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The impact of sustainable gases on gas distribution materials

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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	< 5 ppm < 10.3 mol % < 0.5 mol %
POM, PVC, PE, NBR/SBR	<ul style="list-style-type: none">• H₂S• CO₂• H₂• NH₃	< 160 ppm < 59 mol % < 20 vol % < 100 ppm	< 5 ppm < 10.3 mol % < 12 vol % < 3 mg/m ³

* 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)

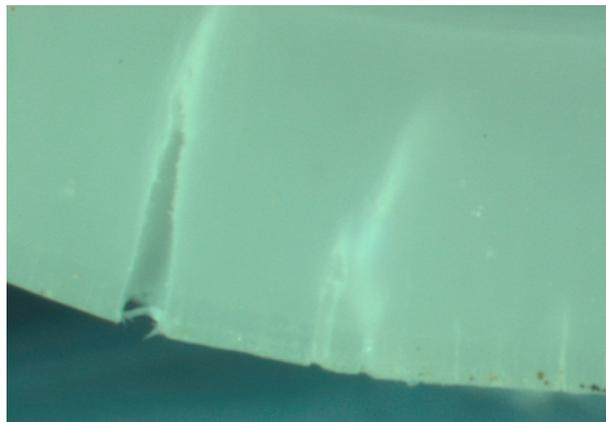


Limitations in the presence of water/condensate

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!

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