

From: Oakes, Ian
To: Bradford, Julie
Subject: FW: Response to latest Landfill Gas Audits 26/11/14 and 12/12/14 Gas well 32 Elevated Hydrogen
Date: 26 February 2014 15:26:59

EDRM/PR

From: Roberts, Anthony
Sent: 26 February 2014 14:48
To: ICraven@coryenvironmental.co.uk
Cc: Oakes, Ian; Wright, Paul
Subject: Response to latest Landfill Gas Audits 26/11/14 and 12/12/14 Gas well 32 Elevated Hydrogen

Dear Ian,

I hope you are well.

Thank you for the response letter you sent to Ian Oakes with regard to the latest landfill gas technical audit and the actions proposed therein in response to the findings.

I wanted to respond initially with thoughts on the sampling for Hydrogen and Carbon Monoxide from well 32, which shows the gas well to have relatively low CO at 36ppm, (this is not really very low as any CO is not a product of normal anaerobic degradation) I would also question that H₂S at 242mg/m³ (174ppm), is negligible as wells should be marked up at levels greater than 100ppm. Interestingly as you stated Hydrogen was high at 5.2%

In your response you mention that the Hydrogen may be the cause of the high CO reading on the instrument from cross gas interference and that the absence of any air (O₂ & N₂) 'further eases any concern about a hot spot being caused by over extraction.'

The hydrogen levels are at 5.2% which is high as it is in older buried MSW. The only source of this hydrogen would be either from an unknown chemical reaction occurring within the body of the waste or (more likely in my opinion) the results of a water gas shift reaction (WSGR) causing the production of hydrogen on reaction of water with Carbon Monoxide from sub stoichiometric combustion at elevated temperature. A form of pyrolysis within the landfill that may have been derived from an initial increase in aerobic conditions caused through the demands on the extraction system from the larger engine.

The reduction in Carbon Monoxide levels may be attributable to its conversion to Carbon Dioxide during the WGSR which produces carbon dioxide and hydrogen. This would fit in with the depleted CO and the elevated Hydrogen.

Oxygen would not be high as it would all have been consumed and the low Nitrogen could be due to a purging effect.

It would be very useful to perform a single well analysis over an extended period on well 32 using historical data to see if and when the CH₄/CO₂ ratios started to change with a concomitant change in Balance gas (free Nitrogen in the absence of O₂) and

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Oxygen ingress. Note that the oxygen ingress may not have been evident as it would have been consumed as it was pulled through the waste just leaving the higher balance gas and a reduction in the CH₄/CO₂ ratio.

Finally I think it might be worth temperature profiling the well as it seemed to be quite a bit warmer than the other wells in the area, this would give us a further strong indication of a solution to the conundrum.

I have spoken to Ian Oakes and he has asked me to suggest that in line with the action timescale in the CAR form Report ID: PP3139GB/0197525 dated 12/12/2013 of the 31st March 2014 you include any findings from investigations as detailed above.

If you would like to discuss any of the above then please feel free to contact me on one of the numbers below.

Best Wishes

Tony

Tony Roberts

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