ideal low-cost solution for remote biogas and biomethane plant application.

Examples of BioMethane Applications

All the following plants are using at least one GasPT system for gas quality control or monitoring:

- Didcot (2010)
- Poundbury (2012)
- Adnams (2011)
- Minworth (2014)
- Grants Girvan (2014)
- Coupar Angus (2014)
- Apsley Farm (2014)
- Mitcham (2014)
- Buchan (2015)
- St Nicholas Farm (2015)
- Icknield Farm (2015)
- Wight Farm (2015)
- Cheltenham (2015)
- Helmdon (2016)
- St Bowells (2016)
- Peacehill Farm (2016)
- Ebbsfleet (2016)
- Tornagrain (2016)
- Grindley Farm (2016)
- Hill Farm (2016)

Publications:

Fast, Accurate, Low-cost, Unconventional Gas Quality Monitoring

IGU World Gas Conference, Paris, 2015.

Development of Real-time Gas Quality Measurement

International Gas Union Research Conference, Copenhagen, 2014.

More information from:

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Figure 4 – Gas PT sensors installed in Biomethane kiosk



Figure 5 – Biomethane Installation



Figure 6 – Gas PTi pipeline mounted installation