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Presentation of the state of the art of biogas production/usage in Switzerland

16th November 2007

Amsterdam



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The general situation in Switzerland

- Directive 2003/55 EC (not conventional gases has to be accepted by the NG-grid)
- Not conventional gases are:
 - Biogas (methane rich gas produced by anaerobic digestion) and
 - SNG (methane rich gas produced by thermal gasification of biomass or other carbon substrates)
- Quality demands has to be fulfilled
- Technical rules and safety standards has to be fulfilled to get access to the grid

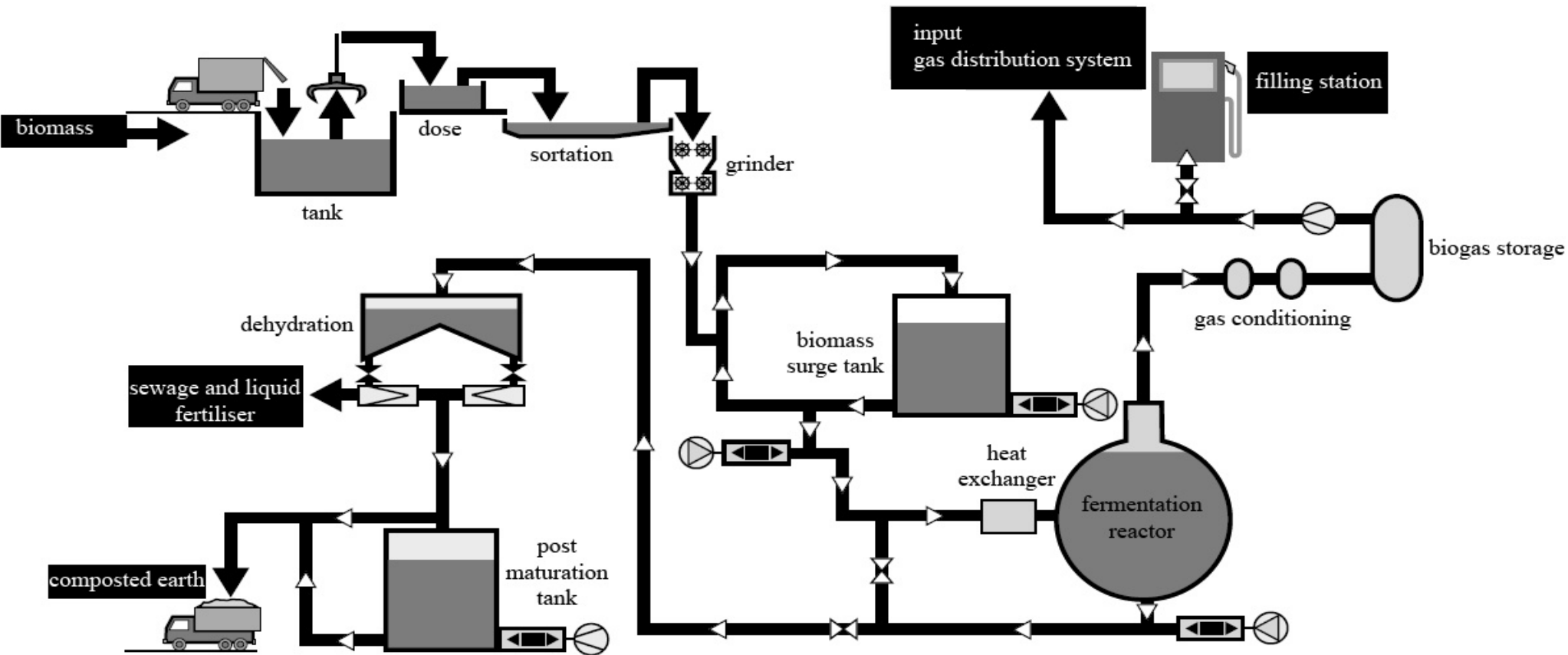
The general situation in Switzerland

- Domestic biogenic waste can be used for the biogas production in Kompogas plants
- The disposal fees of the domestic waste recycling supports the economic balance of the biogas production
- The end products of the digestions cycle can be sold as fertilizer and high quality composted soil
- The biogas is used as fuel (often on the place of production or by a balanced model/injection to the NG grid)
- The biogas access to the grid is “cooperative”

Biogas production

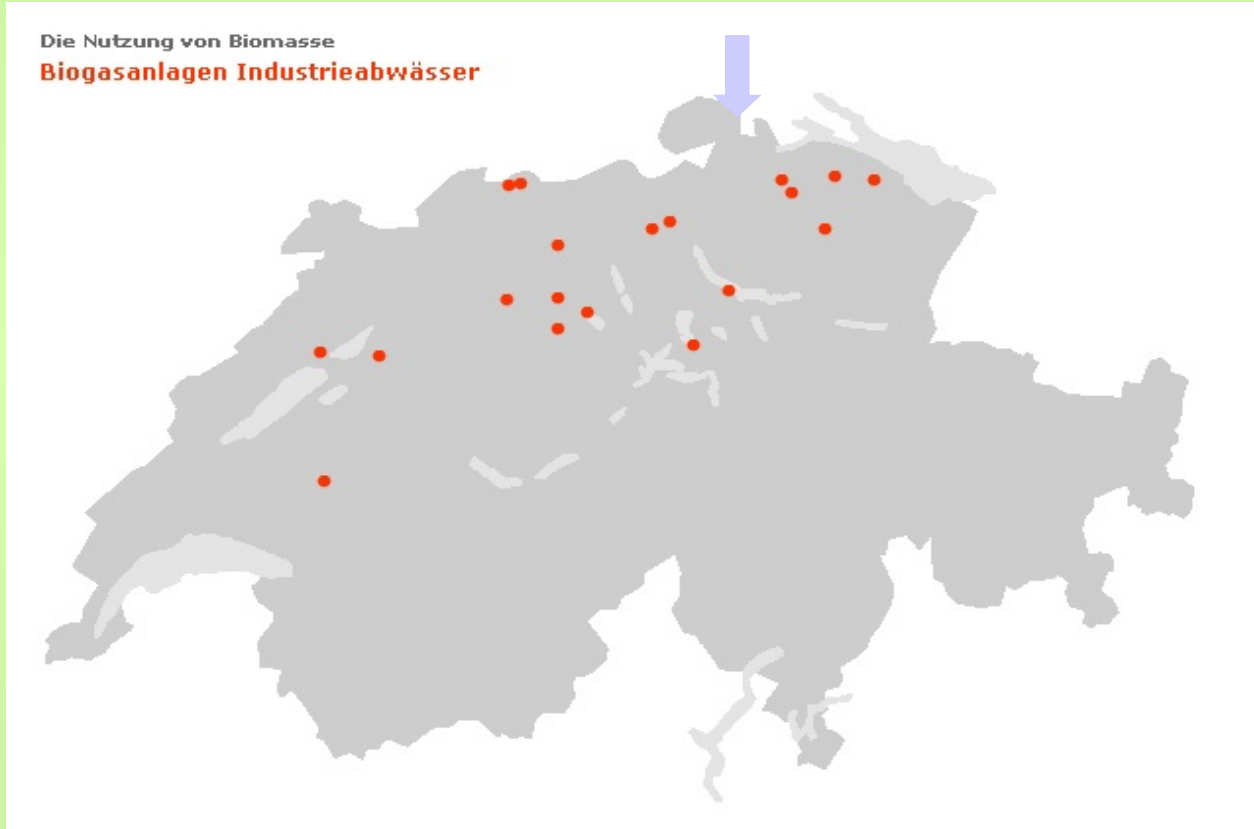
- in the following diagram is the pattern of a kompogas plant represented (most frequently used in Switzerland)
- It is a single-step heat process of an anaerobic fermentation
- approximately 90% of the energy content of the bio wastes are converted into fermentation gas
- The process needs approximately 30% of the produced energy;
- 60% remain usable

Biogas production (optimal ecological cycle)



Source: Verband der Schweizerischen Gasindustrie VSG

Biogas plants using industrial sewage



Source: www.biogas.ch



Source: www.biogas.ch

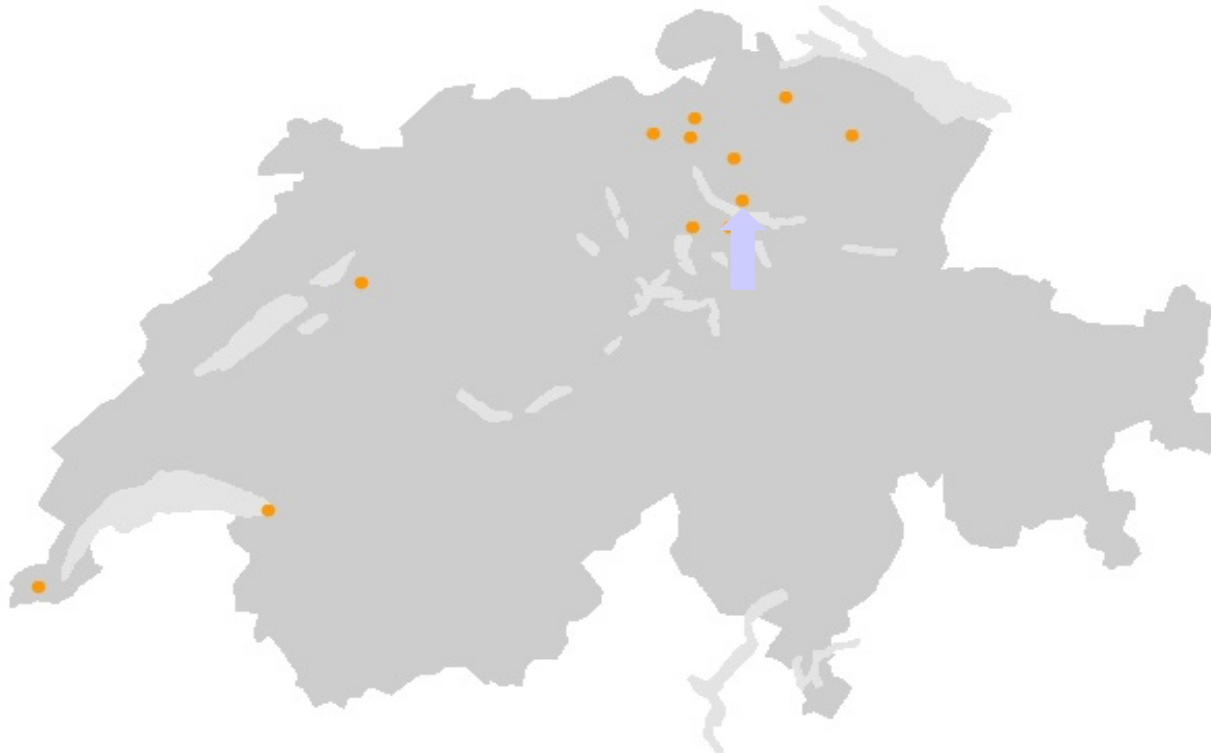
Dällikon ZH

reactor	300 m ³
energy content	822 MWh/a
gas production	137'000 m ³ /a
power supply	206 MWh/a
electric power	60 kW

facts from 23.04.2002

Biogas plants operated by industry

Die Nutzung von Biomasse
Biogasanlagen Gewerbe/Industrie



Source: www.biogas.ch



Source: www.biogas.ch

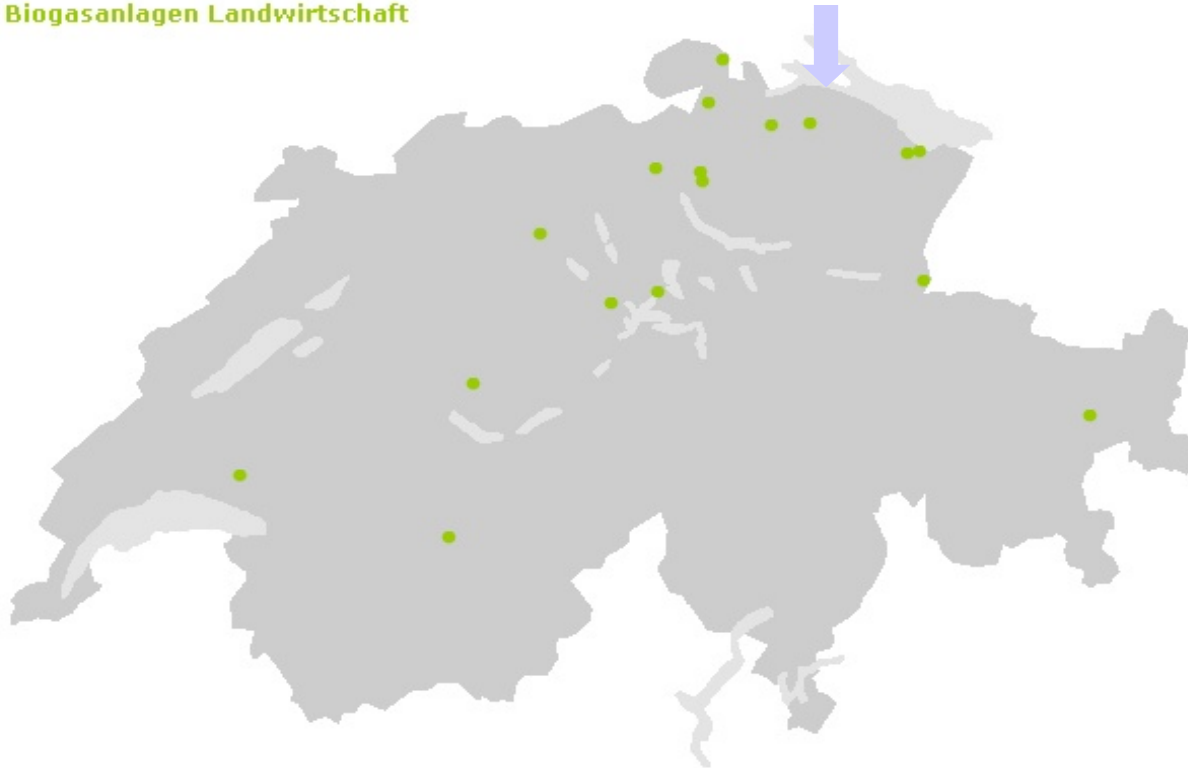
Samstagern ZH

reactor	256 m ³
energy content	2'737 MWh/a
gas production	820'000 m ³ /a
power supply	933 MWh/a
electric power	170 kW

facts from 23.04.2002

Biogas plants digesting agriculture wastes

Die Nutzung von Biomasse
Biogasanlagen Landwirtschaft



Source: www.biogas.ch

Bissegg TG

reactor	600 m ³
energy content	2'766 MWh/a
power supply	802 MWh/a
electric power	75 kW, 80 kW

facts from 23.04.2002

Sewer gas plants

Die Nutzung von Biomasse
Klärgasanlagen



Source: www.biogas.ch

Bissegg TG

reactor	600 m ³
energy content	2'766 MWh/a
power supply	802 MWh/a
electric power	75 kW, 80 kW
facts from	23.04.2002

Statistic of the biogas plants

Biogas: Anlagen, Verbrauch, Produktion

Jahr	Anzahl Biogasanlagen, in:			Biogasverbrauch (GWh), in:			Effektiv genutzte Wärme (GWh), in:			Produzierte Elektrizität (GWh), in:		
	Landwirtschaft	Abfallwirtschaftung ¹	Abwasserwirtschaftung ²	Landwirtschaft	Abfallwirtschaftung ¹	Abwasserwirtschaftung ²	Landwirtschaft	Abfallwirtschaftung ¹	Abwasserwirtschaftung ²	Landwirtschaft	Abfallwirtschaftung ¹	Abwasserwirtschaftung ²
1990	102	8	333	15	69	362	4,6	7	206	1,5	20	59
1994	82	15	381	14	182	407	4,0	27	231	1,5	46	70
1995	76	16	393	13	178	413	3,8	26	233	1,5	49	72
1996	73	18	404	13	182	425	3,7	28	238	1,7	49	76
1997	68	19	414	12	176	440	3,5	26	245	1,7	48	81
1998	63	21	426	13	176	463	3,1	24	258	2,1	49	87
1999	66	23	440	14	183	478	3,1	24	262	2,6	50	91
2000	62	24	451	16	190	485	3,2	25	266	3,2	51	96
2001	64	24	461	18	176	514	3,3	23	271	3,8	47	107
2002	63	24	465	20	158	512	3,5	19	274	4,5	42	107
2003	62	24	468	22	151	513	3,5	14	275	5,3	38	109
2004	67	23	470	26	127	519	3,9	13	277	6,5	29	111
2005	72	24	472	35	119	515	4,7	12	275	9,4	26	111
2006	80	25	475	53	107	530	6,3	12	280	15,5	23	116

¹ Deponiegas und Biogasanlagen Gewerbe/Industrie

² Klärgas aus kommunalen Kläranlagen und Biogas aus Industrieabwässer

Quelle: Statistik der erneuerbaren Energien

Biogas plants

- Apart from some hundred smaller biological gas facilities in the agriculture – there are seven larger fermentation plants
- Each of them digests approx. 5000 - 10000 tons of biogenous wastes from household and trade process per year
- This corresponds to a supply area of approximately 50000 -100000 inhabitants
- Two of these plants - Samstageren and Bachenbuelach - supply natural gas to the net, each about 60 m³/h
- This amounts to approximately 6 GWh per year
- Further plants with net supply are planned

Gas composition requirements

- The composition of fermentation gas is unfortunately not optimal for a further use
- But the contractually regulated high quality of the natural gas may not be impaired by the feed of fermentation gas in the gas net
- Because the natural gas mixed with the fermentation gas has to meet the same quality standards pure NG (gas end using devices)
- heat value and wobble number (index for burner load) must agree in a defined scatter band
- for other components the values may not exceed in accordance with SVGW guideline G 13 (for the feed of fermentation gas in the natural gas net)

Gas composition requirements

SVGW Regelwerk G13

Richtlinien für die Einspeisung
von Biogas ins
Erdgasverteilnetz



Uneingeschränkte Einspeisung

Methan:	>96Vol. %
O ₂ -Gehalt:	<0.5Vol. %
H ₂ S:	<5 mg/Nm ³
CO ₂ :	<6Vol. %
H ₂ :	<5Vol.%

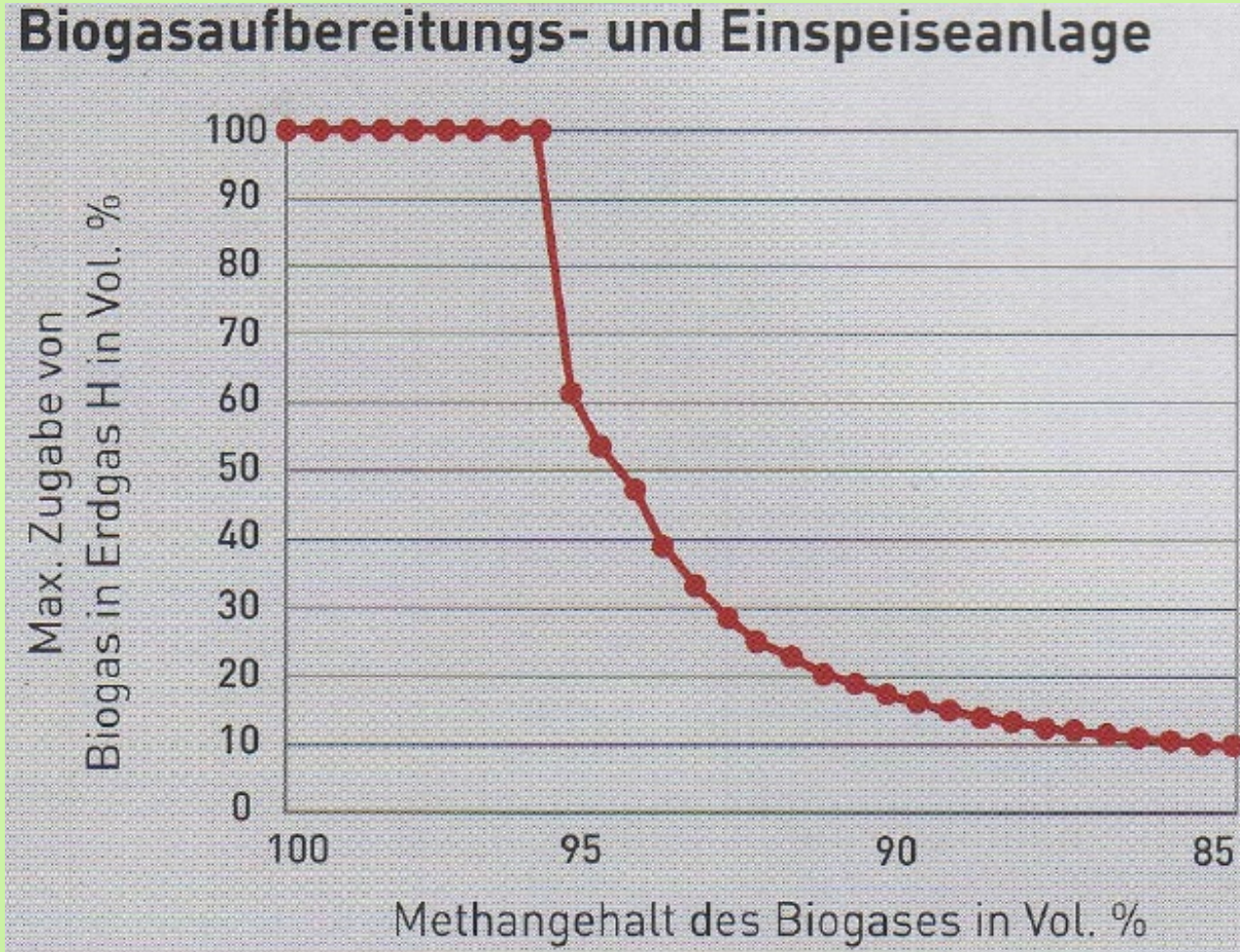
Eingeschränkte Einspeisung

Methan:	>50Vol. %
O ₂ -Gehalt:	<0.5Vol. %
H ₂ S:	<5 mg/Nm ³
CO ₂ :	<6Vol. %
H ₂ :	<5Vol. %

Einspeisung begrenzter Volumenströme

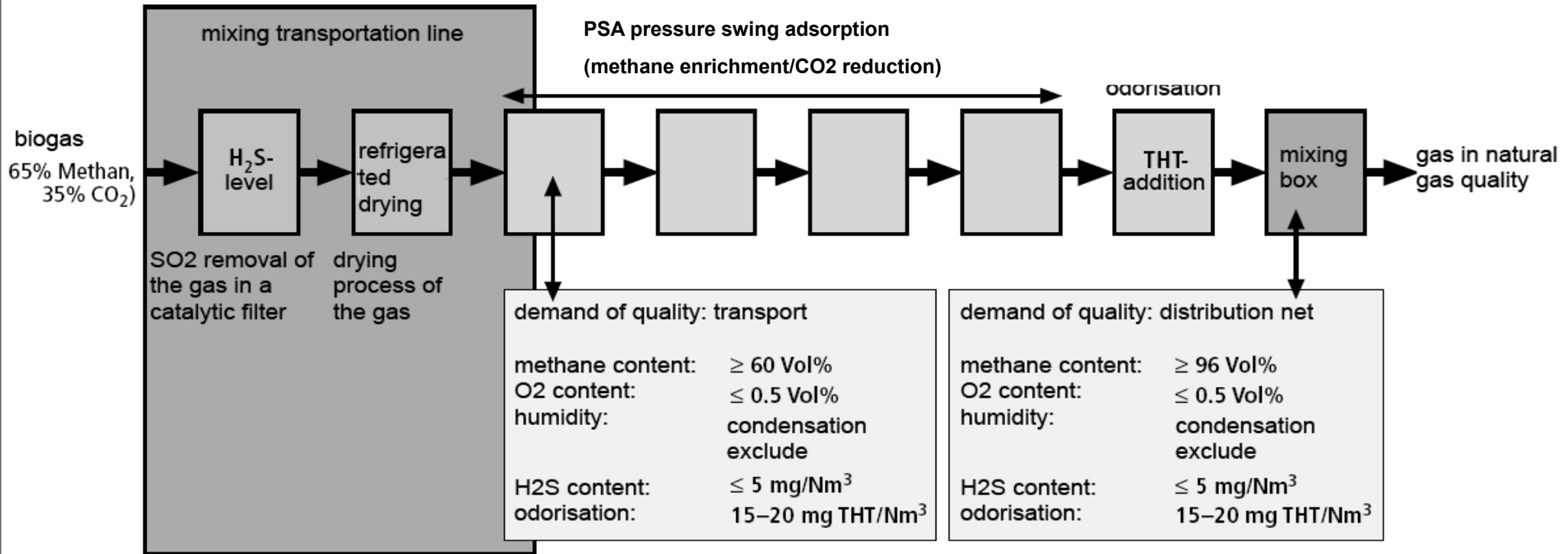
Source: Verband der Schweizerischen Gasindustrie VSG

Gas composition requirements



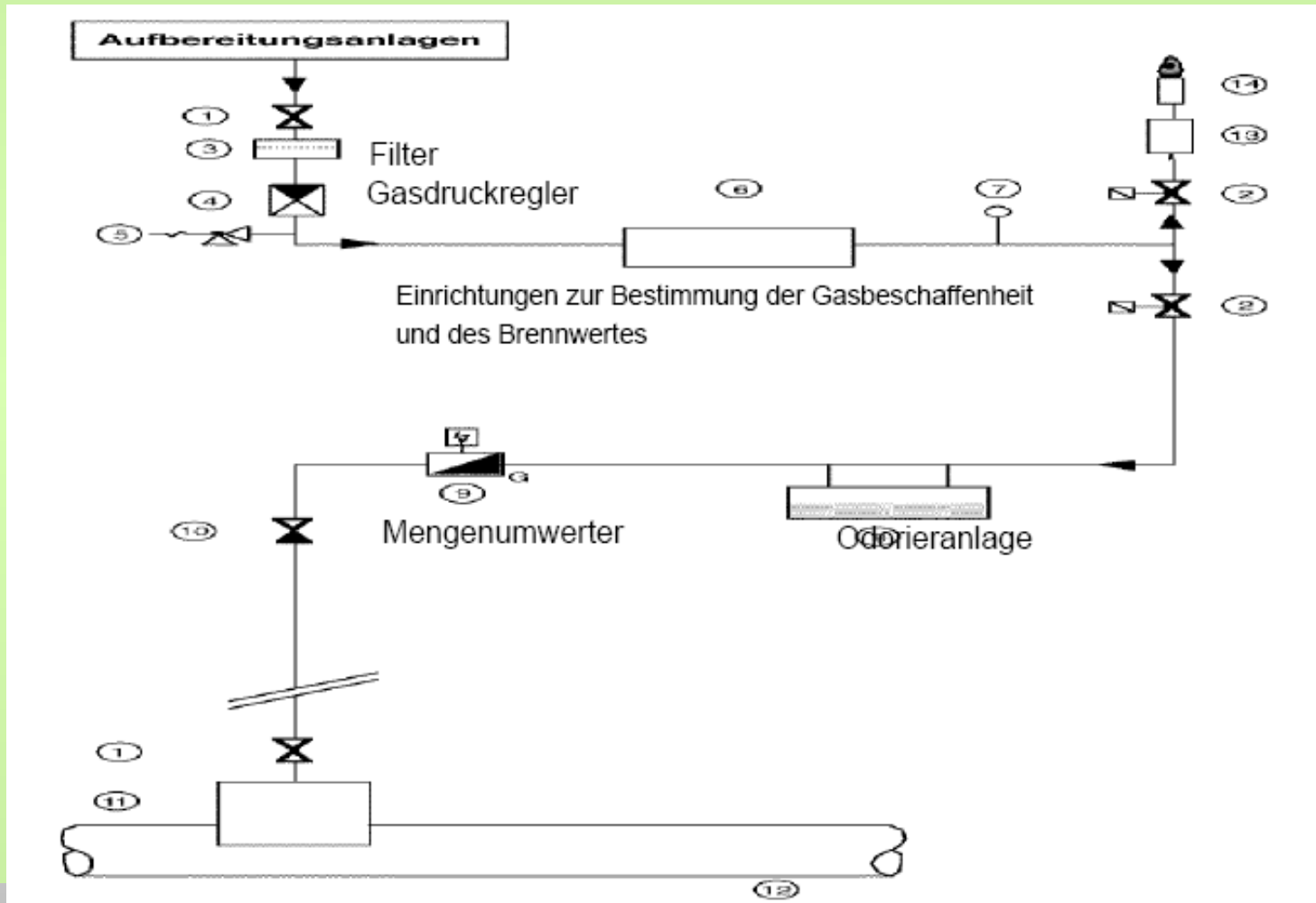
Source: Verband der Schweizerischen Gasindustrie VSG

Biogas conditioning



Source: Verband der Schweizerischen Gasindustrie VSG

Biogas injection



Biogas injection



Gas composition monitoring

Continuously

CH₄

CO₂

O₂

Dew point

Periodic

H₂S

GC analysis of raw
and product gas

Trace elements

Odouring





Sources

- SVGW
- Association of the Swiss gas industry
- www.biogas.ch

thank you for your attention

