Biogas Pre-treatment & Upgrading

Description

Inlet biogas stream from:

- Agriculture
- OFMSW
- Water treatment
- Landfill
- Any organic fermentation

Pre-treatment

Designed for both biogas and natural gas, our system **removes H_2S, VOCs, HCl, NH_3 and more** with high-performance **activated carbons**. It operates continuously, meeting the toughest regulations while **drying gas to a dew point of -30 °C**. From waste and agricultural sources to landfill and fossil gas, it delivers safe, efficient pre-treatment with **minimal maintenance**.

Biogas upgrading

Ecospray provides **complete upgrading solutions** when required, integrating the most widely used VPSA and membrane technologies into a seamless process, combined with our core expertise in **biomethane and CO_2 liquefaction**.

- **VPSA Technology**

  VPSA (Vacuum Pressure Swing Adsorption) efficiently removes CO_2 and other impurities from biogas through alternating pressurization and vacuum cycles, using synthetic zeolites as the adsorption medium. This proven method delivers **low energy consumption** (<0,2kWh/Nm^3_{biogas}), reliable performance across a wide range of plant sizes, and excellent results even **with challenging gas compositions and pollutants**.

- **Membrane Technology**

  High-performance polymer membranes selectively separate CO_2 from biogas, enabling efficient upgrading and carbon capture with **high methane recovery** rates (>99%). Their modular design ensures easy **scalability, minimal maintenance**, and a sustainable approach to gas processing.

Technical Information

Process

The pre-treatment stage is designed to stop large contaminants and capture pollutants with active carbons and condensing water with proper chiller and demister.
The VPSA system uses three molecular sieve reactors, sized to the biogas composition, for efficient CO_2 removal. A guard filter traps any zeolite particles, while vacuum pumps efficiently strips the captured CO_2. An additional reactor recovers methane slip from the off-gas, which is recirculated to the pre-treatment stage for maximum efficiency.
The polymer-based hollow-fiber membranes use selective permeation to separate CO_2 from biogas – compressed by a dedicated screw compressor – with, energy-efficient steps, maintaining methane purity above 99 % with minimal energy use and no chemicals. The system can be configured with two or three membrane stages to achieve the desired methane recovery rate.

Features

- **Compact & modular design** – skid with standard sizes (40 ft) with a flexible design to adapt to the user's available space, easy to transport, install and relocate.
- **Versatile** – designed to process diverse sources – from organic waste and agricultural facilities to wastewater sludge, landfill gas and fossil gas without performance loss.
- **Process engineering expertise** – deep know-how in designing seamless interfaces between upgrading systems and downstream biomethane/CO_2 liquefaction units for maximum efficiency managing the produced offgases and boil off.
- **Custom system design** – tailor-made configurations of VPSA or membrane solutions to match specific gas compositions, flow rates, and end-product quality requirements.
- **Turnkey project delivery** – from design and engineering to commissioning and support, ensuring smooth integration and reliable, long-term operation and single interface.
- **Unmanned** – a remote control of process variables is provided, including web-based access and proper database storage.