

## Biomethane: responsibilities for injection into natural gas grid

This document is the result of collaboration between EBA and MARCOGAZ.

### Scope

The scope of this document is to show the actors responsible in the different stages involve in the injection of biomethane (upgrade biogas) into the natural gas network.

Additionally, information on available analysis system (at date of publication) and required quality parameters by countries are included.

### Responsibilities of in the injection of biomethane into natural gas grid

Three items have been studied:

1. Who is responsible for the quality of the biomethane to be injected into the grid?
2. Who is responsible for the quality control of the biomethane to be injected into the grid?
3. Who is responsible for the quality of the biomethane after injection into the grid

To know this information, a consultation was carried out amongst members of MARCOGAZ and EBA.

Answers were received from Austria, Belgium, Czech Republic, France, Germany, Italy, Spain, Switzerland, Sweden, The Netherlands and United Kingdom.

As the table shown, general trend is that responsibility of biomethane before injection into the grid is for producer/shipper of biomethane, but the quality control of the biomethane before and after injected in responsibility of the concerned grid operator (DSO or TSO).

<b>Who is responsible for</b>	<b>Shipper/Producer</b>	<b>DSO/TSO</b>
<i>The quality of the biomethane to be injected in the grid?</i>	Belgium, Italy, Spain, France, Switzerland, Germany, The Netherlands, Czech Republic, Sweden	
<i>The quality control of the biomethane to be injected in the grid?</i>	Italy, The Netherlands	Belgium, Spain, France, Switzerland (?), Germany (most case), Czech Republic, Sweden
<i>The quality of the biomethane after injection into the grid?</i>		Belgium, Italy, Spain, France, Switzerland, Germany, The Netherlands, Czech Republic, Sweden

### **Control of biomethane quality parameters**

Depending the parameter considered, the quality control of each one is done on-line (continuously) or in batch (by mean of periodic analysis).

Due to the recent publication of the standard EN16723-1:2016, at the time of this consultation, most of the countries only control the parameters included in National specification/standards.

- Calorific value
- Water and hydrocarbon dew points
- Other trace components
- Odorisation

See table on next page for situation in each country.

### **Analysis devices of biomethane quality**

The analysis devices identified in the enquiry are:

- Gas Chromatograph
- Water dew point
- Hydrocarbon dew point
- Methane analysers

Control of main biomethane parameter by countries.

<b>Property/Country:</b>	<b>Belgium</b>	<b>Czech Republic</b>	<b>France</b>	<b>Germany</b>	<b>Spain</b>	<b>Italy</b>	<b>Switzerland</b>	<b>Sweden</b>	<b>The Netherlands</b>
<i>Methane</i>	#N/A	Online	#N/A	Online	Online	#N/A	Online	Online	Online
<i>Propane</i>	Online	Online	#N/A	Online	#N/A	#N/A	#N/A		#N/A
<i>Carbon Dioxide</i>	Online	Batch	Online	Online	Online	Online	Online		Online
<i>Hydrogen Sulphide</i>	Online	Batch	Online	Online	Online	Online	Batch		Online
<i>Oxygen</i>	Online	Online	Online	Online	Online	Online	Online		Online
<i>Inerts</i>	#N/A	Batch	#N/A	Online	#N/A	#N/A	Batch		Online
<i>Water dew point</i>	Online	Online	Online	Online	Online	Online	Batch		Online
<i>Hydrocarbon dew point</i>	#N/A	Batch	#N/A	Online	Online	Online <sup>1</sup>	Batch		Batch
<i>Total Sulphur</i>	Batch	Batch	Batch + online	Batch	Online	Batch	Batch		Batch
<i>Mercaptans</i>	Batch	Batch	Batch	Online	Online	Batch	Batch		#N/A
<i>Gross Calorific Value</i>	Online	Online	Online	Online	Online	Online	Batch	Online	Online
<i>Wobbe Index</i>	Online	Online	Online	Online	Online	Online	Batch		Online
<i>Density (rel)</i>	Online	Online	Online	Online	Online	Online	Batch		#N/A
<i>Odourisation</i>	#N/A	Batch	Online	Online	Online	Batch <sup>2</sup>	Batch		Online
<i>Ammonia</i>		Batch		Batch	Batch	Batch			
<i>Hydrogen</i>		Batch		Online	Batch	Batch			
<i>Carbon Monoxide</i>		Batch		Batch	Batch	Batch			

#N/A: Not Applicable

<sup>1</sup> Only in case of injection of LPG in the biomethane

<sup>2</sup> See prescriptions in UNI 7133 for odourisation control and for odorizability of the biomethane

## Quality values required by legislation in some countries in Europe for biomethane injection into natural gas network, (updated at 20190205)

	FR	NL <sup>4</sup>	ES	SE	DE	CH	AT	IT	DK	GB <sup>2</sup>	BE	CZ
<b>GCV (kWh/m<sup>3</sup>)</b>	9.5 – 10.5 (L) 10.7 – 12.8 (H)		10.23-13.23		8.4-13.1	10.7 – 13.1	9.9-12.8	9.71-12.58			9.52 – 10.75 (L) 10.81 – 12.79 (H)	Value ± 1% of average GCV in gas network for last month at the place of injection  (general range for gas network is 9.4-11.8)
<b>WI (kWh/m<sup>3</sup>)</b>	12.5 – 13.06 (L) 13.64 – 15.70 (H)	43.46-44.41 MJ/m <sup>3</sup>	13.368-16.016		11.0 – 13.0 (L) 13.6 – 15.7 (H)	13.3 – 15.7	13.5-15.5	13.14-14.54	14.1-15.5	13.82 - 15.05	12.19 – 13.03 (L) 13.65 – 15.78 (H)	
<b>Relative density</b>	0.555-0.70		0.555-0.70	0.555-0.7	0.55-0.75	0.55 – 0.70		0.555-0.7	0.555-0.7		0.555-0.70	
<b>Reference conditions: Combustion / volume</b>	0°C / 0°C, 103.25 kPa	25°C/ 0 °C, 103.25 kPa	0°C/ 0 °C, 103.25 kPa	15°C/ 15 °C, 103.25 kPa	25°C/ 0 °C, 103.25 kPa	?	?	15°C/ 15 °C, 103.25 kPa	25°C/ 0 °C, 103.25 kPa	15°C/ 15 °C, 103.25 kPa	25°C/ 0 °C, 103.25 kPa	15°C/ 15 °C, 101,325 kPa
<b>GCV<sup>5</sup> (MJ/m<sup>3</sup>, 15/15)</b>	32.4 – 35.9 (L) 36.5 – 43.7 (H)		34.8 – 45.1		28.7 – 44.7	38.5 – 47.2 <sup>6</sup>	32.4 – 46.1 <sup>6</sup>	35.0 – 45.3			32.5 – 36.7 (L) 36.9 – 43.7 (H)	33.8 – 42.5
<b>WI<sup>5</sup> (MJ/m<sup>3</sup>, 15/15)</b>	42.7 – 44.6 (L) 46.6 – 53.6 (H)	41.23 – 42.13	45.5 – 54.5		37.6 – 44.4 (L) 46.4 – 53.6 (H)	47.9 – 56.5 <sup>6</sup>	48.6 – 55.8 <sup>6</sup>	47.3 – 52.3	48.2 – 55.8	49.8 – 54.18	41.6 – 44.5 (L) 46.6 – 53.9 (H)	
<b>Water dew point (°C at 70 bar abs)</b>	< -5 At MOP	≤ -8 (High pressure L - HTL) ≤ -8 (Regional L - RTL) ≤ -10 at 8 bar abs (Distribution L - RNB)	<2	≤-8			<-8	≤-5	-8	<-10 for MOP < 7 barg < -10 at MOP	<-8 In transmission grid	≤-7 (40 bar)

	FR	NL <sup>4</sup>	ES	SE	DE	CH	AT	IT	DK	GB <sup>2</sup>	BE	CZ
<b>Water (mg/m<sup>3</sup>)</b>					< 50 (MOP > 10bar) < 200 (MOP <10 bar)	< 60					<110 In distribution grid	
<b>HC dew point (°C at 1-70 bar abs)</b>	< -2	≤ 80 (mg/m <sup>3</sup> (n) at 3°C)	<5	<5	< -2		<0	≤0	-2	<-2	<-2 In transmission grid	<0
<b>Total Sulfur (mgS/m<sup>3</sup>)</b>	< 30	≤ 5.5 (≤ 20) (High pressure L - HTL) (before odorisation) ≤ 5.5 (≤ 20) (Regional L - RTL) (before odorisation) ≤ 5.5 (≤ 20) (Distribution L - RNB) (before odorisation) ≤15.5 (<31) (Regional L - RTL) (after odorisation) ≤15.5 (<31) (Distribution L - RNB) (after odorisation)	< 50	≤ 20 (without odorant) ≤ 30 (with odorant)	< 6 < 8 (after odorisation)	< 30	<1 20	≤ 20 (without odorisation)	< 30	< 50	< 20, before odorisation < 30, after odorisation	< 30
<b>Mercaptan sulfur (mgS/m<sup>3</sup>)</b>	< 6	≤ 6		≤ 6 (without odorant)	< 6			< 6			< 6, before odorisation	
<b>Mercaptanes (mgS/m<sup>3</sup>)</b>			< 17				< 16.9		< 6			
<b>H<sub>2</sub>S + COS (mgS/m<sup>3</sup>)</b>	< 5	≤ 5	< 15	≤ 5	< 5		< 6.8		< 5		< 5 mgS/m <sup>3</sup> , before odorisation	
<b>H<sub>2</sub>S (mgS/m<sup>3</sup>)</b>						< 5		≤ 5		≤ 5		≤ 5

	FR	NL <sup>4</sup>	ES	SE	DE	CH	AT	IT	DK	GB <sup>2</sup>	BE	CZ
<b>CO<sub>2</sub> (% Mol)</b>	< 2.5 (Exemptions exist for the DSO system: up to 3,5% (H gas) / up to 11,7% (L gas))	≤3 (High pressure L - HTL) ≤10.3 (Regional L - RTL) ≤10.3 (Distribution L - RNB)	< 2.5	≤ 4	< 10 L-gas* < 5 H-gas*	< 4	<2	≤ 2.5	<2.5 transmission <3 distribution	<2.5	<2,5 on transmission grid <4 on distribution grid (<6 on L-gas)	≤ 3 Transmission ≤ 5 distribution
<b>N<sub>2</sub>+CO<sub>2</sub> (% Mol)</b>											< 15, only for L-gas	
<b>O<sub>2</sub> (% Mol)</b>	0.01 (exemption: up to 0.7% in the transmission grid / up to 0,75% in the distribution grid)	≤0.0005 (High pressure L - HTL) ≤0.5 (Regional L - RTL) ≤0.5 (Distribution L - RNB)	< <0,3 in transmission grid < 1 in distribution grid <sup>1</sup>	≤ 1	< 0.001 (MOP > 16bar) < 3 (MOP <16 bar)	< 0.5	< 0.02	≤ 0.6	< 0.5	< 0.2 < 1 for MOP< 38 bar	<0,1 on transmission grid < 1 on distribution grid	≤ 0.02 Transmission ≤ 0.5 distribution
<b>Hg (µg/m<sup>3</sup>)</b>	< 1		< 1								< 1	
<b>Cl (mg/m<sup>3</sup>)</b>	< 1	≤ 5	< 1	Acc. to CEN/TR (WI 00408007)				< 1		≤ 1.5 <sup>3</sup>	< 1	
<b>F (mg/m<sup>3</sup>)</b>	< 10	≤ 5	< 10	Acc. to CEN/TR (WI 00408007)		< 1		< 3		≤ 5 <sup>3</sup>	< 10	
<b>Halogenures (mg/m<sup>3</sup>)</b>										< 1.5		≤ 1.5
<b>H<sub>2</sub> (% Mol)</b>	< 6	≤0.02 (High pressure L - HTL) ≤0.02 (Regional L - RTL) ≤0.5 (Distribution L - RNB)	< 5	≤ 2	< 2**	< 5		≤ 0.5		< 0.1	< 2 on transmission grid (if not injected in UGS) < 2 on distribution grid	≤ 0.01 Transmission ≤ 0.1 distribution

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<b>NH<sub>3</sub> (mg/m<sup>3</sup>)</b>	< 3		<3	≤ 10	Technically free*			≤ 10	< 3	≤ 20 <sup>3</sup>	< 10	
<b>Amines</b>				≤ 10 (mg/m <sup>3</sup> )	Technically free*			≤ 10			<10	
<b>CO (% Mol)</b>	< 2	≤2900 mg/m <sup>3</sup>	< 2	≤ 0.1				≤ 0.1			< 0.1	
<b>Cyanides (HCN) ppm</b>												
<b>BTX (mg/m<sup>3</sup>)</b>			< 500							≤ 100 <sup>3</sup> (Xilene)	< 500 ppm	≤ 10
<b>Siloxanes (mg/m<sup>3</sup>)</b>		<0.1 as Si		≤ 0.3 as Si	< 5*		< 10	≤ 1	< 1	≤ 0.5 as Si	<1 as Si	≤ 5
<b>Impurities (mg/m<sup>3</sup>)</b>			Technically free	Technically free	Technically free	Technically free					Technically free	
<b>Dust (mg/m<sup>3</sup>)</b>		≤ 100 Size > 5µm	Technically free	Technically free	Technically free			Technically free			< 5µm	≤ 3 µm Transmission ≤ 5 µm distribution
<b>Methane</b>			≥ 90		>90 Mol-% (L)* >95 Mol-% (H)*							≥ 95
<b>Propane</b>											< 3, if enrichment	≤ 3
<b>Methane number</b>				≥ 65								
<b>Injection temperature</b>		5-30 °C (High pressure L - HTL) 5-30 °C (Regional L - RTL) 5-20 °C (Distribution L - RNB)									in MD-B : 2°C < T < 25°C in MD-C : 2°C < T < 38°C	0-40 °C (High pressure) 0-20 °C (low pressure <0,4MPa)

	FR	NL <sup>4</sup>	ES	SE	DE	CH	AT	IT	DK	GB <sup>2</sup>	BE	CZ
<b>Standard / Reference</b>	GRTgaz Prescriptions Techniques, V3, 1/02/2007 Arrêté du 28/03/1980 Arrêtés du 28/01/1981  GRDF, Prescriptions techniques du distributeur GRDF, April 2017	ISO 6326 ISO 6327 ISO 6570 ISO 6974 ISO 6976 ISO 15970 Richtignen R-16-46, 18/08/2016		EN 16726 EN 16723-1 EN 16723-2	DVGW G260 *DVGW G262 ** DIN 51624			UNI TR 11537		Gas Safety (Management) Regulation, 1996 Network Entry Agreements	Synergrid G8/01	459/2012 Sb. (national law) TPG 902 02 Technical rules for gas industry
<b>Update at</b>	March 2018	March 2018	December 2018	February 2019	March 2018			March 2018	March 2018	March 2018	February 2019	April 2018

**Footnotes:**

<sup>1</sup> < whenever that: CO<sub>2</sub> < 2% mol, water dew point < -8°C, biomethane flow in transmission pipelines < 5.000 m<sup>3</sup>/h.

<sup>2</sup> additional requirements for other parameters not included in the table.

<sup>3</sup> for biomethane derived from waste, biomethane has to comply with the UK Environment Agency's End-of-Waste Quality Protocol.

<sup>4</sup> at date of emission of this table, biomethane has been injected only in L gas network, although there is regulation for doing it on H gas network.

<sup>5</sup> properties calculated at reference condition 15°C/ 15 °C, 103.25 kPa, using ISO 13443:2006 Annex A conversion factors. Rounded to 1 decimal.

<sup>6</sup> due to lack of information on reference condition, direct transformation from kWh to MJ done.