

26th World Gas Conference

WOC 4-2

1 – 5 June 2015, Paris, France



The impact of sustainable gases on gas distribution materials

Johannes de Bruin, M.Sc.
Kiwa Technology B.V., the Netherlands



4 years of research (EDGaR)

Exposure of gas grid materials to deleterious gas components

- Lab experiments
 - 17 kinds of materials
 - 25 sustainable gases
 - More than 2500 samples
- Field experiments



A Challenging Experimental Setup for Testing the Impact of Sustainable Gases on Existing Piping Systems. Bruin, Johannes de and Hermkens, R.J.M. Copenhagen, 2014. International Gas Union Research Conference (IGRC)

Research questions & answers

- Is the Dutch gas distribution grid suitable for transportation of upgraded sustainable gases?
 - Yes, as long as gases are dry: no water, no condensate
- What are the maximum allowable component concentrations?
 - Only a limited number of restrictions
- Are the current repair and joint methods still applicable when using sustainable gases?
 - Yes, existing jointing methods are still applicable

Risks using sustainable gases in gas distribution grids

Human

- Toxicity/safety



Material

- Water
- Condensate



Limitations in the absence of water/condensate

Material	Component	Recommendation (dry)	Current limitations (NL)*
Steel, Aluminium, Copper	<ul style="list-style-type: none"> • H₂S • CO₂ • O₂ 	No limitations	<ul style="list-style-type: none"> < 5 ppm < 10.3 mol % < 0.5 mol %
POM, PVC, PE, NBR/SBR	<ul style="list-style-type: none"> • H₂S • CO₂ • H₂ • NH₃ 	<ul style="list-style-type: none"> < 160 ppm < 59 mol % < 20 vol % < 100 ppm 	<ul style="list-style-type: none"> < 5 ppm < 10.3 mol % < 12 vol % < 3 mg/m³

* Aanvullende Voorwaarden RNB Groen Gas Invoeders, I. Schoemaker., version: D14.0 [Dutch]. 2009.

Recommendations to reduce the presence of water

- Reduce water ingress: use 100 mbars as minimum internal gas pressure
- Accept only dry gas (at gas entry points)
 - Dehydrate wet sustainable gas
 - Remove liquid hydrocarbons
 - Decrease water dew point
 - -10 °C at 8 bar(g)

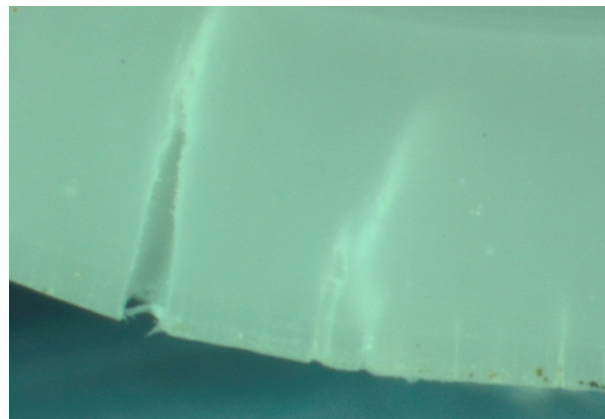
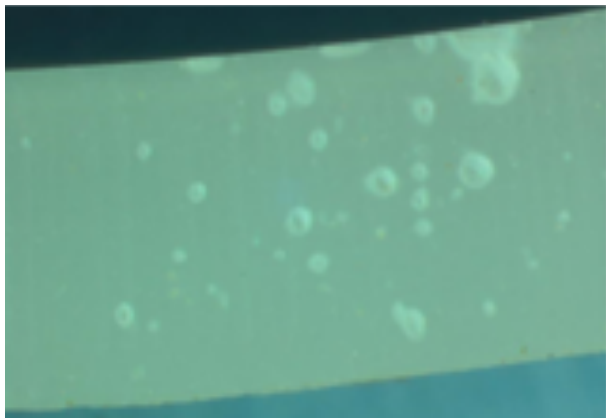


Limitations in the presence of water/condensate

Material	Component	Recommendation (humid)	Current limitations (NL)*
Steel, Aluminium, Copper	<ul style="list-style-type: none">• H₂S• CO₂• O₂	<ul style="list-style-type: none">< 34 ppm< 10.3 mol %< 0.01 mol %	<ul style="list-style-type: none">< 5 ppm< 10.3 mol %< 0.5 mol %
POM, PVC PE NBR/SBR	<ul style="list-style-type: none">• HCl• (Aromatic) hydrocarbons	<ul style="list-style-type: none">< 0.1 ppm< 800 ppm	<ul style="list-style-type: none">< 1 ppm< 1 mol %

* Aanvullende Voorwaarden RNB Groen Gas Invoeders, I. Schoemaker., version: D14.0 [Dutch]. 2009.

Why these limitations?



Thank you for your attention!

Johannes de Bruin, M.Sc.
Consultant Piping systems & Materials

T +31 (0)55 539 36 07
M +31(0)62 905 71 72
F +31 (0)55 539 32 23

Kiwa Technology B.V.
Wilmersdorf 50
P.O. Box 137, Apeldoorn
www.kiwatechnology.nl



Acknowledgements

This research has been financed by a grant of the Energy Delta Gas Research (EDGaR) program. EDGaR is co-financed by the Northern Netherlands Provinces, the European Fund for Regional Development, the Ministry of Economic Affairs and the Province of Groningen. The presenter would like to thank EDGaR, Netbeheer Nederland and all cooperating Dutch Distribution System Operators for their support in conducting the research on the impact of sustainable gases on gas distribution materials.

