Standardization of Biomethane

UPDATE OF THE ACTIVITIES OF CEN TC 408

ERIK BÜTHKER, SPECIALIST GASEOUS FUELS TOTALENERGIES

Transition towards sustainable fuels

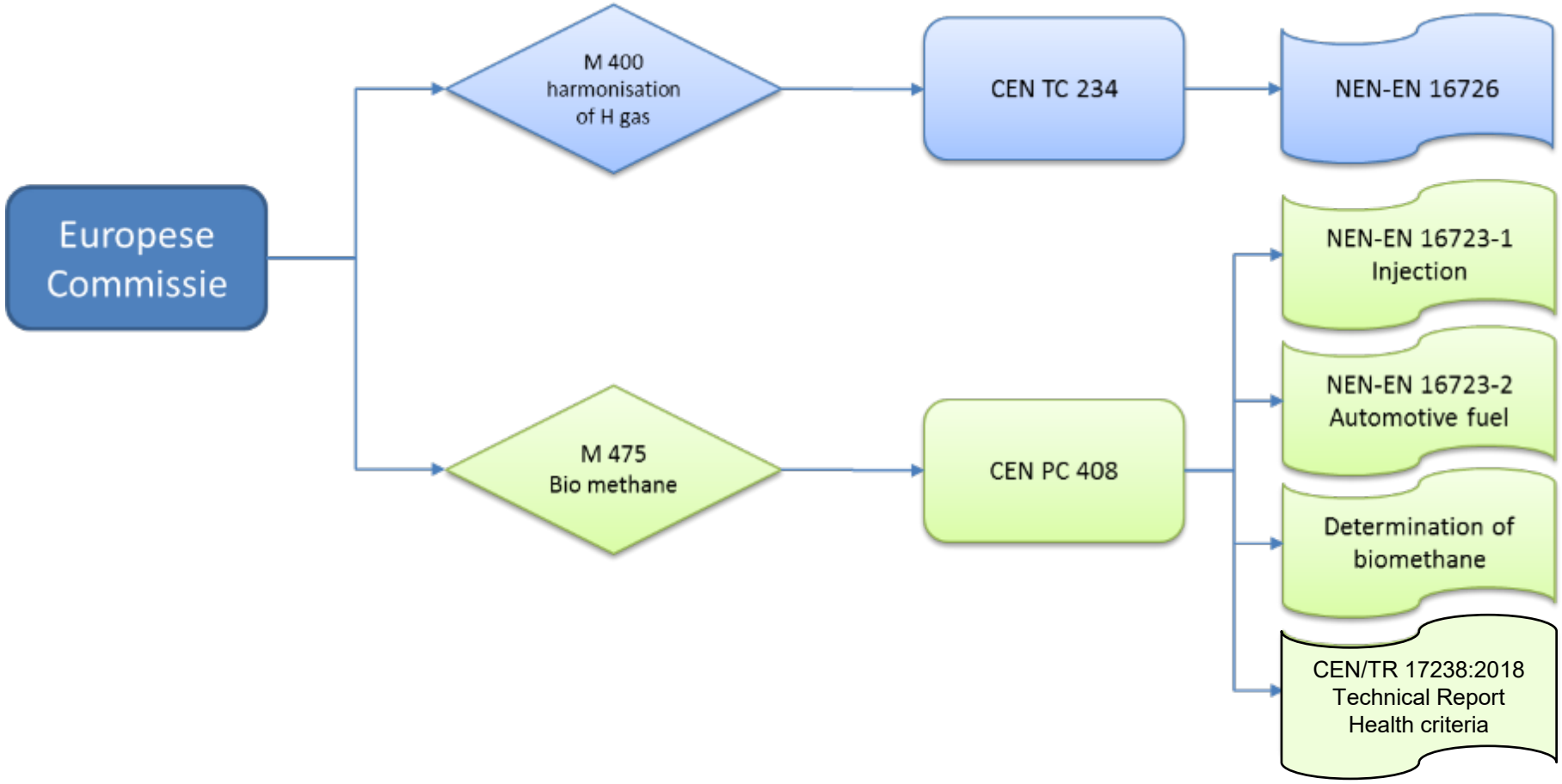
Transition towards:

renewable gas, green gas or bio methane and bio LNG

green hydrogen

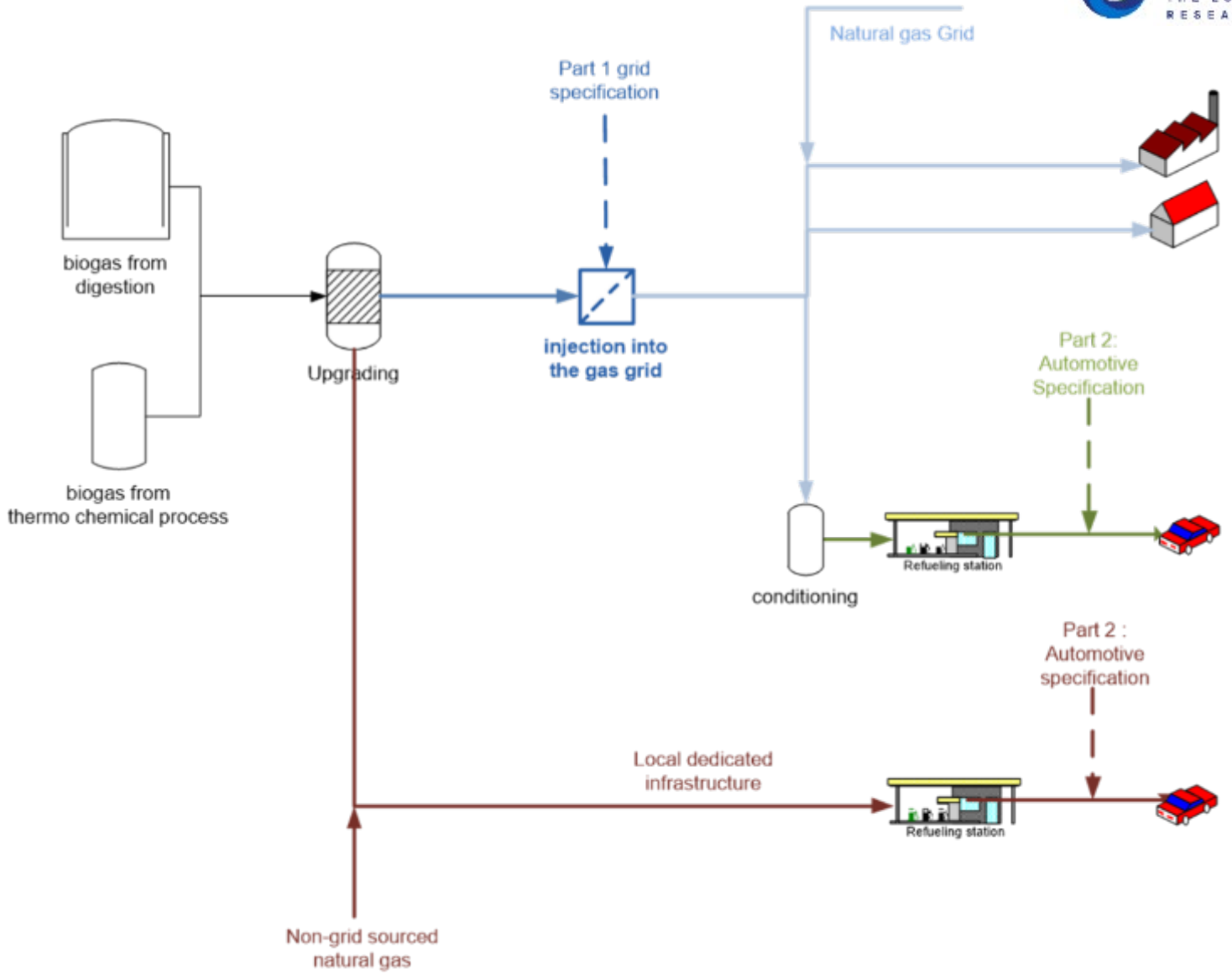
renewable electricity

Background of the establishment TC 408



Scope PC 408

Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid



EN 16723-1

Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network - Part 1: Specifications for biomethane for injection in the natural gas network

Standard	Parameter	Value
EN 16726	hydrocarbon dewpoint	max -2 °C
EN 16726	sulfur	The standard for injection will follow the specification for sulfur in EN 16726.
ISO 8573-2	Compressor Oil	The biomethane shall be free from impurities other than “de minimis” levels of compressor oil and dust impurities. In the context of this European Standard, “de minimis” means an amount that does not render the biomethane unacceptable for conveyance and use in end user applications.
ISO 8573-4	Dust Impurities	The biomethane shall be free from impurities other than “de minimis” levels of compressor oil and dust impurities. In the context of this European Standard, “de minimis” means an amount that does not render the biomethane unacceptable for conveyance and use in end user applications
EN 1911	Chlorinated components	
ISO 15713	Fluorinated components	max 1 %
EN 16723-1	CO	max 0,1 % The 0,1% limit was taken from the CLP-Regulation (EC) No 1272/2008.
EN 16723-1	Total Silicon	0,3 – 1 mg Si /m3 Studies have demonstrated that continuous exposure to 100 % biomethane for 15 years should require a specification as low as 0,1 mg Si/m3. However, a limit set at this level would present difficulty in terms of analytical measurement (current quantification limits are at best 0,10 mg Si/m3, which would imply setting a limit of 0,30 mg Si/m3). Moreover, this would not recognize the mitigating effects of dilution of injected biomethane by natural gas. It is therefore suggested that the limit value to be applied [in a Network Entry Agreement] should be agreed between biomethane producer and gas transporter [grid operator] taking into account both performance of current analytical methods and dilution opportunities through, e.g. capacity studies
EN 16723-1	NH3, Amine	in absence of water no need, else 10 mg/m3

EN 16723-2

Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network - Part 2: Automotive fuels specification

	Parameter		
EN 16726	Hydrogen sulfide + Carbonyl sulfide (as sulfur)	5 mg /m3	
EN 16726	hydrocarbon dewpoint	max -2 oC	
EN 16726	Methane number	min 65	
EN 16723-2	Methane number dedicated spec.	min 80	
EN 16723-2	water dewpoint	max -10 °C at 200 bar	Class A
		max -20 °C at 200 bar	Class B
		max -30 °C at 200 bar	Class C
EN 16723-2	dust impurities	**de minimis** proposal < 5 micron dust < 10 micron liquid	
EN 16723-2	S total (including odorization)	30 mg S /m3	
EN 16723-2	Total Silicon	0.3 mg Si /m3 0,1 mg Si /m3 can severely harm switching type oxygen sensors of some vehicles (see DNV GL report). However, a limit set at this level would present difficulty in terms of analytical measurement (current quantification limits are at best 0,10 mg Si/m3, which would imply setting a limit of 0,30 mg Si/m3). And currently biomethane production processes cannot guarantee a level of siloxanes below 0,5 mgSi/m3.	

EN 16723-2

Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network - Part 2: Automotive fuels specification

	Parameter	
EN 16723-2	Compressor oil	The fuel shall be free from impurities other than “de minimis” levels of compressor oil and dust impurities. In the context of this European Standard, “de minimis” means an amount that does not render the fuel unacceptable for use in end user applications.
EN 16723-2	Dust impurities	• The fuel shall be free from impurities other than “de minimis” levels of compressor oil and dust impurities. In the context of this European Standard, “de minimis” means an amount that does not render the fuel unacceptable for use in end user applications. • Fuelling stations providing LNG should include a filter with maximum size of 5 µm nominal and 10 µm absolute with 90 % efficiency and giving maximum particle contamination of 10 mg/L of LNG to protect the vehicle system from debris.
EN 16723-2	Amine	10 mg /m3
EN 16723-2	Hydrogen	2 % mol /mol
EN 16723-2	Oxygen	1 % mol /mol

TR 17238

Proposed limit values for contaminants in biomethane based on health assessment criteria

Example of different sources of HCVs

These examples given in Table A.1 are extracted from a French study by INERIS. For a set of several compounds, sources to define HCV come from several countries or National experts' panel. They are defined under specific conditions which are further explained in the references.

Table A.1 — examples of different sources of HCVs

CAS	Substances	HCV - Inhalation pathway - Threshold toxicity	
		(mg/m3)	Références
75-01-4	Vinyl chloride	56	RIVM, 2001
156-59-2	cis-1,2-Dichloroethene	6	RIVM, 2007
71-55-6	1,1,1-trichloroethane (1,1,1-TCA)	1	OEHHA, 2008
79-01-6	Trichloroethylene (TCE)	2	US-EPA, 2011
127-18-4	Tetrachloroethylene (PCE)	4	US-EPA, 2011
75-09-2	Dichloromethane	4	OEHHA, 2000
67-66-3	Trichloromethane (chloroforme) (TCM)	63	AFSSET, 2008
56-23-5	Tetrachloromethane (TCC)	38	AFSSET, 2008
75-25-2	Tribromomethane	No value	

New activities

Analysis methods

prEN ISO 2611-1 (WI=00408012) Analysis of natural gas -- Biomethane determination of halogenated compounds -- Part 1: Part 1: HCl and HF content by ion chromatography
prEN ISO 2612 (WI=00408015) Analysis of natural gas -- Biomethane ¬-- Determination of ammonia content by Tuneable Diode Laser Absorption Spectroscopy
prEN ISO 2613-1 (WI=00408013) Analysis of natural gas -- Silicon content of biomethane -- Part 1: Part 1: Determination of total silicon content by AAS
prEN ISO 2613-2 (WI=00408016) Analysis of natural gas -- Silicon content of biomethane -- Part 2: Determination of siloxane content by Gas Chromatography Ion Mobility Spectrometry
prEN ISO 2614 (WI=00408017) Analysis of natural gas -- Analysis of biomethane -- Determination of terpenes' content by micro gas chromatography

Research

Results of the previous research on siloxanes

- Siloxanes research
  - report on behaviour of silicon for domestic boilers (executed on Dutch gas)
    - failure of ionization safety device
    - clogging of stainless steel heat exchangers
    - carried out in L gas situation

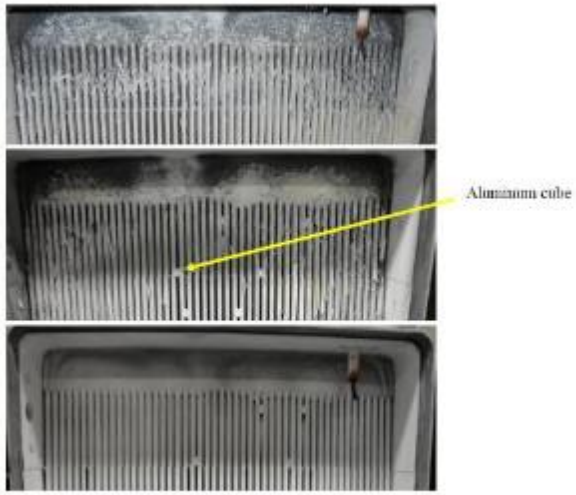


Figure 21: Photographs taken of the lamellar heat exchanger of boiler 1 taken after experiments with different siloxane concentrations. From top to bottom, the siloxane concentrations were 264.0 mg Si/m^3_n, L2, 56.3 mg Si/m^3_n L2 and 33.2 mg Si/m^3_n D5. For each experiment ~50 grams of silica was produced.

Report

Regarding specifications for siloxanes in bio-methane for domestic equipment

Groningen, February 6, 2013

Research

research on Siloxanes as automotive fuel

- research on behavior of gas engines exposed to silicon
  - failure of spark plug
  - sensors performance like Lambda sensors
  - performance of catalyst
  - Silica build up in lubrication oil
- conclusion
  - No big difference between the limit value for siloxanes for injecting biomethane into the grid or the limit value for use as automotive fuel
  - Not all biomethane production sites produces siloxanes
  - The installations for upgrading raw biogas to distribution specifications will take out most of the siloxanes.

Figure 26: Ionization probe from boiler 1 covered with silica.

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SILOXANEN CNG

Towards well-founded standards for siloxanes in bio-CNG

AFNOR Normalisation

Report No.: GCS.102568

Date: 3-10-2016

Biomethane trace components and their potential impact on European gas industry

Biomethane trace components and their potential impact on European gas industry

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Towards the removing of technical barriers to biomethane injection into the natural gas grids

A multi-phase project aiming to revise the standards limits regarding trace component in biomethane

Phase 1

GERG gas industry priorities:
Status review and gap analysis:
- Siloxanes
- Corrosive components
- Micro-organisms

Phase 2a

January 2018

Combination of GERG priorities & CEN immediate priorities:
- Status review and gap analysis
  - Sulfur
  - Oxygen
  - Health impact assessment
- Experimental program: impact of siloxane on:
  - Industrial boilers
  - Heavy duty vehicles performance

SA/CEN/RESEARCH/475/2017-07

Phase 2b

October 2020

Follow up from Phases 1 & 2a

WP1: Experimental program on siloxanes impacts
- Engines: test on switching type oxygen sensors

WP2: Experimental program on the impact of sulfur on vehicles After Treatment System (Catalysts)
- Lab test using dedicated burner with given sulfur concentration in natural gas

WP3: preparation for Experimental program on the impact of oxygen and corrosive components on gas facilities:
- Gas grid
- Underground Gas Storage

WP4: Improve knowledge on biomethane
- Biomethane quality database (UK data)
- Literature review on siloxane purification process

CEN/2019/ENER/C2/452-2019

Phase 2c

Follow up from Phases 1, 2a & 2b

WP1: Experimental program on siloxanes impacts
- Industrial boilers: cycling mode (start and stop)

WP2: Experimental program on the impact of sulfur on vehicles After Treatment System (Catalysts)
- Ageing test
- Vehicle test
- Sulfur ageing modeling

WP3: Experimental program on the impact of oxygen and corrosive components on gas facilities:
- Gas grid
- Underground Gas Storage
- Impact of hydrogen on type 1 CNG steel tanks

WP4: Improve knowledge on biomethane
- Biomethane quality database (Swedish data)
- BioSNG & bioLNG quality data (French data)
- Upgrading process database

Phase 3

Revision of standard EN 16723 part 1&2

Questions and Contact Details

My contact details:

Erik Büthker
Specialist Gaseous Fuels
Business Development Asia, New Markets
Mobile: +31621501403
E-mail: erik.buthker@totalenergies.com