

Use of biogas for production of town gas

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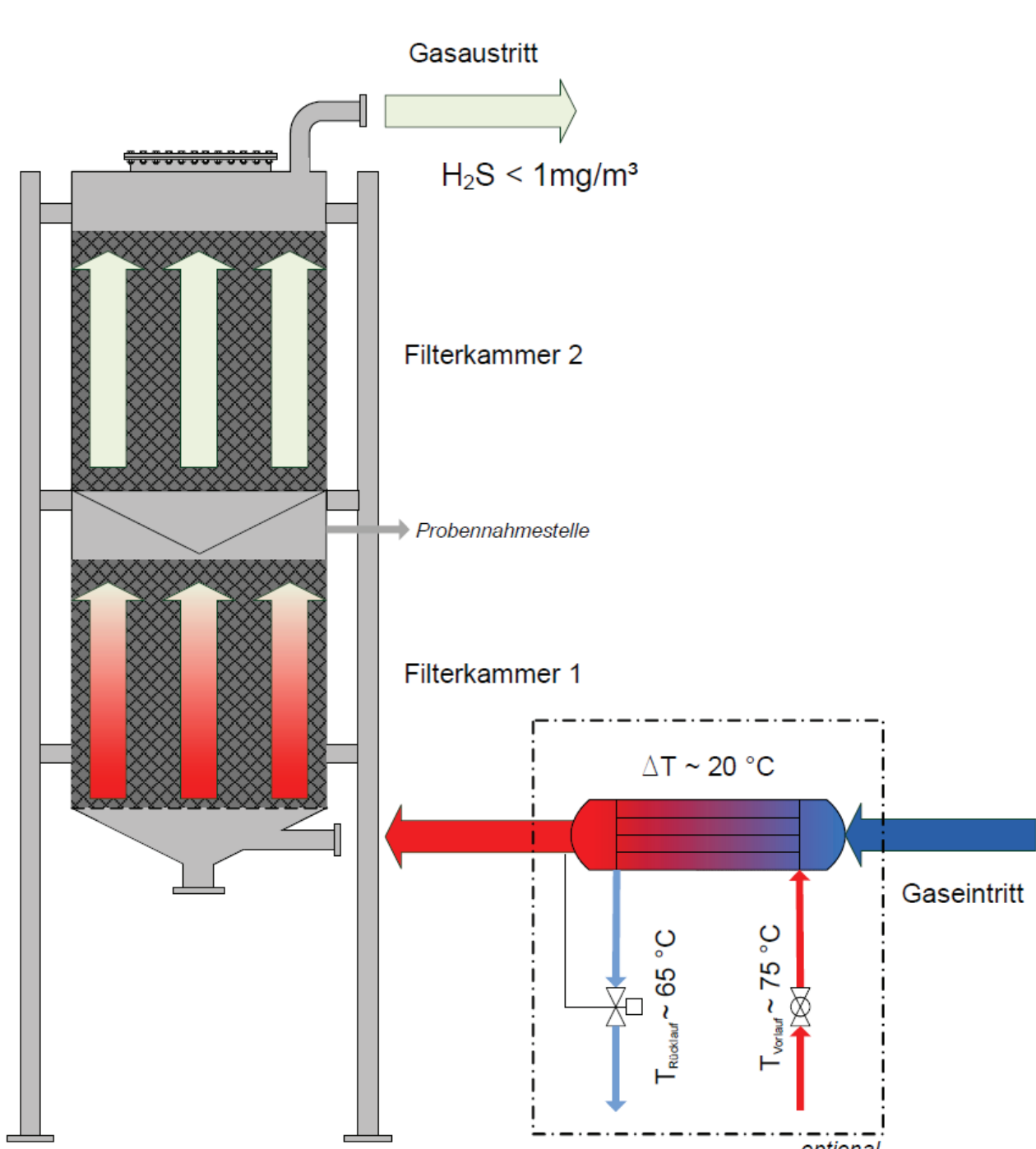
Introduction

HOFOR A/S is distributing towngas to the city of Copenhagen. The type of towngas is 1e. Produced by mixing natural gas and air in ejectors at steady conditions. (natural gas at 19 baro and air at atmospheric pressure). App. in proportions 1:1 to have a towngas with an upper wobbeindex at 24,9 MJ/mn³.

Biogas from purifying water at Biofos A/S in Copenhagen is produced in excess. HOFOR has in 2012 agreed with Biofos A/S to buy and use this biogas. App. 6 mill m³/year. In 2013 HOFOR has build a biogas purification plant at Biofos A/S to purify the biogas (removal of H₂S, siloxanes and NH₃). As biogas is only purified and not upgraded (no removal of CO₂) the use of biogas at low pressure in the production of towngas is to a much lesser expense than using only natural gas (upgraded).

Carbon filters

- 2 x 6m3 filters – 1 filter in operation (500 kg carbon/m³)
- 4 g carbon /m³ gas (500 ppm H2S, 100 ppm NH₃, 15 mg /m³ gas siloxanes)
- 750 m³/h – 8.000 h/år
- 5-6 weeks of operation per filter (90% eff.)
- 24.000 kg/år = 6.000.000 m³ biogas = 720.000 DKK/år



6.000.000 m³ of biogas per year at a pressure of 200 mbar

Raw Biogas					
Gascomposition (dry basis)					
	Unit	Mean	Min.	Max.	
CH ₄	Mol %	60,98	59,77	62,34	
CO ₂	Mol %	39,02	37,66	40,23	
N ₂	Mol %	0,001	0	0,186	
O ₂	-	n.d.			
H ₂ S	Mg/m ³	300	230	430	(215 ppm)
NH ₃		n.d.			
Total silicium compounds	Mg/m ³	19,6	17,6	24,8	
n.d. : not detected					

The purified biogas is distributed 4,5 km along to the towngas production plant Kløvermarken.

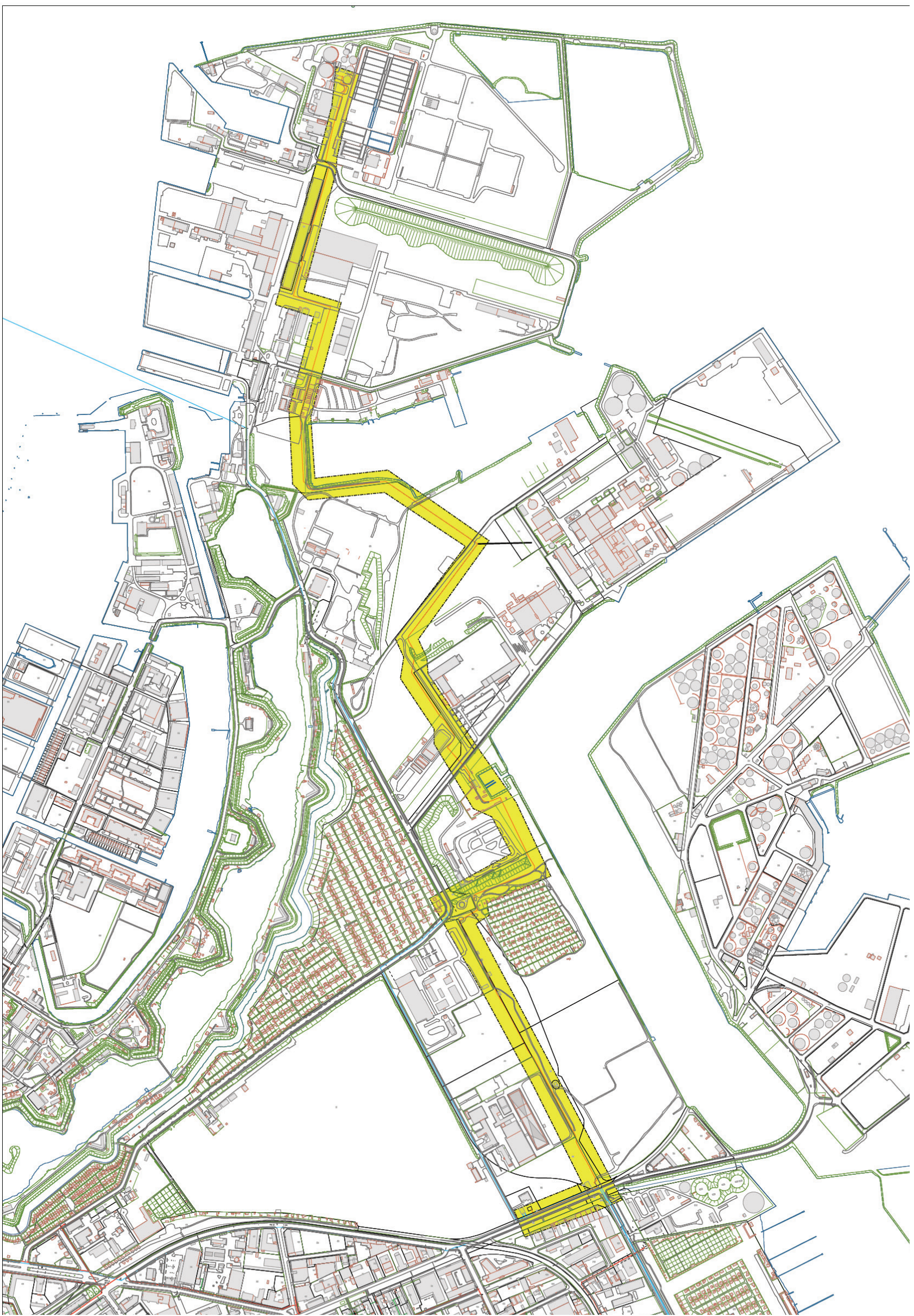


Gaspipeline ø 560 mm



Kløvermarken towngas production

Towngasquality:
W.I (upper): 24,9 MJ/mn³
Typical variations:
A: 36,6% nat. gas – 33,7% air – 30% biogas
B: 44,1% nat. Gas – 40,9% air – 15% biogas (biogas nom. 61% CH₄ and 39% CO₂)



At Kløvermarken the biogas is used for production of towngas by mixing with natural gas and air in a dynamic ejector. App. in proportions 1:1:1. Still to have a towngas with an upper wobbeindex of 24,9 MJ/mn³. The capacity is 1.000 m³/h biogas (3.000 m³/h towngas) at a pressure of 300 mbar.

