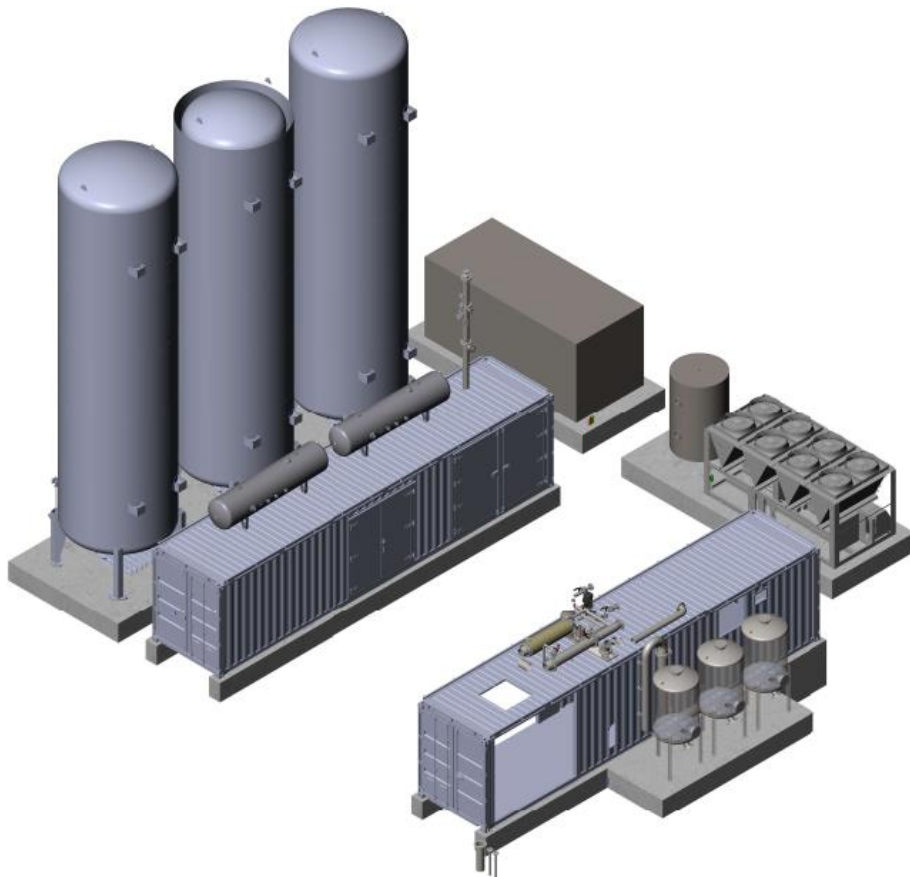


# TECHNICAL AND ECONOMIC OFFER



## Adapt Biogas - CO2

Ref : OTE BIOCO2 – Adapt Biogas - 10000 - 230620



# Summary

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## Operating Principle

The CarboliQ system is made up of four main parts:

### 1. Compression

The offgas enters the system initially with a concentration of minimum 97,7% CO<sub>2</sub> and maximum 2,0% CH<sub>4</sub> at a pressure of 5 mbar.

The compression part is responsible for compressing the offgas to reach 22 bara. This part contains:

- A booster to supply the compressor at 250 mbar
- Two vessels activated carbon filtration system (2x2 000 kg) to eliminate traces of sulfur
- A particle filter
- An oil free compressor to compress the offgas from 250 mbar to 22 bara (+ Complete compressor protection system)
- A dryer to remove moisture from the offgas
- An Advanced polishing filtration system for CO<sub>2</sub> (Option)
- A cooler to reduce the temperature of the offgas to 15 degrees after compression
- Pressure + Temperature sensors

Once the offgas is at the right pressure as well as the humidity and sulfur are eliminated, the gas will then be liquefied by a cold group at a temperature of the order of -25 ° C.

### 2. Offgas liquefaction

The offgas is partially liquefied using a chiller able to reduce the temperature of the offgas to -25°C. This part makes to liquefy a large part of the offgas (the gas which remains is a mixture rich in methane which will be sent afterwards to the inlet of upgrading system).

This part contains:

- A chiller containing:
  - o One or more refrigerant compressors (+ Complete compressor protection system).
  - o A water condenser
  - o A bottle of refrigerant (Liquid Tank)
  - o An oil separation system
  - o An oil supply system for the compressors
- An expansion valve with an analog control to vary the power of the chiller according to the flow rate of the offgas (Expander) to control the refrigeration capacity
- A direct expansion evaporator
- A frequency converter to control the evaporation temperature of the refrigerant
- Pressure and temperature sensors to be able to control the power of the system

Once the offgas is liquefied the CO<sub>2</sub> / CH<sub>4</sub> mixture is ready to enter a distillation column to perform the purification of the CO<sub>2</sub>.

### 3. CO2 distillation

The CO<sub>2</sub> / CH<sub>4</sub> mixture liquefied at -25 ° C enters the distillation column with an initial concentration of minimum 97,7% CO<sub>2</sub> and maximum 2,0% CH<sub>4</sub>. Once in the distillation column, the CO<sub>2</sub> / CH<sub>4</sub> mixture goes down by gravity towards the bottom of the column. During this descent, the mixture is in contact with a hot CO<sub>2</sub> stream rising from the bottom of the column, which separate the CH<sub>4</sub> from the mixture.

This part of the process purifies the CO<sub>2</sub>. The purity of the CO<sub>2</sub> leaving the column is of the order of 99.97%.

At the outlet of the distillation column, a heat exchanger is installed to sub-cool the CO<sub>2</sub> before sending it to the storage tank.

### 4. Storage :

The pure and liquid CO<sub>2</sub> will then be sent to an insulated vacuum tank to be stored at 20 bara at -20°C.



## 5. Project data and advantage of the CarboliQ system

- Offgas max flow rate 750 Nm<sup>3</sup>/h
- CO2 production:
  - o Expected: 11 611 Tons/year of CO<sub>2</sub> produced at maximal flow
- Electricity consumption:
  - o Expected: 0,2505 MWh/Ton of CO<sub>2</sub> produced at maximal flow
- Energy recovery:
  - o Expected: 606,6 MWh/year at maximal flow
- CH4 recovery: 1 439,9 MWh HHV/year at maximal flow
- Zero emission of CH<sub>4</sub> and CO<sub>2</sub>
- Easy handling and simple maintenance system

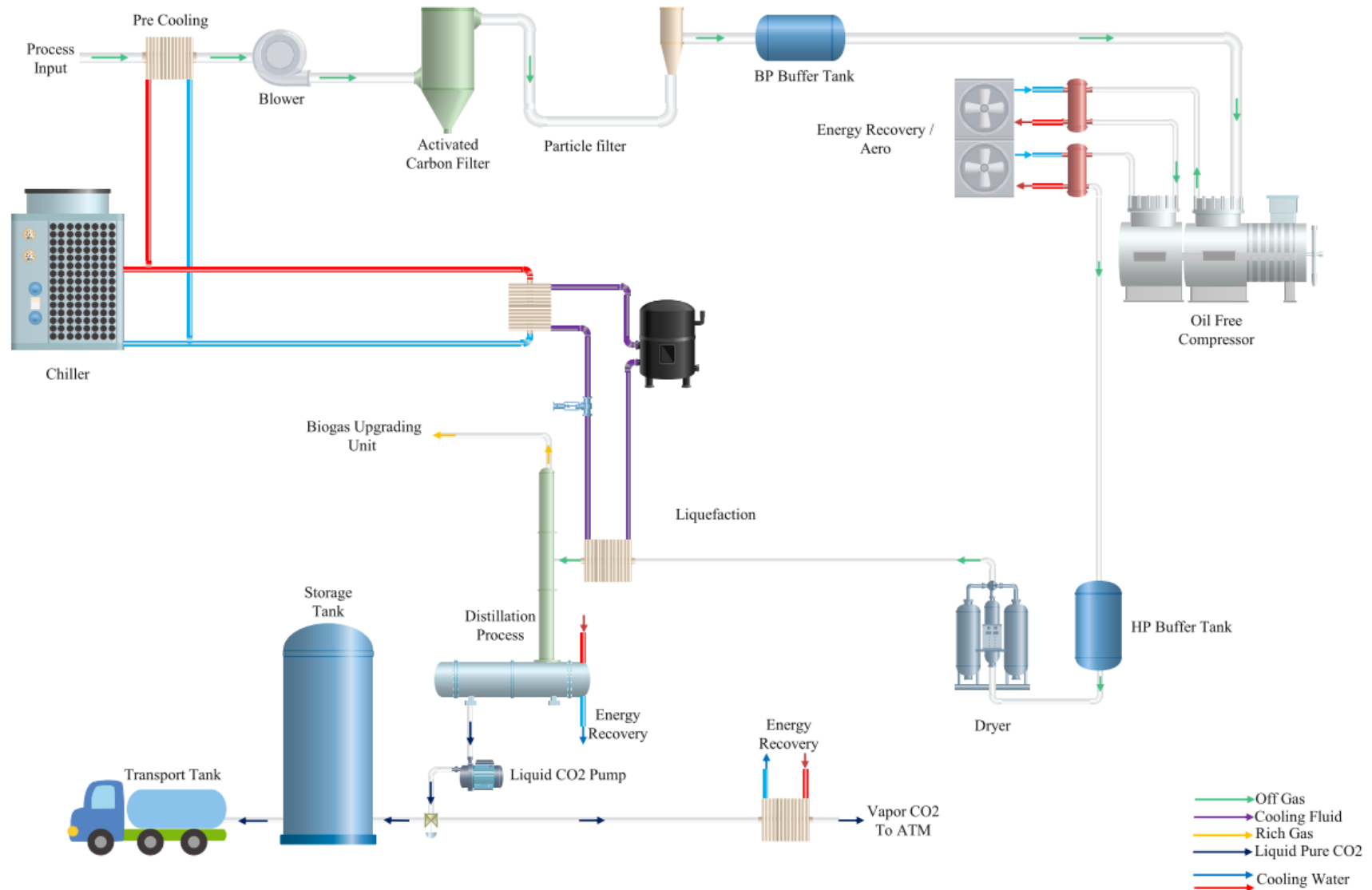
Offgas Composition		
CH4	2,000%	maximum
CO2	97,7668%	minimum
O2	0,00%	
N2	0,00%	
H2S	0,00%	
H2O	0,2332%	maximum
	100,00%	
Temperature	60	degF / 15,56°C
Pressure	0,0725	Psig / 5 mbar

Without Other components in offgas

**We are waiting for real analyzes (full screening) of the offgas, and the real flow measured in order to be able to define the limits of guarantees**

- Electricals information (EU norms / PED):
  - o Electrical cabinet:
    - Supply : Three phase 400V: 3 phases + neutral/ground combined
    - Distribution: Three phase 400V: 3 phases + neutral + ground
  - o Power installed: 599,9 kW
  - o Max Amperage : 983,3 A
  - o Maximum power absorbed: 484,1 kW
  - o Maximum absorbed amperage: 780,8 A

## 6. PFD CarboliQ system





## Commercial offer

### 1. Investment and options

DESCRIPTION	P.U. (€ HT)	Qt	TOTAL (€ HT)
<p><b>1. BIOCO2 PURIFICATION AND LIQUEFACTION UNIT</b></p> <ul style="list-style-type: none"> <li>- Offgas recycling, 22 bara compression, cooling to -25 ° C, liquefaction of BioCO2 at 99.97% purity</li> <li>- Offgas dryer</li> <li>- Buffer storage of offgas with compression</li> <li>- Compressor and offgas dryer</li> <li>- Chromatograph</li> <li>- Membrane for CH4 enrichment</li> <li>- Containerized installation</li> <li>- Electricity, automation, piping</li> <li>- Study, engineering, delivery included, unloading not</li> <li>- Regulations and specific elements</li> <li>- Ventilation, lighting, BAES, security, CH4 detector, CO2 detector, HFC detector, display and regulatory panels</li> </ul> <p><b>Installation performance:</b></p> <ul style="list-style-type: none"> <li>- Maximum ambient temperature in normal operation: 40 °C</li> <li>- Minimum ambient temperature in normal operation: -10 °C</li> <li>- Guaranteed availability: 98.0%</li> <li>- Expected availability: 99.0%</li> </ul> <p>EU norms / PED EC</p>	2 395 383,63 €	1	2 395 383,63 €
<p><b>2. Bank guarantee</b></p> <ul style="list-style-type: none"> <li>- Bank charges for the provision of an Advance Payment Refund Bank Guarantee</li> </ul>	18 278,40 €	0	Not Included
<p><b>3. Storage bulk 60 000 L</b></p> <ul style="list-style-type: none"> <li>- Vertical/Horizontal bulk 20 barg,</li> <li>Delivery included, unloading not</li> </ul>	185 412,39 €	3	556 237,17 €
<p><b>4. Advanced polishing filtration systems for CO2</b></p> <ul style="list-style-type: none"> <li>- Carboguard System CG-04</li> </ul>	20 551,41 €	0	Not Included
<p><b>5. Liquid CO2 tanker (transport)</b></p> <ul style="list-style-type: none"> <li>- Capacity : 27 000 Liters</li> <li>- CO2 filling : 25 650 liters = 26,47 tons</li> <li>- Pressure : 23 bara max</li> <li>- Suitable for 44 tons – 6 axles</li> <li>Delivery included,</li> </ul>	324 471,67 €	0	Not Included
<p><b>6. Liquid CO2 measurement unit for food and beverage control (ISBT norms)</b></p> <ul style="list-style-type: none"> <li>- Carboscan 300 analysis module</li> <li>- 5 samples taken</li> <li>- Oxygen analyser</li> </ul>	540 786,13 €	0	Not Included

	<ul style="list-style-type: none"> <li>- Certificate of conformity printing module</li> <li>- On-site supervision</li> <li>- User interface</li> </ul> Delivery included, unloading not			
<b>TOTAL INVESTMENT</b>		Excluding taxes		<b>2 951 620,80 €</b>
<b>For information equivalent price at 1 GBP = 1,1700 Euro</b>				<b>2 522 752,82 £</b>

7.	<b>COMPLETE PREVENTIVE MAINTENANCE OVER 15 YEARS OF THE BICO2 LIQUEFACTION UNIT</b> <ul style="list-style-type: none"> <li>- Preventive maintenance</li> <li>- Telephone support: 30 minutes, 24/7</li> <li>- Assistance via remote supervision: 1 hour, 24/7</li> <li>- Troubleshooting with site interventions: 8 working hours, 8 a.m. to 5.30 p.m. on working days</li> <li>- 98% guaranteed installation operating availability</li> <li>- 80% coverage of losses compared to guaranteed production, capped at 20% of the contract</li> <li>- Annual indexation of 2.4% on the anniversary date of the contract</li> <li>- Monthly billing over 15 years</li> </ul>	10 000 €/month	12	120 000 €/year
8.	<b>Maintenance CARBOSCAN 300</b> <ul style="list-style-type: none"> <li>- Annual spare parts</li> <li>- 24/7 telephone and technical support</li> <li>- 1 site visit per year 2 days</li> </ul> Excluding travel, accommodation, meals, travel time ... of a Unisensor technician	14 683 €/year	0	Not Included
9.	<b>Maintenance Carboguard System CG-04</b> <ul style="list-style-type: none"> <li>- Annual Maintenance Kit CS-04</li> </ul>	4 664 €/year	0	Not Included

## 2. Obligation of the contracting authority

Access to the equipment supplied by Verdemobil BioCO2 must be possible from all sides with a telescopic to facilitate maintenance

## 3. Period of validity of the offer

The validity period of the offer is 30 days

## 4. Guarantees

The equipment is guaranteed for 12 months on commissioning or 18 months after delivery, whichever comes first.





## 5. Delivery schedule

We are committed to a delivery schedule of (9) months excluding holidays after receipt of your order and the related down payment.

## 6. Indexation of the offer

From 20/07/2023, the offer is indexed at a flat rate of 0.20% per month, until the date of receipt of the purchase Order **AND** the related down payment.

Subject to a sharp increase from our suppliers.

## 7. Payment term

14 days net upon receipt of invoice, by email, PDF format.

## 8. Payment schedule

We offer you the following payment schedule:

**30%** Downpayment on Purchase Order

**10%** On layouts acceptance

**20%** On deliveries prorata in our workshop

**20%** On delivery prorata on site

**10%** On Commissioning on site

**10%** On Performance tests on site

## ORDER FORM

*Name, title, date, stamp, signature*