RICE
Research & Innovation Center for Energy
GRTgaz

AUTHORS

L. Cuccia, B. Sanz, D. Vorin, C. Senne, F. Bougueroua, L. Pyrée, Y. Courtois, D. Ballestas Castro, C. Tastard, M. De Renty

GRTGAZ - RESEARCH AND INNOVATION CENTER FOR ENERGY (RICE),
361 AVENUE DU PRÉSIDENT WILSON, 93211 LA PLAINE SAINT-DENIS

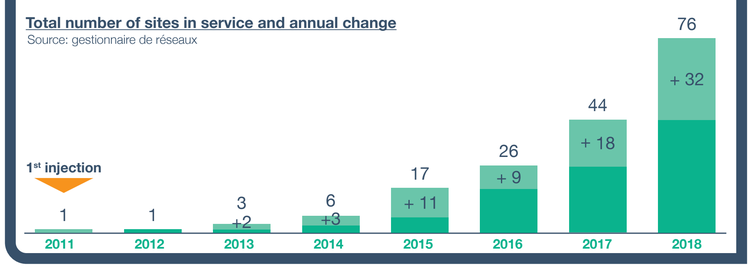
Contact: lorena.cuccia@grtgaz.com

DEVELOPMENT OF STANDARDISED METHODS FOR THE ANALYSIS OF AMMONIA, TERPENES AND AMINES IN BIOMETHANE (RENEWABLE NATURAL GAS)

BIOMETHANE TESTING METHODS: A CHALLENGE FOR THE DEVELOPMENT OF THE SECTOR

32% of renewable energies in 2030 in accordance with the European Directive on renewable energies

Twice as much biomethane injected into French networks between 2018 and 2017



Standard EN ISO 16723 specifies requirements in terms of testing biomethane quality, with specifications for 8 parameters, including: amines, terpenes and NH_3

No standard specific analytical methods

METROLOGY FOR BIOMETHANE

Objective of the EMPIR project: Develop reference standards and reliable, robust and standardised analytical methods specific to biomethane, enabling the tracking of the compounds targeted by standard EN ISO 16723

12 project Partners: VSL, IMBiH, NPL, PTB, RISE, VTT, GRTgaz, INERIS, ISSI, NEN, Rijksuniversiteit Groningen, Waverton Analytics Limited

BIOMETHANE TESTING METHODS DEVELOPED BY RICE

AMINES

CHALLENGES

Amines: Derived from the biogas purification process leading to biomethane.

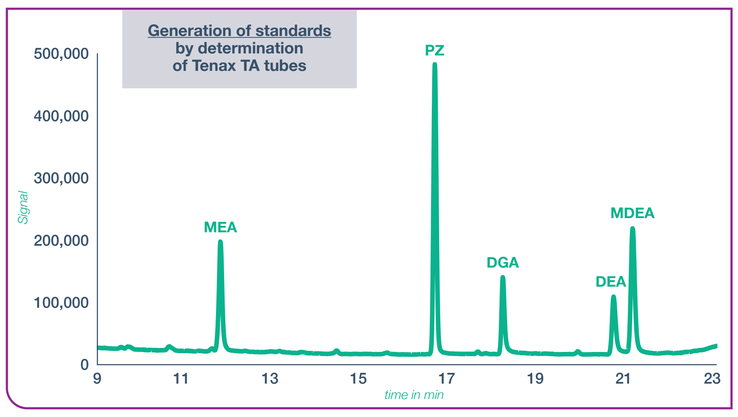
Maximum amine content allowed in biomethane (EN ISO 16723): **10 mg/m³.**

Amines selected for the study:
- Ethanolamine: MEA
- Piperazine: PZ
- Diglycolamine: DGA
- Diethanolamine: DEA
- Methyldiethanolamine: MDEA

METHODS

Sampling: Tenax TA tubes
Analysis: TDS-GC-MS

RESULTS



Example of chromatogram obtained after directly injecting 1 µL of a 100 mg/L solution into the methanol of the 5 amines via an Rtx-Volatile Amine column.

TERPENES

CHALLENGES

Terpenes: Derived from feedstocks and depending on their composition, terpenes (odorant compounds) may mask the odorant of biomethane (THT).

Maximum terpene content allowed in the biomethane: **no threshold specified to date.**

Terpenes selected for the study:
- α and β pinenes
- p-cymene
- 3-carene
- limonene

METHODS

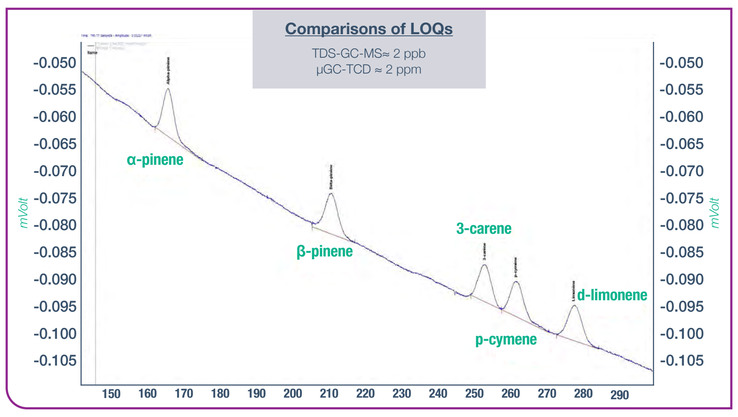
Method 1

Sampling: Tenax TA tubes
Analysis: TDS-GC-MS

Méthode 2

Sampling: Canister
Analysis: µGC-TCD

RESULTS



Example of chromatogram obtained after µGC-TCD analysis of the 5 terpenes at 2 ppmmol in the methane, CP Sil 5 CB column, (standard mixture prepared by NPL).

AMMONIA

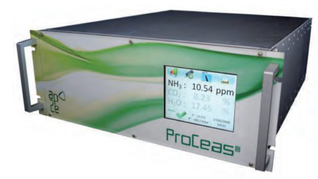
CHALLENGES

Biogas (non-purified biomethane) contains impurities such as ammonia (NH_3), a corrosive compound. Traces of this compound may be present in biomethane.

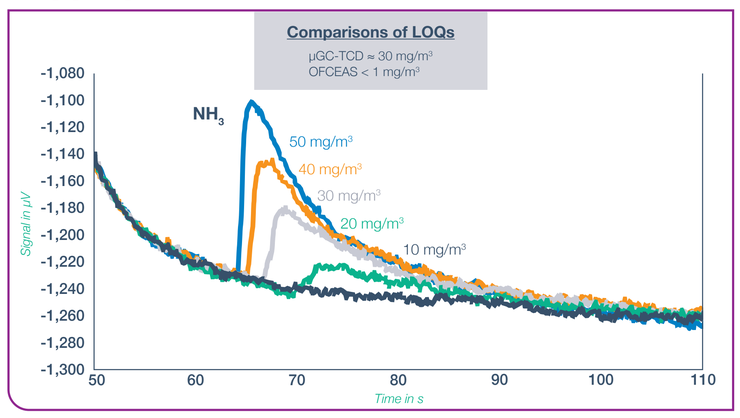
Maximum NH_3 content allowed in biomethane (EN ISO 16723): **10 mg/m³.**

METHODS

Sampling: Treated canister
Analysis methods:
- Chromatography: µGC-TCD
- Laser: OFCEAS



RESULTS



Chromatograms obtained after injection and analysis in µGC-TCD (PPU module) of NH_3 in the methane at 10/20/30/40&101 mg/m³.

CONCLUSIONS

RICE operates to **develop routine methods** (best cost) to track the amines, terpenes and ammonia in the biomethane.

The development and validation of these methods are in progress.

Vigilance points:
- Possible interferences of the target compounds with other biomethane constituents
- Availability of real samples derived from processes resulting in target compounds

End of project: May 2020

EMPIR
EURAMET
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METROLOGY FOR BIOMETHANE