

ENTSOG Gas Quality and Hydrogen Handling Workshop. Take-aways

Date: 7th November 2022
Time: 10:00 to 13:30 CET
Venue: Online

The goal of this workshop was to share the latest information on gas quality and hydrogen handling and facilitate the discussion with all stakeholders. Additional information is available at [ENTSOG website](https://www.entsog.eu).

Session 1: Biomethane cross-border flows. Challenges & potential solutions

1.1 Biomethane development & Oxygen management - Jean-Marc Le Gall (GRTGAZ)

1.2 Biomethane handling O₂ cost-efficiently - Anette Münther (DGC)

1.3 Oxygen handling at Interconnection Points - Jens Sorensen (ENERGINET)

- Promoting the development of biomethane to reach 35 bcm by 2030 at European level should be accompanied by incentives to move towards a gas system that notably tolerates a reasonable level of oxygen.
- Keeping 10 ppm as a reference at TSO interface will hinder the development of biomethane.
- Depending on the biomethane plant size and the biomethane share in the region, avoiding O₂ at biomethane plants has potential to be most cost-efficient solution overall. Yet, this might not be as easy to implement in reality.
- Removal of O₂ at UGS could be an interesting and safer choice since UGSs have professional staff and experience with advanced process equipment, and it reduces the risk of hindering or delaying biomethane investments.
- Through dialogue and cooperation with end-users some countries have been able to increase the oxygen acceptance level.
- There is an issue in aligning gas quality on IPs being determined by technical standards. Standards reflect the common least denominator of the different tolerance levels for a given parameter across the value chain. Looking into the future, the minimum common denominator may not be sufficient to speed up decarbonisation.

Session 2: Gas quality tracking tools

2.1 Tracking gas quality along the network - Gerhard Sauer (GASCADE)

2.2 Gas quality tracking tools. Decentralisation injection points - Tobias Wiegleb (ONTRAS)

- Meshed networks together with different entries and a high level of supply diversity lead to mixing zones, which affects all gas parameters. With gas tracking systems it is possible to solve the problem of unknown gas quality within the intermixture zones with a cost efficient solution.
- It is not possible to equip all exit points with gas quality measurement equipment due to the high associated costs but gas quality at exit points is calculated with high accuracy especially for invoicing reasons.

Session 3: Impact on gas quality due to changes of gas supply sources

3.1 New gas supply routes to Germany. Impact on gas quality - Tobias van Almsick (OGE)

3.2 Insights on the changes in the Italian natural gas supplies - Alejandra Casola (SNAM)

- The increase of LNG to EU is not expected to have major impact on gas quality parameters. But close monitoring of Gas Quality will be necessary for some LNG qualities since they are known to go above some European national standards (i.e., Germany).
- Oxygen can cause trouble within gas infrastructure due to the oxidation of trace components, e.g. formation of elemental sulphur and black powder. Formation of black powder and elemental sulphur does not necessarily require liquid water, presence of moisture is sufficient. The impact of oxygen on UGS is greatest however. Although specifications are defined to prevent having any liquid water, including moisture, the risk of formation of black powder and elemental sulphur cannot be ignored. However, geographical differences among countries exist.
- Taking over odorized gas from France should not cause any fundamental problems: 1) Odorization level is not significantly higher than in Germany (max. values: 10 vs. 14.5 mg/m³ sulphur) and 2) Footnotes in G260 in conjunction with Appendix F allow for higher sulphur contents in justified cases. In Germany, special end-user appliances (e.g. CNG-fuelling stations, natural gas used as feedstock, especially in combination with catalysts) have to be subject to gas treatment or other mitigation measures.
- Decrease of Russian gas flows to Italy did not lead to any substantial changes in gas quality parameters in the South. In the North of Italy, especially in the north eastern part where only Russian gas arrived, a change in composition has been seen due to an increase in LNG and flows from the south, and so an increase in GCV.

Session 4: Repurposing natural gas pipelines and the effect on H2 quality

4.1 Repurposing natural gas pipelines and effect on H2 quality - Peter van Wesenbeeck (GASUNIE)

4.2 Conversion of a natural gas pipeline to H2 and effects of impurities - Henk Top (DNV)

- Hydrogen specification focus was primarily on the minimum hydrogen content but sensitive end user applications are often only negatively impacted by small amounts of specific traces like oxygen, sulphur.
- Minimum hydrogen content of 98 % is currently the most reasonable approach given large uncertainties in hydrogen production and demand and lack of practical knowledge.
- Repurposed natural gas pipelines do not limit the minimum hydrogen content to a maximum of 98 %.
- Effect of natural gas residues depends on the history, treatment, cleaning of pipe. More research is needed to determine the exact effect on the hydrogen quality. At the moment very high purity hydrogen ($\geq 99,97\%$ H₂) cannot be guaranteed. Effect of natural gas residues in the pipeline diminishes with time.
- Based on DNV tests and measurement results for a 12 km long pipeline for 4 years, it could be concluded that in the long run no contaminants/components were found that could be originally related to the former natural gas transport. This applies to both flowing and stationary conditions of the pipeline in question.
- It was shown, that shortly after conversion of the pipeline from natural gas to hydrogen and after a period of standstill, adsorbed components in the inner pipe wall could possibly cause a (temporary) increase of those components in the gas phase.

This document compiles the main take-aways from the presentations held during the workshop. For the avoidance of any doubts, this information has not been verified nor challenged by ENTSOG and does not necessarily represent ENTSOG's position.