

Biogas Lab Factsheet on Innovative renewable gas technologies



Gaya project: biomethane production from dry biomass and waste pyrogasification

About the technology

GAYA project aims to produce a synthetic methane which is a green substitute of Natural Gas, by converting various biomasses and waste through pyrogasification and syngas methanation. It is an integrated technological process chain, currently being industrialized by ENGIE, that has been patented, developed and optimized by ENGIE Lab CRIGEN. It aims at valorizing various lignocellulosic biomass from sustainable harvest, wood waste, Solid Recovered Fuels (SRF) from industry and communities, non-recyclable plastics, etc.



The technology is at pre-commercial scale. The process has been validated on the cutting edge semi-industrial GAYA demonstration platform, close to Lyon (France). Since the end of 2019, biomethane has been produced from biomass. Only one year after, in November 2020, the first cubic meters of synthetic methane from waste (Solid Recovered Fuels) have been produced, a first of a kind achievement in the world towards green gas.

Benefits for the biogas sector

This renewable synthetic methane production pathway results in a reduction of GHG emissions of around 80% compared to a fossil natural gas reference in the French context when produced from biomass. Once deployed, this new industry will generate 400,000 GWh of renewable SNG in Europe by 2050.

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ALG-AD: Creating value from waste nutrients by integrating algal and anaerobic digestion technology

About the technology

The ALG-AD technology uses the liquid fraction of digestate, produced from the anaerobic digestion of food and farm waste, to cultivate microalgal biomass. The process consists of a first separation of the liquid and solid fractions of the digestate, which can be achieved by using centrifuges, screw presses or a simple sedimentation step, all with varying costs and separation yields. The liquid fraction obtained is further treated with a filtration step (either microfiltration or ultrafiltration) to further remove sediments and increase the light penetration through the liquid. The treated liquid fraction is then fed to an algal reactor in small concentrations (1-2.5%) as to give enough nutrients for algal growth while avoiding toxic effects of high ammonia concentrations.

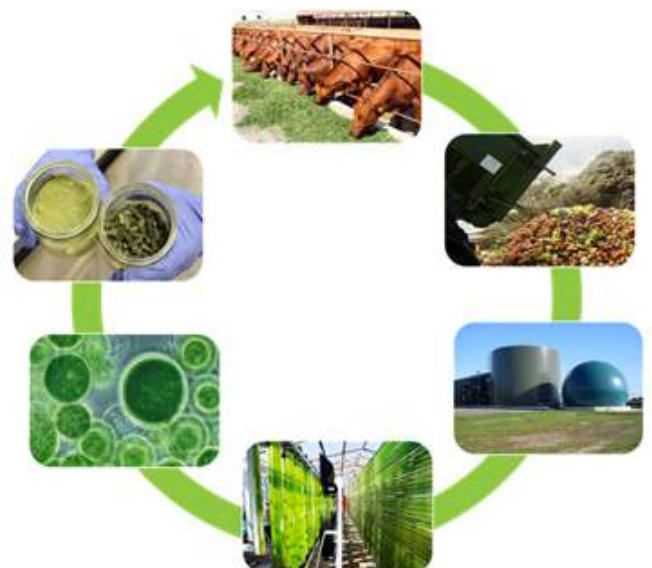
Further pretreatment of the liquid fraction to enable feeding higher concentrations of it to the algal reactor are still under development.



Benefits for the biogas sector

Algae require nutrients to grow and so the digestate resulting from AD can provide an inexpensive nutrient source that might otherwise go to waste due to stringent legislation restricting its land application.

Moreover, the cultivated microalgae can be processed into compounds and products which have the potential to reach a higher financial value than land application of the nutrients. The ALG-AD technology has, therefore, the potential to increase revenues from the AD sector by using low-value digestate for the production of high-value biomass.



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Defoamers for highly performant biogas digesters

About the technology

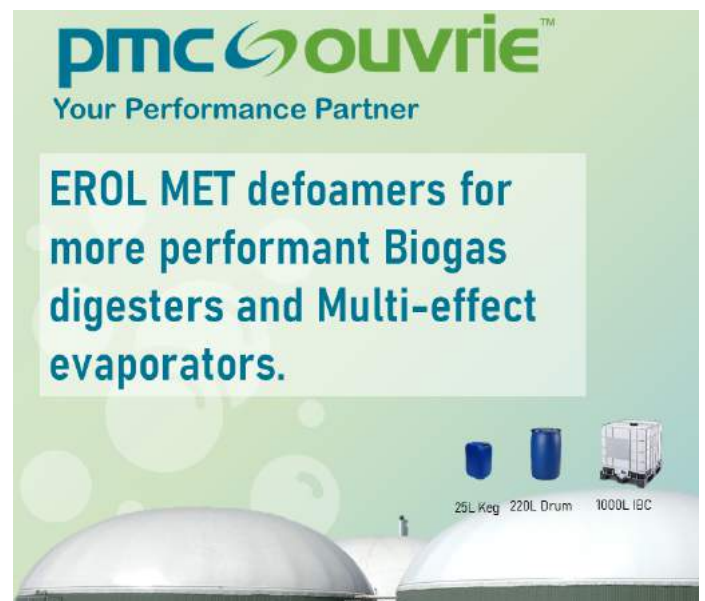
EROL MET is a range of defoamers produced by PMC Ouvrie and dedicated to biogas digesters and other equipment of biogas plants.

Biogas digesters can encounter in some cases foaming issues that can be impactful negatively for their performance. Digesters foaming is stabilized by foaming agents like surfactants and proteins.

When injected, preferably by pouring from the top, EROL MET solutions will penetrate and entrap foaming agents, which will facilitate bubbles coalescence and blow up. When poured from the top of the digester, defoamers will spread more easily over the foam surface thanks to the spreading capacity of their oils. This will ensure a homogenous distribution and immediate action. If pouring from the top is not an option, then it is possible to add the EROL MET solution with the substrate, ideally the closest to the digester to preserve a long-term effect.

EROL MET solutions help maintain a stable anaerobic digestion process by continuously controlling foam levels and eliminating already existing foam if necessary.

They do not contain toxic molecules, which preserves the microbial activity and they are not harmful to the environment nor to the soils.



PMC OUVRIE™
Your Performance Partner

EROL MET defoamers for more performant Biogas digesters and Multi-effect evaporators.

25L Keg 220L Drum 1000L IBC

Benefits for the biogas sector

Defoamer solutions ensure foam control in biogas digesters and in other facilities in biogas plants like multi-effect evaporators. Thanks to defoamers it is possible to optimize biogas digesters performance and help maintaining a stable anaerobic digestion process.

This will also allow to avoid overflows and shutdowns of the unit.

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Integrated system of biogas treating and liquefaction

About the technology

To enable small-scale, decentralized production of bio-LNG, Nordsol has developed an integrated system of biogas treating and liquefaction, called iLNG. The iLNG technology utilizes standard membrane technology to produce ultra-pure biomethane which is liquefied to bio-LNG. iLNG technology allows for processing of a wide range of gas compositions and volumes, and is compatible with existing process methods, highly reliable and simple to operate. The integrated nature of the process makes the technology a very good fit for local, small-scale, and energy-efficient bio-LNG production.



Nordsol is building the first bio-LNG installation in the Netherlands. The biogas for this installation is sourced from Renewi Organics, who produces biogas by processing organic waste. The iLNG technology from Nordsol upgrades and liquefies this biogas into bio-LNG. The offtaker of the bio-LNG is Shell, who sells it at LNG retail stations. The installation will produce 3,4 kton bio-LNG per year and 6,8 kton liquid bio-CO₂.

Benefits for the biogas sector

The iLNG technology enables biogas producers to enter the high-value fuel market with bio-LNG. Bio-LNG provides the best economic and environmental value to biogas. It is a premium product for which there is increasing demand and that takes advantage of an already existing infrastructure. The iLNG technology allows biogas producers to produce bio-LNG locally, either by themselves or in a collaborative partnership. In addition, it allows biogas producers to transfer from a subsidy-dependent environment to a market-driven environment.

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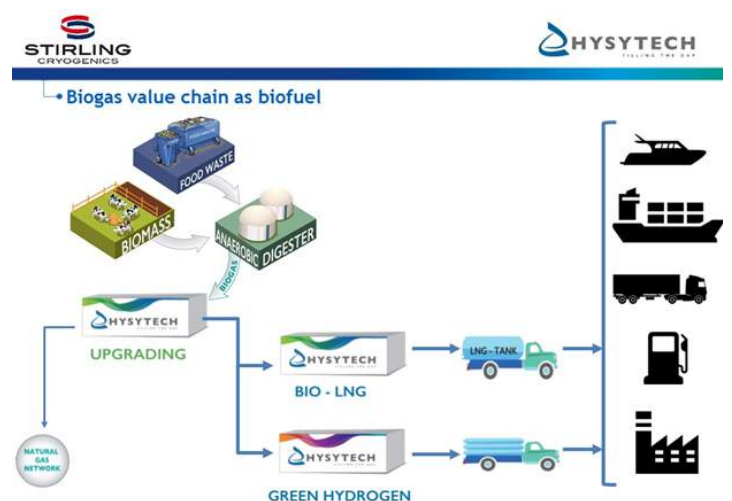
From Biogas Upgrading to Bio-LNG and Green Hydrogen

About the technology

Hysytech provides cost-effective innovative technology for:

- Biogas Treatment and Upgrading (Biomethane), based on proprietary hybrid process that combines pressurized water scrubber and membranes. The process requires less membranes compared to typical 3-stage membrane setup. It is more robust and capable to withstand wider fluctuations and higher levels of contaminants (H₂S, VOC, NH₃, etc.). Recycle flows are lower hence leading to lower power consumption.
- Micro-Scale Bio-LNG liquefaction and gas conditioning. Biomethane polishing is integrated within the process, so CO₂, H₂S and moisture values from typical Biogas upgrading can be directly fed into the unit. The liquefaction is based on the reverse Stirling Cycle, with no process gas in contact with mechanical parts and no heat leaks due to cooling vector.
- High-purity Hydrogen Generation from biogas or biomethane, with more than 3 patents and over 200 equipment installations. The process is based on methane steam reforming (SMR), allowing the generation of high-purity H₂ generation at the lowest cost of ownership.

All these products are turn-key plants, with minimal site works. The units are fully pre-assembled, tested and certified by Hysytech.



Benefits for the biogas sector

The technology can open biogas to the biofuel market. It can allow to make value out of Biogas even if the gas network is not present.

It can also generate Green Hydrogen from biogas or biomethane and access both biofuel or industrial market.