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Managing the Hazard Implications of New Biomethane Injection Technologies: Lessons from an Odorant Fade Event

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ABSTRACT

As energy systems transition toward lower carbon alternatives, the introduction of biomethane into existing gas networks presents new operational and safety challenges. Although biomethane is broadly compatible with natural gas at a compositional level, its specific composition—driven by variability in feedstocks, anaerobic digestion processes, and upgrading technologies—introduces trace contaminants not commonly encountered in traditional gas systems. These compounds can affect pipeline integrity, odorisation effectiveness, and gas quality compliance in ways that are not yet widely understood.

This presentation discusses the findings of an incident investigation into a significant odorant fade event that occurred shortly after the restart of a biomethane injection facility. Despite upstream odorant dosing being within expected ranges, downstream testing showed no detectable odorant in the distribution network, resulting in an operational incident response.

The investigation revealed that prior to restart, the biomethane injection pipeline had experienced an extended period of isolation following multiple off specification gas events.

During this period, contaminants such as hydrogen sulphide, chlorides, siloxanes, and moisture had likely been present in stagnant gas within the line.

These conditions created an environment conducive to accelerated internal corrosion, leading to the formation of iron oxide, iron sulphide, and potentially reactive chlorine compounds. When biomethane export resumed, the newly formed corrosion products reacted with the injected mercaptan based odorant through adsorption and oxidation mechanisms, effectively stripping the odorant from the gas stream. This phenomenon differs markedly from behaviour observed in pipelines carrying conventional natural gas, where odorant fade is generally well understood and easier to control.

Key learnings derived from the incident highlight several essential considerations for biomethane integrated networks:

- Enhanced contaminant monitoring is required, as reliance on standard continuous analysers may miss critical trace species such as chlorine compounds, siloxanes, and certain VOCs.*

- *Revised shutdown, purging, and restart procedures are needed to manage the risk of corrosion and odorant loss during periods of no flow.*
- *Updated integrity management frameworks must reflect the unique corrosion pathways introduced by biomethane and its impurities.*

As biomethane injection technologies continue to scale, this case study underscores the importance of recognising emerging hazards early, implementing robust monitoring and operating strategies, and leveraging learnings across sectors to ensure safe and reliable energy transition pathways.

KEY WORDS

Biogas, new energy, incident investigation, offspecification, contaminants, challenges

BIOGRAPHY

Lisa is a chemical engineer with over 25 years of experience in top-tier oil and gas companies and as a principal risk consultant at GPA. She has extensive expertise in operations engineering, engineering management, reliability, maintenance, and process safety consulting. Throughout her career, Lisa has experienced and learned from major incidents, been involved in recovery efforts, experienced the introduction of MHF legislation, and led the preparation, audit, and licensing of two safety cases. Recently, she has facilitated safety in design studies for future fuels projects involving new and novel technologies.

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