

# Real-time autonomous remote monitoring of AD

Tanja Radu<sup>1</sup>, Richard Blanchard<sup>2</sup> and Andrew Wheatley<sup>1</sup>

James Taylor<sup>3</sup>

<sup>1</sup>School of Civil and Building Engineering, <sup>2</sup>School of Electronic, Electrical and Systems Engineering, Loughborough University, Loughborough, UK

<sup>3</sup>Ambisense Limited, Institute of Research & Development, Birmingham Research Park, B15 2SQ

Monitoring and optimisation of small and medium size, remote anaerobic digesters is an outstanding issue. Continuous on-line monitoring of biogas quality and quantity, along with reactor pressure and oxygen levels (potential indicators of leaks) would enable control and management of decentralized digesters. Current monitoring systems at large digesters are bespoke and expensive precluding their use for smaller reactors.

We have identified a novel remote monitoring platform developed by Dublin City University (commercialised by Ambisense Ireland) for the on line measurement of methane, carbon dioxide and pressure currently under test by the landfill industry. The instrument is autonomous (solar powered) and can be controlled remotely. The data is sent to the cloud via GSM transmissions, and accessible via an online portal. CO<sub>2</sub> and CH<sub>4</sub> are measured by modified infrared and pressure by piezoelectric sensors embedded in a chip.

Here, we are examining instrument's suitability for application in AD market by testing its performance at various biogas compositions, pressures and temperatures typical of the AD process range. Success in this proof of concept would lead to a further development of an expert machine control system, based on the monitor, to allow autonomous control and optimise performance of several digesters remotely.



Screen shot of online software for real-time remote monitoring



Loughborough University  
**ambisense**  
 AUTONOMOUS GAS MONITORING

Labscale AD 02		
CH4	43.82	%vol
CO2	35.64	%vol
O2	2.67	%vol
Pressure	6.49	mBar
PressureAtm	1010.84	hPa
Battery	6.28	V
Mon 9/11/2015 14:28		

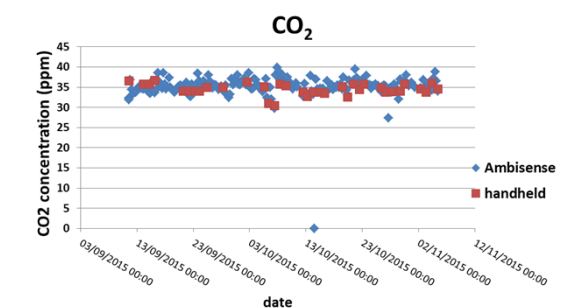
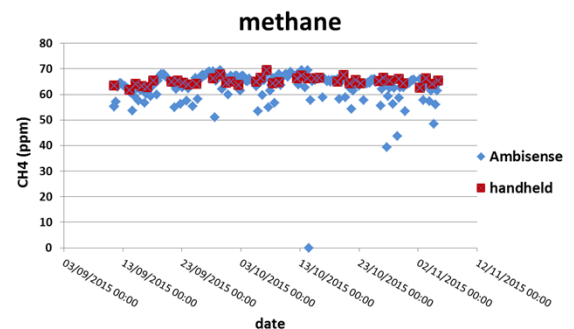


Autonomous landfill gas monitoring platform developed by Ambisense Limited:

- a) Deployed in field
- b) In Loughborough University labs

## Autonomous remote monitoring of: CH<sub>4</sub>, CO<sub>2</sub>, O<sub>2</sub>, pressure

- Using autonomous wireless gas sensing platforms- reliable long term performance and reduction in component cost
- The data sent to the cloud via GSM transmissions, and is accessible via an online portal for remote monitoring by the facility management
- CO<sub>2</sub> and CH<sub>4</sub> sensing: high-accuracy infrared absorbance sensors
- Pressure sensing: piezoelectric sensors (critical for understanding gas flows)
- Oxygen sensor is an electrochemical cell
- The integrity of the sensors' measurements are protected by use of pre-conditioning filters to remove water vapour, particulates and condensate
- Autonomous operation is achieved by custom-programmed microcontroller circuitry, which also manages data logging and remote transmission (GSM communications)
- Ambisense data shows good agreement with the hand held instrument for CH<sub>4</sub> and CO<sub>2</sub>



Monitoring quality: comparison with hand-held device

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 For further details please contact Tanja Radu at T.Radu@lboro.ac.uk or +44 (0)1509 23808