Kanadevia INOVA

Datasheet CO_2 liquefaction

CO_2 recovery, purification and liquefaction

Carbon dioxide liquefaction process

The gas produced in biogas plants primarily consists of two components: carbon dioxide (CO_2) and methane. Instead of releasing the generated CO_2 into the environment, it can now be captured and utilised. To help mitigate the global increase in atmospheric CO_2 levels, there is a growing trend of recovering CO_2 from biomass and processing it for use in various applications. This is done at CO_2 liquefaction plants.

Technical description

The CO_2 liquefaction process involves cooling the gas to temperatures where CO_2 condenses into a liquid while trace gases such as nitrogen, methane, etc., remain in their gaseous state. The process includes cleaning, drying and compressing the CO_2 and condensing it to a liquid. To ensure the quality of the liquid CO_2, trace gases and other impurities are removed. Any methane remaining in the CO_2 can be captured and returned to the biogas plant, which improves the profitability and sustainability of biomethane production.

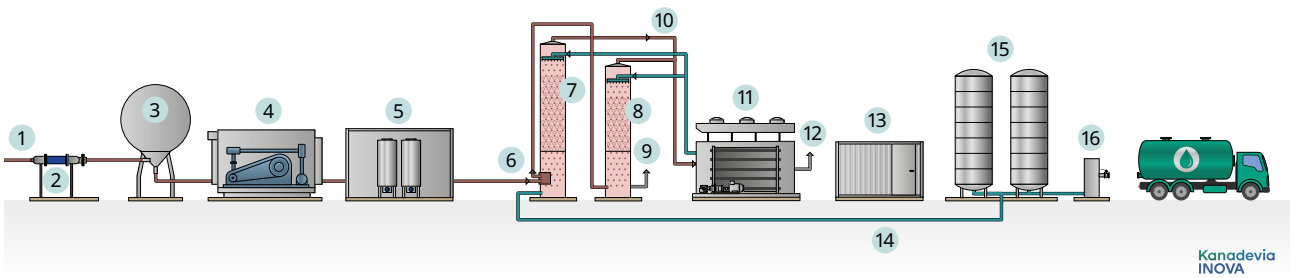
Market opportunities

- Environmental benefits and carbon credits: By capturing CO_2, biogas plants reduce carbon emissions significantly, enhancing their environmental sustainability. This process generates additional carbon credits, strengthening compliance with regulatory frameworks.
- Carbon capture and utilisation (CCU): The liquefied CO_2 produced during biogas upgrading can be captured and utilised in various industries. For example, it can be used in food and beverage production for carbonation, in greenhouses to enhance plant growth or in chemical manufacturing. This creates additional revenue streams for biogas producers, as they can sell the captured CO_2.
- Industrial applications and export potential: With increasing awareness of sustainable practices, industries are looking for solutions to reduce their carbon footprint. Liquefied CO_2 has growing market potential not just domestically but also in international markets, where renewable energy sources are highly sought-after.

Benefits

- 100% methane recovery
- Natural coolant CO_2
- Compact and modular design
- Food-grade product quality (ISBT/EIGA)
- Product guaranteed to have no odour, colour or taste

Schematic of principal setup



1 Inlet gas piping
2 Preconditioning
3 Buffer tank
4 Compressor
5 Cleaning and drying
6 Reboiler
7 Stripper column
8 DCC column (DCC: direct contact cooler)
9 VOC-rich off-gas (VOC: volatile organic components)
10 CH_4-, N_2-, O_2-rich gas
11 Condenser
12 CH_4-, N_2-, O_2-rich off-gas
13 Quality measurement
14 Liquid CO_2
15 Liquid CO_2 storage tank
16 Truck filling

CO_2 liquefaction

		Model S	Model M	Model L
Plant size				
Nominal liquefaction capacity	kg/h input	550	1,200	2,300
Turn-down	%		50	

Technical data				
Container	ft	1 x 40’	2 x 20’ 1 x 40’	4 x 20’
Weight, approx.	t	20	2 x 8 10	4 x 8
Height, approx.	m	10	11	12
Area outdoor installation [1]	m x m	12 x 15	22 x 16.5	24 x 18

Performance data		
Voltage	V	400
Frequency	Hz	50 / 3 Ph
Design temperature	°C	–15 to +35
Product quality		ISBT/EIGA (food and beverage quality)
Input gas pressure	mbar (g)	≥100
Power demand standard coolant R449A [2]	kWh/kg CO_2 (input gas)	0.22
Power demand option coolant R744 [2]	kWh/kg CO_2 (input gas)	0.20
Liquefaction efficiency [3]	%	Up to 94

Emissions		
Sound pressure level at 10 m distance	dB (A)	≤80

Options		
		CO_2 product analyser with or without enclosure
		CO_2 product storage tanks including truck filling unit
		Off-gas recovery

Equipment		
Control system		Siemens
Visualisation		WinCC
Remote access		yes

[1] Clarification of the upstream technology necessary
[2] Design values. Guaranteed values may vary depending on the plant size
[3] At ambient temperature of +15 °C and in compliance with the minimum requirements as per the CO_2 input gas specifications

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