MEMBRANE GAS SEPARATION

Biogas upgrading technology

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www.mega.cz

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MemBrain®

MEGA/Membrain - Fields of activity

Processes	EDI, ED, RO, MF, NF, UF, GMS			
Segments	Water	Food	Fine Chemicals	Gas Separation
Applications	Treatment			Biomethan Production
	Recycling			Separation Hydrogen
	Desalination			
	Concentration			Enriching Air with Oxygen
Products	Research, Laboratory, Engineering, Laboratory Units, Small-scale Units			

We have in both fields nearly 100 applications around the whole world

MEGA/Membrain – Our technology in Poland

r. 2014 MLEKOVITA®

r. 2015 CHORZELE

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Separation of Biomethane – Advantages

- **Advantages of using membrane separation**
  - Small built up area
  - Minimum service requirements
  - Low consumption of energy
  - Continuous operation
  - High flexibility in fluctuations in flow and composition of biogas
  - Simple capacity expansion
  - Quick start up

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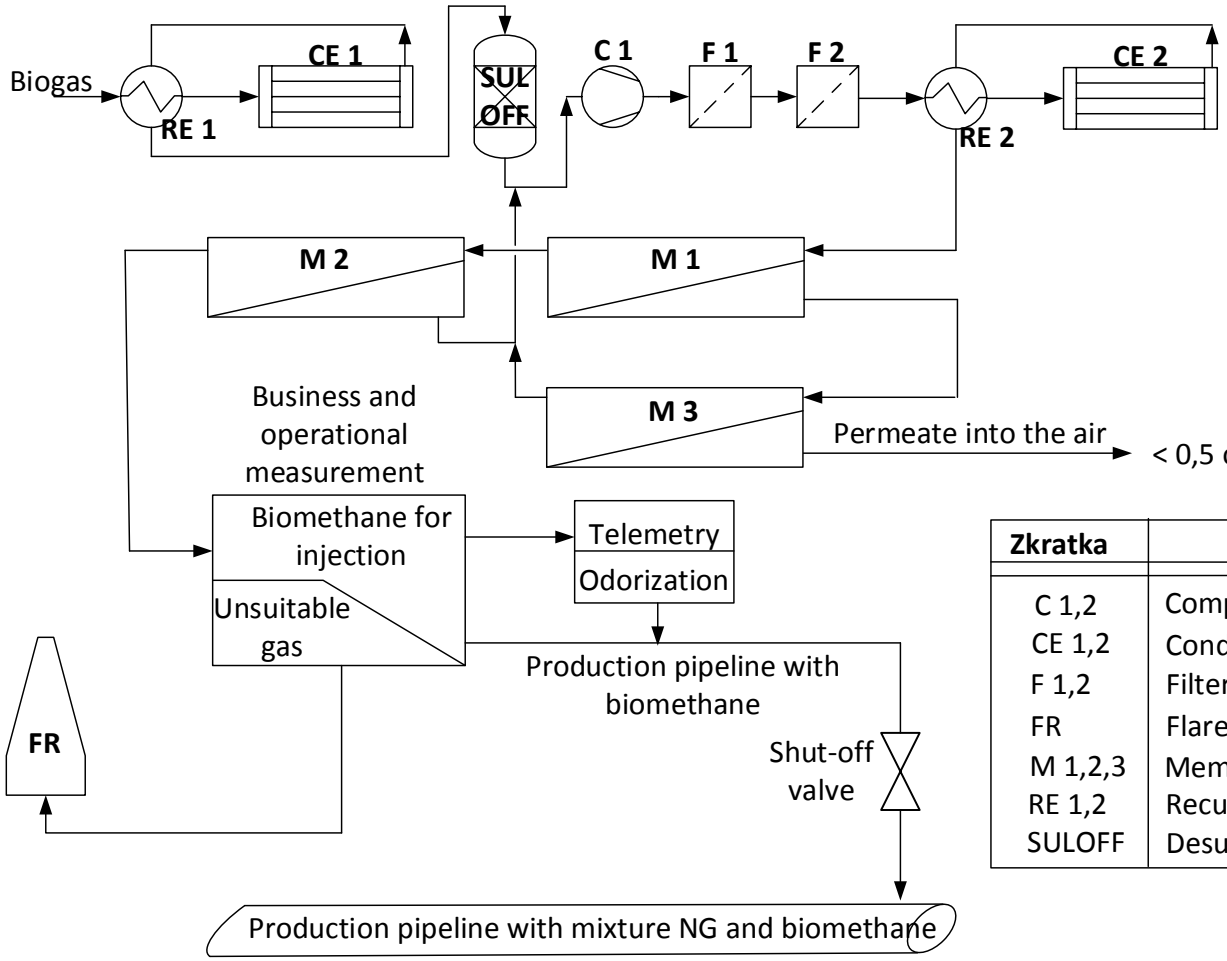
Separation of Biomethane – Basic parts



Zkratka	Zařízení
C 1,2	Compressor 1, 2
CE 1,2	Condensing exchanger 1,2
F 1,2	Filter 1, 2
FR	Flare
M 1,2,3	Membrane modules 1,2,3
RE 1,2	Recuperation exchanger 1,2
SULOFF	Desulfurization column

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Separation of Biomethane – quality of biogas

- CH4 > 50 vol.%
- N2 max. 1,2 vol.%
- O2 depends on concetration of N2
- H2S < 50 ppm, at higher is necessary to use column
- NH3 < 20 ppm, at higher is necessary to use column
- Siloxanes < 5 ppm, at higher is necessary to use column

Biomethane commercial units

- ***Tab.1.*** Standard series of performance

Biogas flow	Nm^3/h			100	200	250	500	1000
Concentration CH_4 in biogas	obj.%			51 - 65	51 - 65	51 - 65	51 - 65	51 - 65
Biometan production	Nm^3/h	13 - 17	26 - 34	53 - 68	to 135	to 169	to 338	to 677
Biometan	Kg/h	9 – 12	18 - 24	37 - 48	75 - 95	to 118	to 237	to 474

- Three-stage of biomethane separation
  - three-stage – permeate containing 0,3 – 0,5 vol.% CH_4

Biomethane commercial units

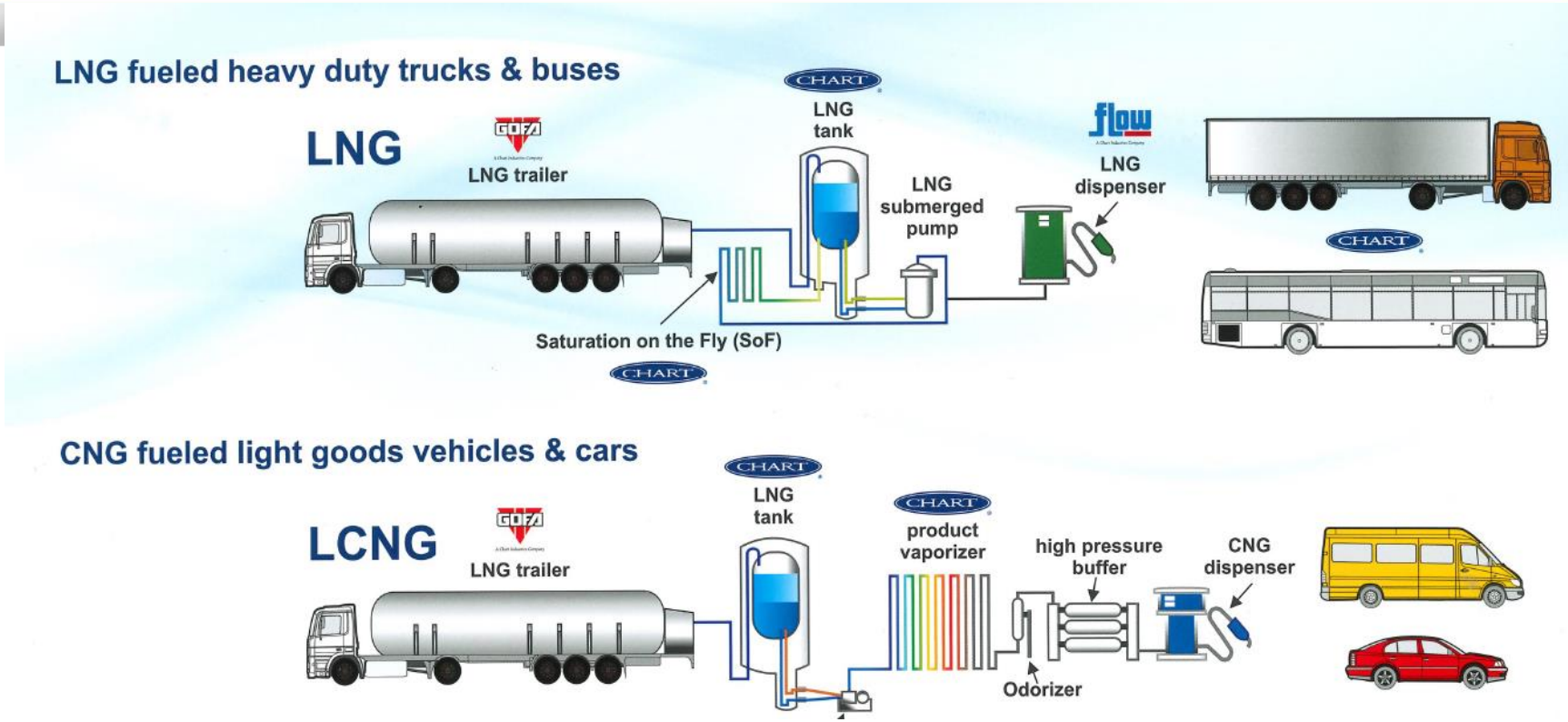
- ***Tab.2.*** Consumption of energy

Biogas flow	Nm^3/h	250	500	1000
Consumption calculated on the raw biogas	kW/Nm3	0,45	0,32	0,3
Consumption calculated on the biomethane	kW/Nm3	0,76	0,54	0,46

Energy consumption includes blower, compressor, cooling, air condition, and biomethane compressor

Option: 75% of energy for compressor is possible to use like source of hot water, t = 55°C

BioLNG


LNG fueled heavy duty trucks & buses
LNG
LNG trailer
CHART
LNG tank
LNG submerged pump
flow
LNG dispenser
Saturation on the Fly (SoF)
CHART
CHART
CNG fueled light goods vehicles & cars
LCNG
LNG trailer
CHART
LNG tank
CHART
product vaporizer
high pressure buffer
CNG dispenser
Odorizer

BioLNG

- **Benefits**
  - You cannot be near the gas pipeline for injection of biomethane
  - Simple logistics
  - Required fuel for trucks, supported by EU legislation

CONCLUSION

- BioCNG (biomethane) production technology has been proven by company Membrain and is commercially viable.
- Each unit can be specifically designed according to customer specification.
- We can designed and construct completely new biomethane unit together with new production of biogas from company Farmtec

CZECH REPUBLIC

Thank You for your attention

MEGA a.s., MemBrain s.r.o.

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