



Solutions for biomethanation

MICROPYROS



Pietro
Fiorentini



An ancient solution for modern problems

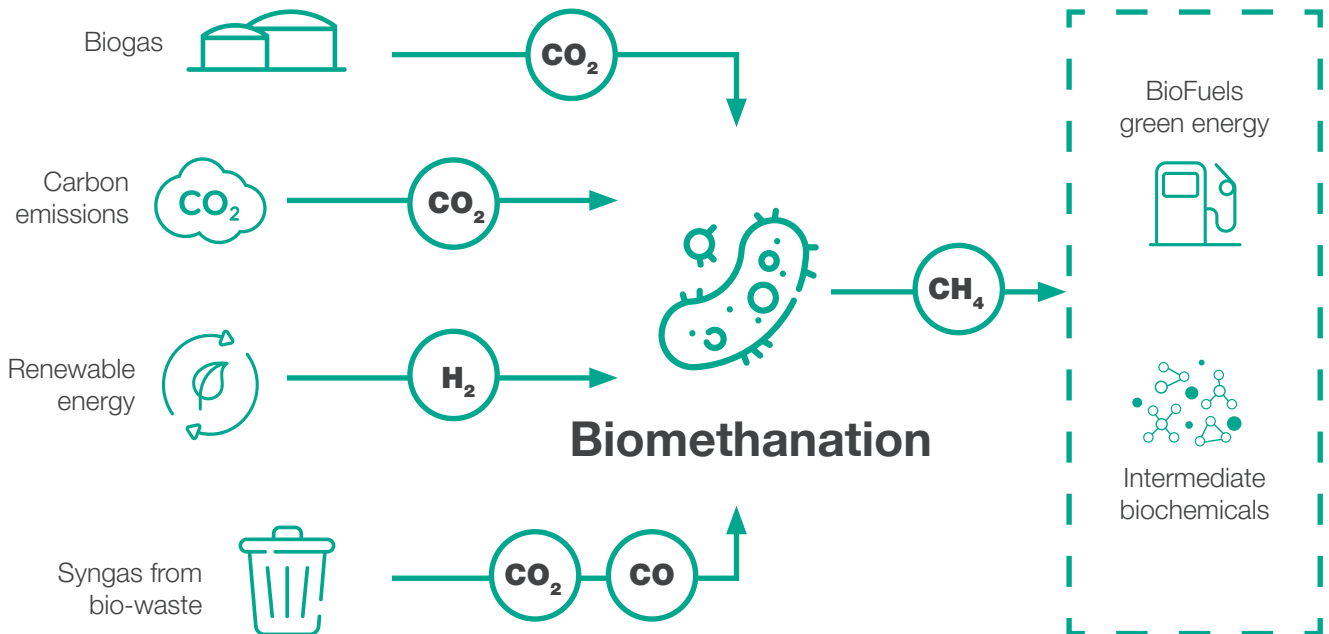


**In our bioreactors, millions of years old
archaea produce climate-friendly gas from
organic waste and renewable energy in
stable, evolution-proven processes.**



Energizing biology

The microorganisms used in biological methanation are in their natural forms. This process uses no rare materials and produces no rare materials. This means easy disposal of all components at end-of-life. This technology is 100% green.



Applications



Renewable power surplus valorization: biomethanation is an outstanding option to deal with a growing surplus of renewable energy from wind or solar energy.



CO₂ emission reduction: renewable gases produced in biological methanation plants are generated capturing dangerous greenhouse gases coming from waste fermentation.



Grid balancing: unused electricity or grid congestion can be converted into green gas, offering grid stabilization while realizing additional business income.



Waste biomass valorization: almost all organic waste material can be treated with *Archaea* in order to realize climate-neutral mobility and heating.



CO₂ and CO methanation: using cocktails of microorganisms enables a flexible process that turns gas mixtures of CO₂ and CO, like syngas, into biomethane.

MICROPYROS

The story so far

Strange but true: the story of MicroPyros literally begins 2.7 billion years ago, with the evolution of our most important employees, the *Archaea*. But it was not before 1980 that one of our founders, Prof. Dr. Robert Huber, pioneered the *Archaea* research.

Discovering the power and the importance of these primordial micro-organisms is our company's cornerstone, essential for our role in the global energy transition.

Today's MicroPyros BioEnerTec™ Company, newly founded in May 2021, takes the processes of biomethanation to the next, industry-scale level.

Pioneers in biotechnology



AsH₂ Gas (2015)

- Proved CO biomethanation in batch mode
- Successful syngas treatment on pilot scale

Power-to-Mobility (2019)

- Proved CO₂ biomethanation in continuous
- Demonstration of the complete solution in an industrial environment



Straubing WWTP (2022)

- Main research facility of MicroPyros
- Continuous process and biology development
- Pilot plant also used for feasibility studies

SynBioS (2024)

- First fully commercial plant in EU
- 1MW of electrical input
- Scope of supply: electrolyser, biomethanation reactor and grid injection
- Direct biogas conversion



Our **2.7 billion years** journey



2.7 billion years ago

Evolution of *Archaea*

1980



MicroPyros founder pioneers
Archaea research

2012



MicroPyros founded

2013



Pioneering laboratory scale

2015



Pilot: world's first
biomethanation reactor

2019



Pre-industrial scale

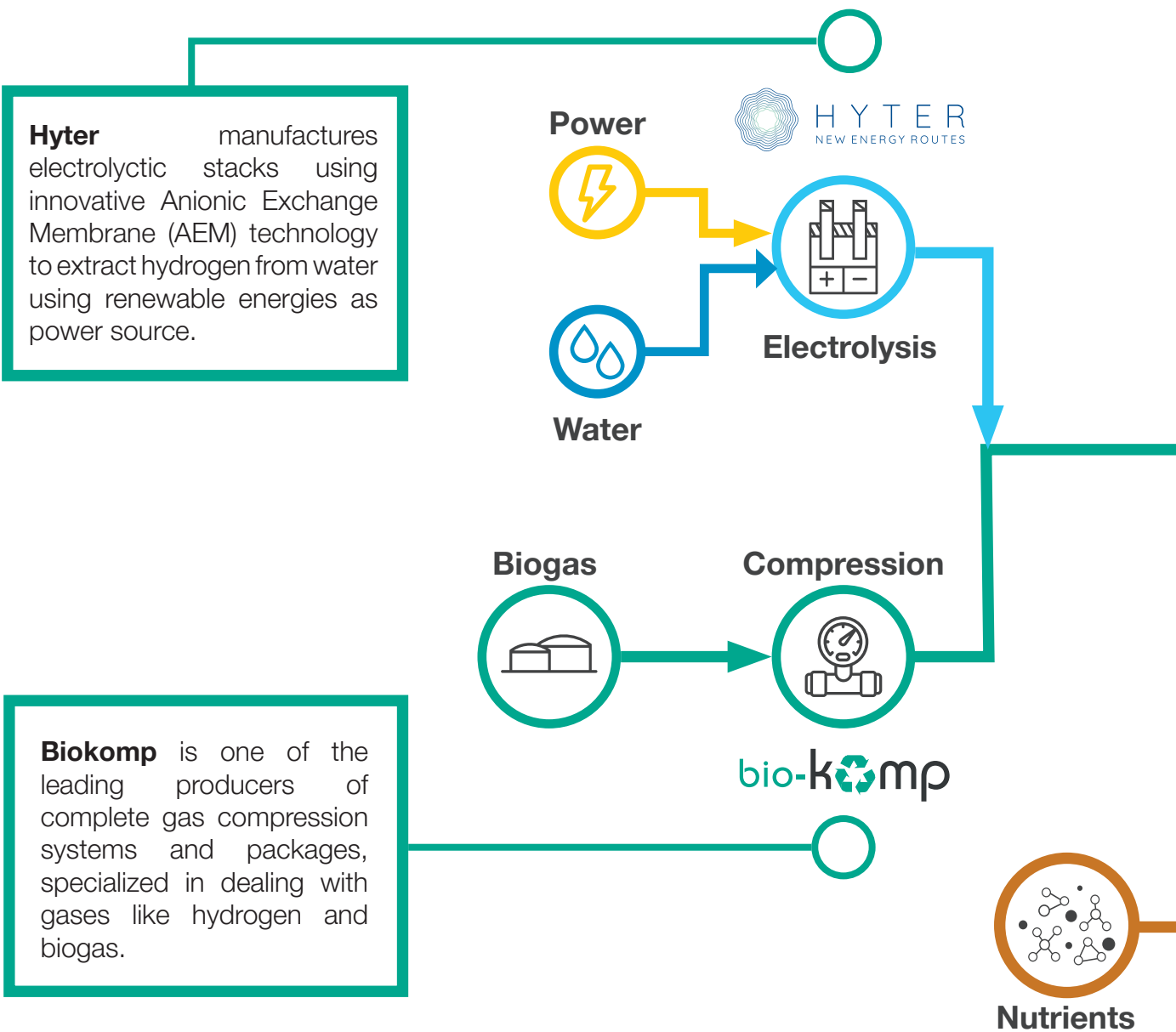
2022



Commercial scale

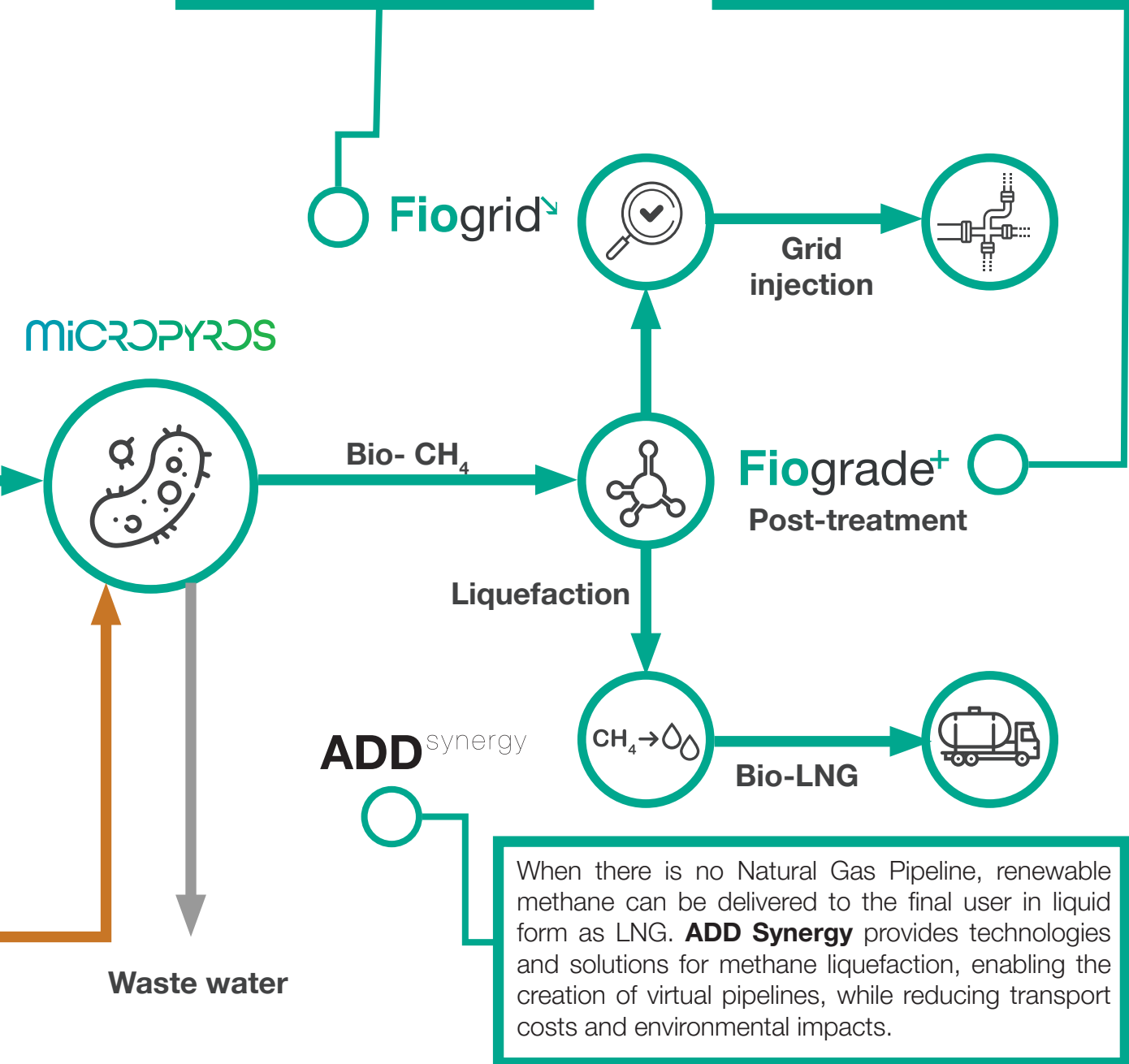
An integrated environment

Since the early 1940s and thanks to decades of experience, Pietro Fiorentini has been providing products, complete systems and services for natural gas worldwide. In view of the future energy system, which is already taking shape, we are walking the path of sustainability, with the ultimate goal of creating an integrated environment in which natural gas, biomethane, e-methane, hydrogen and renewable power coexist. To achieve this with best results, we joined forces with some of the most innovative companies in Europe: MicroPyros, Hyter, Biokomp and ADD Synergy. Together, we are creating the energetic infrastructure of tomorrow.



Pietro Fiorentini **FIOGrid⁺** injects biomethane and e-methane into the natural gas grid. Before being injected, the gas must go through quality check, metering, treatment, compression or pressure regulation and eventually odorization. Thanks to our engineering department we provide integrated solutions for every type of plant.

Thanks to Pietro Fiorentini **FIOGrade⁺** complete upgrading solutions, contaminants and inert substances that lower calorific value are eliminated from the inlet gas, transforming it into a clean vector. This is now ready to be sent to an integrated injection system for delivery to the natural gas grid.



When there is no Natural Gas Pipeline, renewable methane can be delivered to the final user in liquid form as LNG. **ADD Synergy** provides technologies and solutions for methane liquefaction, enabling the creation of virtual pipelines, while reducing transport costs and environmental impacts.



Bio FARM

R&D center

On Friday, July 21st, 2023, Europe's first and only research and testing facility for biomethanation, Bio FARM, opened in Straubing, Germany. Located within the Straubing wastewater treatment plant and operated by Straubinger Entwässerung und Reinigung (SER), Bio FARM takes advantage of its location to directly use biogas and sewage sludge to perform biomethanation on-site. The plant can operate in a real environment and perform conversion processes with different inputs and boundary conditions, reproducing both the biology and fluid-dynamics of an industrial-scale system. Therefore, Bio FARM not only serves as a crucial asset for continuous bio-methanation development and improvement, but also as a platform to reproduce any specific process context, perform feasibility studies and supply optimized ad hoc solutions to final clients.



Biotechnology is a new frontier for the Pietro Fiorentini Group, which has long been investing in building a range of solutions for biomethane and e-methane production. Our goal is to export Bio FARM's technology around the world to accelerate the energy transition.

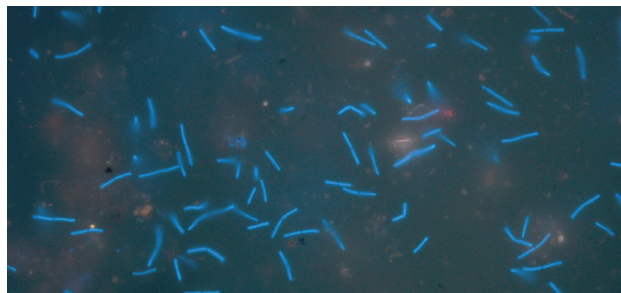


MioLAB

microbiology laboratory

MioLAB is a microbiology laboratory designed for the **maintenance** of our **strains of methanogenic archaea** and for **for maintenance, harvesting and development** of our methanogenic *Archaea* strains.

Unlocking the full biomethanation potential



Biological laboratory

Fully equipped laboratory with all necessary equipment for **cultivation** and **selection** of more than 70 different anaerobic *Archaea* strains.

Multi-gas distribution system

Dedicated gas distribution system for **8 different gases**, which makes it possible to **simulate all possible working conditions**.

Anaerobic chamber

An innovative anaerobic chamber ensures that microbiological experiments are using microorganisms are conducted in the **total absence of oxygen**.



43 cultures

from environmental samples
(sludges, hot springs, ...)



Cultivation

and sample preparation



Reports

Genome extraction /
sequencing / analysis
and final report



Ready for the next future



Energize the future sustainably with thermochemical and hydrothermal gasification forging a greener path to energy innovation and environmental responsibility.



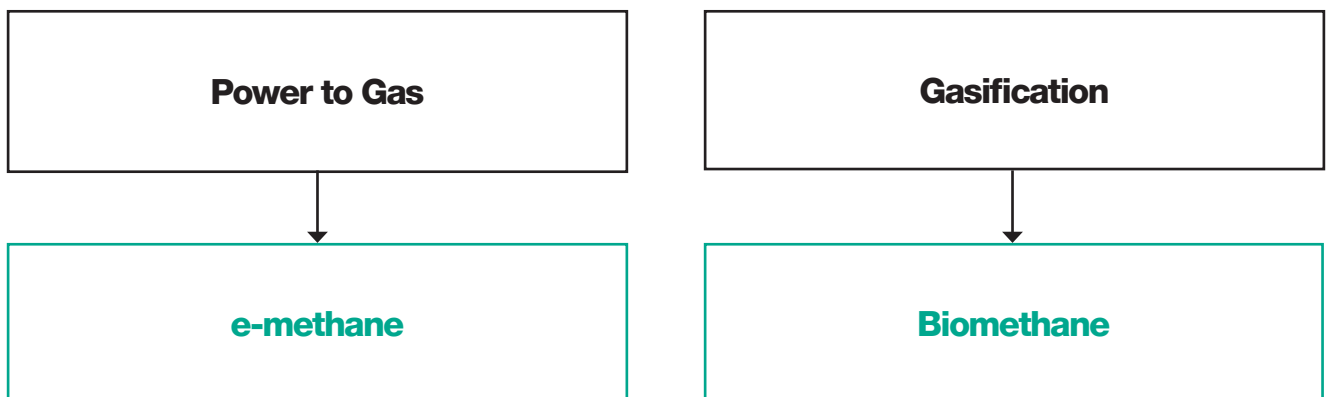
Thermochemical and hydrothermal gasification

Thermochemical and hydrothermal gasification are innovative processes producing renewable and low-carbon gas with high energy content. **Thermochemical gasification** employs thermochemical processes, **heating solid waste** to high temperatures to generate syngas rich in methane and hydrogen. **Hydrothermal gasification converts liquid, wet, and dry organic waste** through high-pressure and high-temperature processes. The resulting syngas can be **converted into renewable methane**, injectable into the gas grid, thanks to **MicroPyros** advanced biotechnology.

The treatment of syngas is complex because it contains CO. **MicroPyros is one of the few players capable of methanising CO.**



MicroPyros segments of interest





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