Northeast GAS ASSOCIATION NYSEARCH

Technology Brief

Study on Impact of Trace Constituents in RNG

Description: **Gap analysis followed by practical testing to evaluate effects of trace constituents in RNG on gas infrastructure and residential appliances**

Status: **Gap analysis ongoing to identify trace constituents, trigger limits and scientific evidence to support specified limits**

BENEFITS

This project aims to reduce the uncertainties and variation in limits set by different utilities for the trace constituents in Renewable Natural Gas (RNG) by providing scientific data to back up the trigger limit recommendations. In light of growing demand for RNG production and injection into distribution infrastructure in North America, the testing should help both producers and developers to help determine the optimum upgrading and measurement system for biomethane. For LDCs, it will aid decision making and help advance specifications to address safety and reliability issues.

The gap analysis will help identify deleterious constituents and/or group of constituents to gas infrastructure and appliances. Accelerated testing will be conducted to evaluate safety limits for each of them.

BACKGROUND

To reduce carbon emissions and move towards a more sustainable energy supply, there is an increasing trend of using Renewable Natural Gas (RNG) in the United States and Canada. Depending on the source (See Figure 1), RNG can contain compounds that are not present in traditionally distributed natural gas such as ammonia, halocarbons, siloxanes, biologicals etc. One of the requests by our members during a NYSEARCH Decarbonization Workshop was to conduct additional research to determine the appropriate levels of some of the contaminants in RNG. NYSEARCH was directed to establish the science-based limits as needed for the RNG trace constituents. Our initial survey led to limited documented scientific evidence on the appropriate levels of trace constituents in pipeline quality gas. Also, the trace constituents list considered for further evaluation includes contaminants that are present in natural gas and for which there are network limits, e.g., mercury, hydrogen sulfide and moisture. This is because some limits set for natural gas are based on empirical data. They are either missing scientific evidence or are based on measurements now deemed obsolete such as historical analytical capabilities.

DNV-GL has conducted two risk assessments for NYSEARCH members on Impact of Corrosive substances on distribution infrastructure and the effects of Siloxanes on residential gas appliances and gas engines. DNV-GL is also currently in the

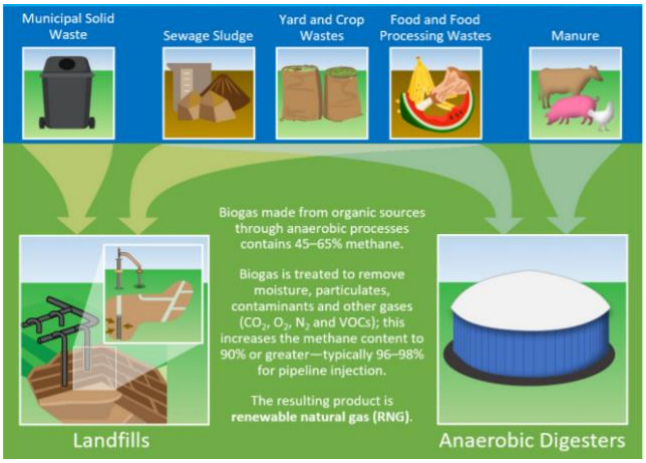

Figure 1: RNG Sources and trace constituents

process of testing for Trace Constituents for gas networks in Europe. DNV-GL's expertise in natural gas networks and RNG production led them to conclude that the impact of any individual contaminant should not be considered in isolation due to fact that they will not be released in the network one at a time. Thus, a gap analysis is needed before limits can be set for individual constituents.

TECHNICAL APPROACH

The objective of the project is to study the impact of trace constituents in Renewable Natural Gas and traditional pipeline gas on LDC infrastructure and customer appliances. This project will be carried out in two tasks as described below:

Task 1: Gap Analysis: DNV-GL surveyed the project sponsors for data of US networks and appliances. Using their expertise from over (10) years of biomethane risk assessments for UK gas networks, DNV-GL is assembling a list of possible RNG trace constituents that they are aware of or believe to be deleterious to network equipment and materials (metallic, polymeric, and elastomeric). The list is going to also include a combination of trace constituents that can cause problems during certain network operations, e.g., pressure regulation, in-grid storage, in-grid compression, odorization, etc. A similar analysis is being conducted for consumer appliances as part of Task 1. The result is a list of trace constituents that are believed to be damaging and those trace constituents or combination of trace constituents that cause problems during or after combustion.

Figure 2: Experimental Accelerated testing in lab

DNV-GL will recommend to NYSEARCH which type of impact study i.e., network infrastructure, network operations, or consumer appliances are likely to be most critical in terms of trace constituent concentration. The combined output allows NYSEARCH sponsor(s) to carry out a fully informed assessment of which contaminant or group of contaminants need further testing.

Task 2: Experimental Test Program: The test program (see Figure 2) is anticipated to use an optimized fractional factorial experimental design to examine the effect of the trace constituents on the properties of the polymer/elastomer. For this experimental design and for the selected materials, mechanical properties would be measured before and after soaking in a test fluid that contains both a high and low concentration of the short-listed trace constituents. Results from this experimental approach will help evaluate relative effect of each trace constituent and give insights into any interaction parameters.

PROGRAM STATUS

DNV-GL is working on the gap analysis and will propose a list of trace constituents that need experimental testing to sponsoring utilities. Based on DNV-GL's recommendations and consensus among NYSEARCH sponsors, the list will be prioritized for further testing in 2021.

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