

## Supplementary Information

### Simultaneous production of biomethane and food grade CO<sub>2</sub> from biogas: an industrial case study

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\*Electronic Supplementary Information (ESI) available: [SI Table 1, with original analysis data of the CO<sub>2</sub> stream]. See DOI: 10.1039/x0xx00000x

**SI Table 1.** CO<sub>2</sub> composition after the membrane separation unit.

<b>Substance</b>	<b>Concentration</b>	<b>EIGA ISBT Limit <sup>1</sup></b>	<b>Substance</b>	<b>Concentration</b>	<b>EIGA ISBT Limit <sup>1</sup></b>
<b>Aromatic hydrocarbons (ppm)</b>			<b>Sulfides (ppm)</b>		
Benzene	0.002	0.02 <sup>c)</sup>	Carbon disulfide	<0.01	0.1 <sup>a)</sup>
Toluene	0.004		Methylethylsulfide	<0.01	
Ethyl benzene	0.002		Dimethylsulfide	<0.01	
<i>m,p</i> -Xylene	0.008		Diethylsulfide	<0.01	
<i>o</i> -Xylene	0.003		Carbonyl sulfide	<0.1	
<i>p</i> -Cymene	0.003		Sulfur dioxide	<0.1	<0.1 <sup>a)</sup>
Other oxygenated hydrocarbons	<1				
<b>Halogenated hydrocarbons (ppm)</b>			<b>Thiols (Mercaptans) (ppm)</b>		
Chloroform	<0.001		methyl mercaptan	<0.01	
Trichloroethylene	<0.001		ethyl mercaptan	<0.01	
Dichlorobromomethane	<0.001		Isopropylmercaptan	<0.01	
Tetrachloroethylene	<0.001		N-Propylmercaptan	<0.01	
Chlorodibromomethane	<0.001		<i>t</i> -Butylmercaptan	<0.01	
Tribromomethane	<0.001		<i>sec</i> -Butylmercaptan	<0.01	
1,2-Dichloroethane	<0.001		Isobutylmercaptan	<0.01	
Vinyl chloride	<0.001		N-butylmercaptan	<0.01	
<b>Gases and Vapours</b>			<b>Alcohols, ethers and esters (ppm)</b>		
CO <sub>2</sub> (%)	98.06	99.9 <sup>b)</sup>	Methanol	<1	10
CH <sub>4</sub> (ppm)	1680	50	Ethanol	<1	
Hydrogen (%)	<0.05		N-propanol	<0.01	
Nitrogen (%)	<0.06		Isopropanol	<0.01	
Oxygen (ppm)	200	30 <sup>a)</sup>	N-butanol	<0.01	
Water (ppm)	120	50 <sup>b)</sup>	Isobutanol	<0.01	
Hydrocyanic acid (ppm)	<0.5	0.5	<i>t</i> -butanol	<0.01	
Oxide of nitrogen (ppm)	<0.1	2.5 <sup>c)</sup>	Methyl ethyl ether	<0.01	
Nitrogen dioxide (ppm)	<0.14		Dimethyl ether	<0.01	
Hydrogen Sulfide (ppm)	<0.1		Ethyl acetate	<0.01	
Carbon monoxide (ppm)	<1	10 <sup>b)</sup>	Isoamyl acetate	<0.01	
<b>Metals (µg/Kg)</b>			<b>Heavy metals (µg/Kg)</b>		
Boron	<1		Aluminium	<1	
Calcium	<1		Antimony	<1	
Cobalt	<1		Arsenic	<1	
Iron	<1		Cadmium	<1	
Magnesium	<1		Chromium	<1	
Molybdenum	<1		Manganese	<1	
Selenium	<1		Mercury	<1	
Sodium	<1		Nickel	<1	
Zinc	<1		Lead	<1	
			Copper	<1	
			Vanadium	<1	

**SI Table 1.** CO<sub>2</sub> composition after the membrane separation unit.

<b>Substance</b>	<b>Concentration</b>	<b>EIGA ISBT Limit <sup>1</sup></b>	<b>Substance</b>	<b>Concentration</b>	<b>EIGA ISBT Limit <sup>1</sup></b>
<b>Ammonia and amines (ppm)</b>			<b>Aldehydes and ketones (ppm)</b>		
Ammonia	<1	2.5 <sup>b)</sup>	Propionaldehyde	<0.01	
Methylamine	<0.1		Acetone	<0.01	
Methylamine	<0.1		Acetaldehyde	0.3	0.2 <sup>a)</sup>
Isopropylamine	<0.1				
Propylamine	<0.1				
<b>Others</b>					
Phosphine	<0.1 ppm	0.3 ppm			
Non-volatile residue	<5 (mg/Kg)				
Non-volatile organic compounds	<1 (mg/Kg)				
<b>Sensory analysis</b>					
Smell	Odourless	Odourless <sup>a)</sup>			
Taste	No foreign taste	No foreign taste <sup>a)</sup>			
Appearance	No colour or turbidity	No colour or turbidity <sup>a)</sup>			
Acidity	comply with the test	comply with the test			
<sup>a)</sup> Included for sensory reason by the EIGA/ISBT					
<sup>b)</sup> Included for process reason by the EIGA/ISBT					
<sup>c)</sup> Included for regulatory by the EIGA/ISBT <sup>1</sup>					

## References

- 1 European Industrial Gases Association, Carbon dioxide source qualification quality standards and verification, (2008) 13.