Green hydrogen producer ensures quality of the network's gas blend using a gas chromatograph

RESULTS

- Ensured on-spec hydrogen blending into natural gas network with accurate compositional data of the full hydrogen and natural gas (H_2/NG) blend
- Reliably tracked and validated blend rate from initial injection and through the network
- Succeeded in greening the gas network and reducing carbon footprint

APPLICATION

Pipeline natural gas monitoring at hydrogen injection facility.

CUSTOMER

HyDeploy project, a six-partner consortium led by Cadent. The partners include Northern Gas Networks, Progressive Energy Ltd, Keele University, HSE – Science Division and ITM Power. The program partners manufacture green hydrogen and distribute it to a local gas utility network in the UK.

CHALLENGE

As part of a national effort to meet the UK's goals for carbon neutrality by 2050, HyDeploy is a demonstration project launched in England's midlands to demonstrate the safe distribution and use of hydrogen blends for the first time on a live gas network since the conversion from towns gas. HyDeploy program partners oversee the operation and monitor its effectiveness.

Green hydrogen is produced by electrolyzing water using renewable electricity (for example, power from wind turbines produced at night while demand is low), and it is suitable for a variety of energy and chemical feedstock applications. In this project, the locally produced hydrogen is being added to pipeline natural gas to displace methane, which reduces carbon dioxide output from natural gas burning by commercial and residential users.

Hydrogen has different characteristics than methane, the main constituent in natural gas, so the maximum injection rate currently allowed is 20% to ensure it does not affect equipment life or cause safety concerns for the network or end users. As a result, the local

"The gas chromatoraph enables the project to track gas quality changes from the initial blend point through the network. It has worked without fault since commissioning and was a very worthwhile investment and collaboration with Emerson."

Tommy Isaac

Principal Engineer, Progressive Energy

The HyDeploy project uses Rosemount 700XA Gas Chromatograph to provide an independent validation of the full hydrogen and natural gas blend rate.

utility must monitor hydrogen blend rate and overall gas composition of the finished H_2/NG blend as it is distributed to consumers. This calls for an appropriate analyzer able to speciate and measure the full range of components in the gas stream, including hydrogen. Conventionally produced natural gas contains hydrogen, but normally it is well below 1%.

Monitoring natural gas composition and characteristics is a routine process for producers and pipelines, however some technologies commonly used, such as laser absorption spectroscopy, cannot handle higher concentrations of hydrogen.

SOLUTION

Gas chromatographs (GCs) are the only analyzer technology suitable for measuring the full composition of natural gas plus high hydrogen content of a blended natural gas stream. In addition, gas chromatography is the internationally accepted analytical method for the accurate measurement and calculation of gas quality properties as defined by the International Organization for Standardization (ISO). For this project, Cadent chose Emerson's Rosemount™ 700XA Natural Gas Chromatograph. It provides evidence of a stable and consistent blend level throughout the network, as well as an accurate compositional analysis of the full hydrogen/natural gas blend, its quality, calorific value, and Wobbe index.

With its parallel chromatography and ATEX/IECEX safety rating, the Rosemount 700XA is ideal for natural gas custody transfer and advanced gas composition analysis. Its field-mountable, explosion-proof design reduces the need for elaborate and temperature-controlled analyzer shelters.

HyDeploy selected this analyzer based on its combination of flexible installation options and high hydrogen measurement limit. While conventional air-bath oven GC designs can also handle the hydrogen range, they require a more elaborate temperature-controlled shelter. The Rosemount 700XA can operate within temperature ranges of -20 to 60 C (-4 to 140 F), and it has no need for instrument air for purging, minimizing operational costs.

Based on the accuracy and reliability of the Rosemount 700XA, the HyDeploy facility can modulate its output to match local consumption patterns. It can test any specific hydrogen injection rate up to the 20% maximum and monitor natural gas consumer responses. This helps reduce greenhouse gases as the hydrogen blend is distributed throughout the network, minimizing natural gas consumption.

> ***"The GC provides an independent validation of the blend rate, allows gas quality data to be captured for combustion experiments being undertaken on the network, and provides evidence of a stable and consistent blend level."***
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> **Tommy Isaac**
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> Principal Engineer, Progressive Energy

RESOURCES

HyDeploy Project
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Hydrocarbon Engineering: **Improved Solutions for Natural Gas Quality Analysis**
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Gas Processing & LNG: **Streamline Complex Natural Gas Analysis for Transport and Custody Transfer**
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