Remote Monitoring of Landfill Gases from Solid Waste Landfill

Including real time data integration to a web based data portal

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Introduction

•Landfill gas is primarily made up from Methane (CH_4) and Carbon Dioxide (CO_2).

• Global methane emissions from landfill are estimated to be between 30 and 70 million tonnes each year.

• Methane makes landfill gas *explosive* when it is present in the 5-15 % concentration range.

•Landfill directives state, that licensed landfills in the UK and Ireland should never exceed a concentration of 1% for CH_4 and 1.5% for carbon dioxide, at perimeter borehole wells [1]. However, the EPA itself has cited large non compliance with suggested targets [2].

•This is partly due to the single point nature of the CH_4 and CO_2 sampling, and also the low sampling frequency.

• This research group has developed a dual autonomous CH_4 and CO_2 sensor, and has successfully run extensive field trials over the last 2 years.

•Currently using the system, three live data streams are being populated logging methane and carbon dioxide values in real-time on three different landfill sites.

Figure 1. Left is a field deployed system, monitoring gas migration on a perimeter borehole well, right is a visualisation of the newer system in situ

Device Development

•Development has seen a successful prototype device (Figure 1. left), developed into a more commercialized system, where price and performance have been optimized (Figure 2).

• Successful long term remote deployments have been achieved, where data is reliably harvested.

• A price reduction against the previous generation system of over 50% has been achieved.

•An 120 fold increase has been seen in terms of data generated (4 per day v 1 per month).

• Device lifetime doubled, through implementation of new energy scavenging routines.

•The continuous nature to the data feed ensures that key events are never missed, it also allows the user to compare and contrast against other influencing factors (changes in the water table, temperature etc.,).

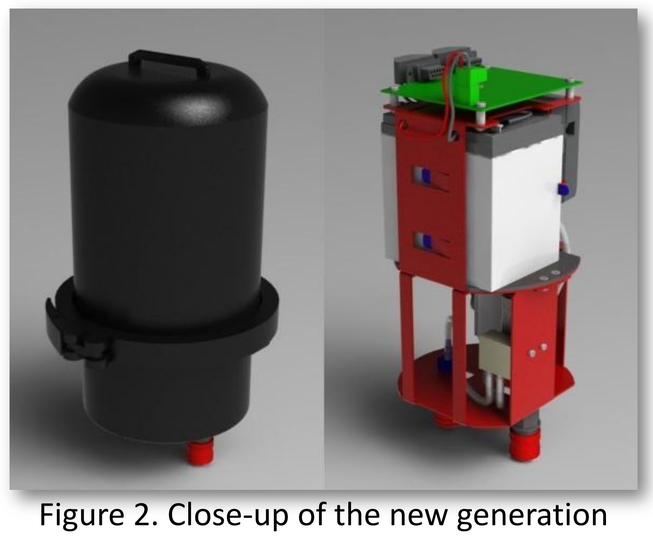

Figure 2. Close-up of the new generation system, right without IP68 casing

Data - Handling & Presentation

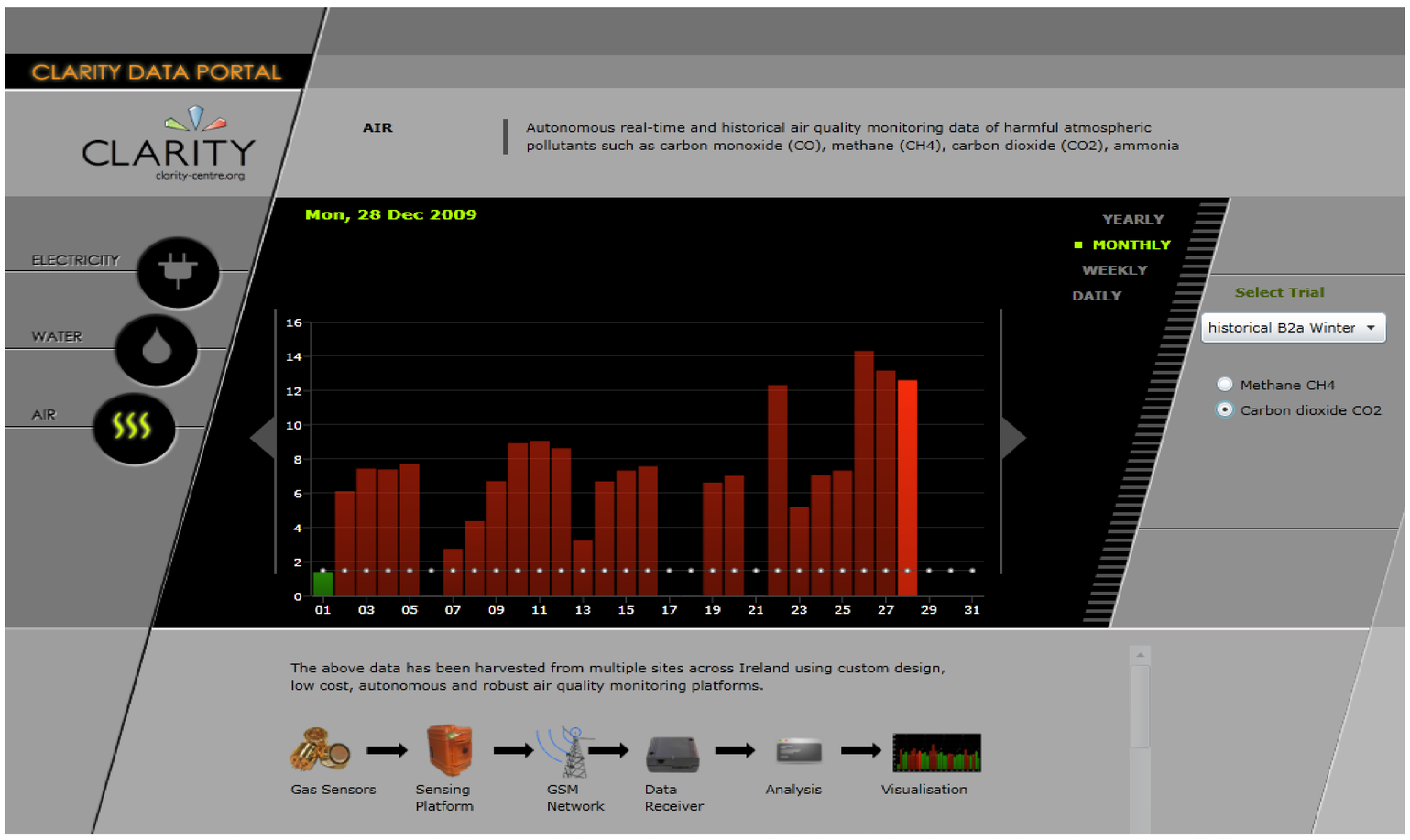

Figure 3. Live updating web based Microsoft Silverlight based data interface [3]

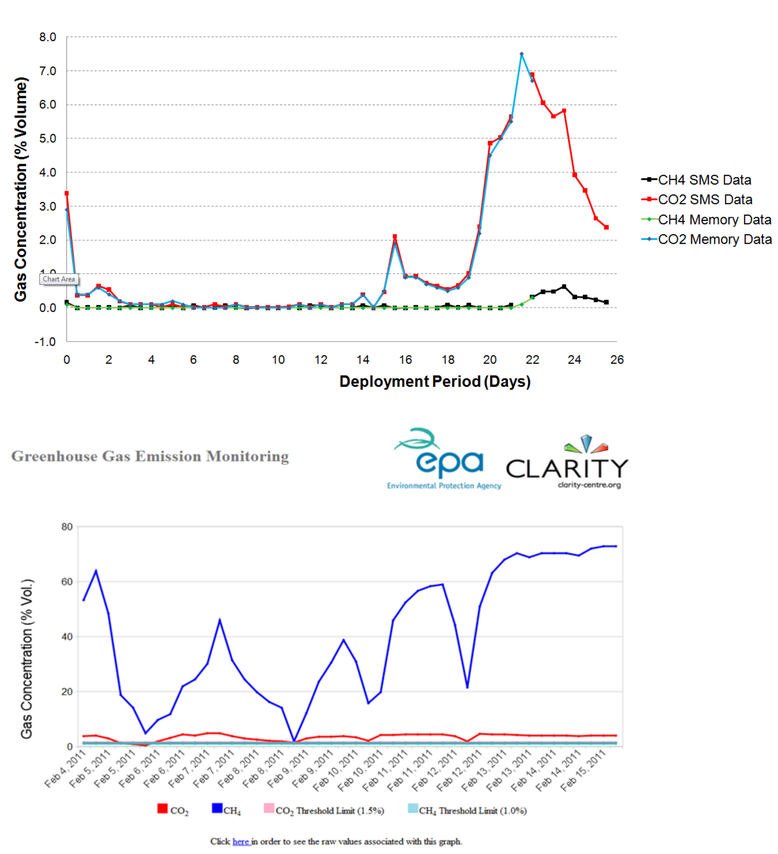

Figure 4. Collected real word deployment data, exhibiting both high CH_4 and CO_2 data

Once deployed, the sensor immediately beings to takes measurements. This is done in a baseline, sample, purge manner, where the system takes four measurements per day based on 3 minute tests. It is this statistical representation that is sent via GSM to the base station data server, where it is backed up before being visualised on the Clarity Data Portal as visible in Figure 3.

[1] Guidance on monitoring landfill gas surface emissions, Tech. rep., Environmental Agency, U.K.

[2] Focus on land filling in Ireland, Office of Environmental Enforcement, Environmental Protection Agency.

[3] Clarity data portal available at http://clarityapp.ucd.ie/~sensorportal/

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