BIO-LNG PRODUCTION - MADE SIMPLE

Biogas2020
Skandinaviens Biogaskonferens
October 2016
About Cryo Pur

- Supplier of an **integrated system** for:
  - Cryogenic biogas upgrading
  - Biomethane liquefaction
  - BioCO2 liquefaction
  - All-In-One

- 22 people, located in Palaiseau, France

- 6m€ funds raised

- 15 years of R&D, **7 worldwide patents**

- 1 **demonstration plant** in operation in Paris since mid-2015 (WWTP)

- 1st **contract signed** in Northern Ireland; delivery due in Q2 2017
Cryo Pur in the biogas value chain

Agricultural waste
Industrial waste
Household waste
Sewage sludge

Anaerobic digesters

Biogas
CRYO PUR SYSTEM

Biogas
CO₂ separation
BioCO₂

Upgrading and liquefaction

BioLNG

Natural gas grid injection
Fuel
Industry
Greenhouse

Industry
The LNG market for long-haul trucks is under development in Europe

- The development is supported by the launch of new, more efficient vehicles...

- ... and through building up distribution infrastructure.
Bio-LNG can help further reduce maritime transport emissions

Source: Fluxys

Source: www.lnginbalticseaports.com, Containerships Group, Serry 2015
The liquid form enables efficient biomethane transport and storage

- **A - Compressed in bundles**
  - Pressure: 250 bar
  - Capacity: 2t per ‘flak’

- **B1 - Liquefied in ISO container**
  - Pressure: up to 20 bar
  - Capacity: 10-20t per container

- **B2 - Liquefied in trailer**
  - Pressure: 2-6 bar
  - Capacity: 20t per trailer
Biogas upgrading and biomethane liquefaction is made simpler by cryo-upgrading technology.
Cryo Pur is an integrated process for both upgrading and liquefaction of CO2 and CH4.
Expertise in cryogenic CO2 capture

- Cryogenic CO2 capture: physical separation.

-90°C: CO₂ starts frosting

-120°C: Separated CO₂ ready to be unfrosted and liquefied
Cryo Pur technology carries many benefits

- **Integrated technology** for biogas upgrading, bioCO₂ liquefaction and biomethane liquefaction
  - Lower CAPEX and OPEX
  - Simplified integration and management of interfaces
  - Performance Guarantees
  - Large product range
  - Liquid CO₂ as by-product

- **Low electric energy consumption**:  
  - 0.6 kWh/Nm³ raw biogas for both upgrading and liquefaction: 15 bar(a)/-120°C  
  - 0.7 kWh/Nm³ raw biogas for both upgrading and liquefaction: 2 bar(a)/-160°C

- **Heat recovery** on refrigeration systems covering up to 100% AD heating needs

- **No methane slip** or minimum methane slip for landfill biogas

- **High flexibility** of the system: from 50% to 120% of the nominal biogas flowrate

- Physical separation, **no consumables**
### Cryo Pur Range

<table>
<thead>
<tr>
<th>Product</th>
<th>Nominal biogas flowrate (Nm³/hr)</th>
<th>Minimal biogas flowrate (-50%) (Nm³/hr)</th>
<th>Maximal biogas flowrate (+120%) (Nm³/hr)</th>
<th>Nominal bio-LNG production* (TPD)</th>
<th>Nominal LCO₂ production* (TPD)</th>
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</thead>
<tbody>
<tr>
<td>CP 70</td>
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<td>1 000</td>
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* Production is calculated for a biogas composition of 55% CH₄ and 45% CO₂.
General Layout of the Cryo Pur Equipment

1. Desulfurization (activated carbon filters)
2. Dehumidification and pretreatment
3. CO2 separation and liquefaction
4. Biomethane liquefaction

Air cooler
Electrical room
Chiller
Refrigeration units
Cryo Pur references:

• BioGNVal Project – Valenton WWTP, France (120 Nm$^3$/h biogas)

• Greenville Project – Northern Ireland (300 Nm$^3$/h biogas) - 2017
THANK YOU FOR YOUR ATTENTION

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