Pietro Fiorentini

A clean energy world

We are committed to innovative projects that contribute to a more sustainable future for the new generations.

Innovative **technologies**

We are working on **integrated solutions along the entire natural gas chain**: from the plants for treatment of raw biogas and the supply of biomethane into the network, on to systems and components enabling networks to use hydrogen.
We also manage the remote supervision and control of systems to analyse the data flow and enable safety and recognition of incentives for producers.

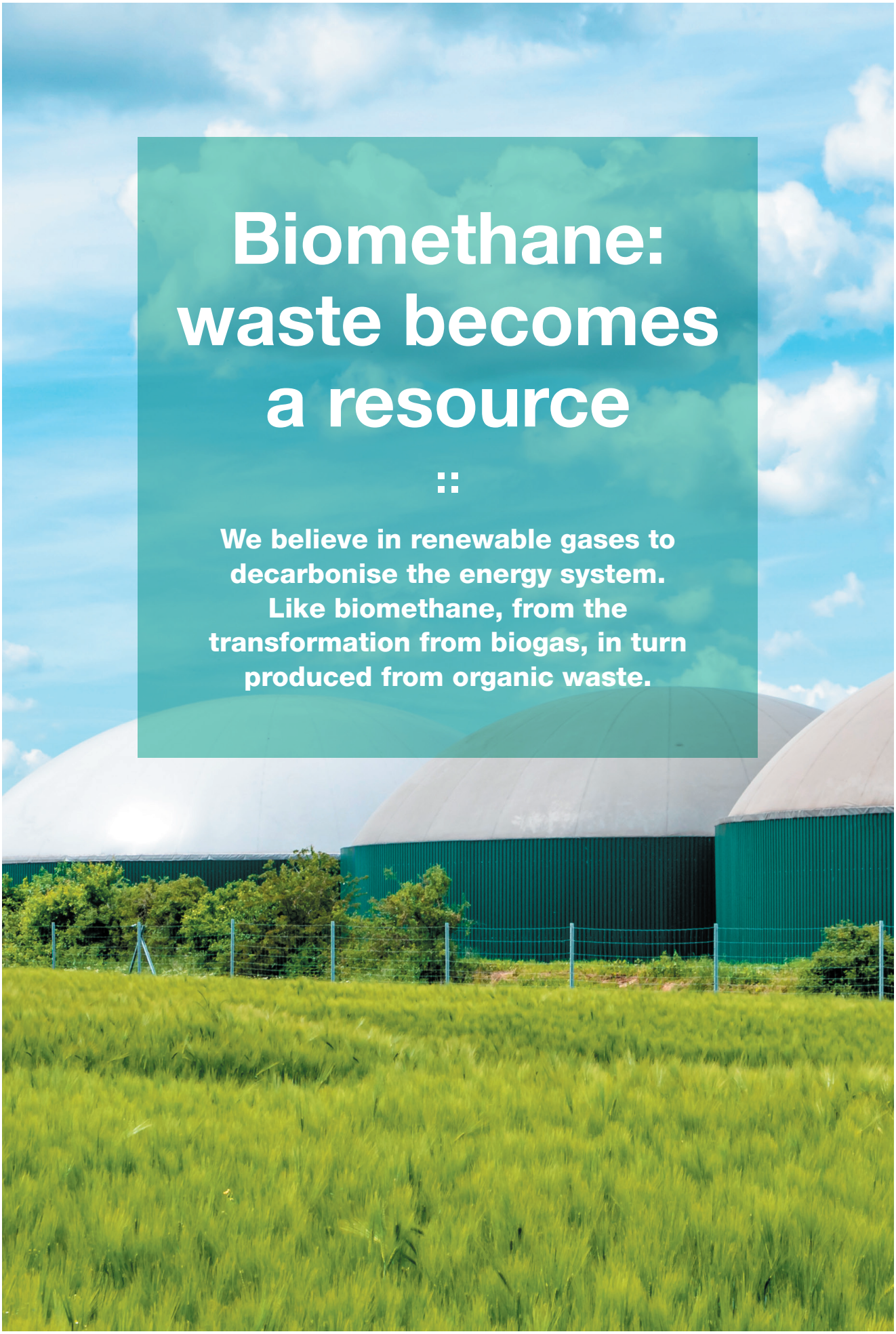
Pietro Fiorentini Group

Founded in
Bologna in 1940

Headquarters:
Arcugnano (VI)

One of the main industrial companies in the North East of Italy

The Pietro Fiorentini Group wants to lead the new change scenarios as protagonist: **digitalisation, the transition towards cleaner energy sources** and greater responsibility on issues of economic, social and environmental sustainability.



Biomethane: waste becomes a resource

We believe in renewable gases to decarbonise the energy system. Like biomethane, from the transformation from biogas, in turn produced from organic waste.

Upgrading phase

Biogas comes from the controlled fermentation, without oxygen, of agricultural sub-products, organic urban waste, sewage sludge from water and industrial residues. Thanks to our upgrading solutions, **contaminants and inert substances** that lower the heating power **can be eliminated** from the biogas, thus **turning it into biomethane**.

Grid **injection**

The biomethane is sent to the network injection system to be transported and used exactly like traditional natural gas. However, before the injection, the renewable gas goes through **quality assessment processes**, measurement, treatment, compression or regulation of pressure and lastly odorisation.
We provide **integrated solutions for all types of system**, from direct injection on to solutions for liquid biomethane.

SMAT Group biomethane upgrading and grid injection system

The project: with Tonello Energie we created an integrated upgrading and injection system for **SMAT Group**, in the Castiglione Torinese purification site.

Implementation: 2019-2020

Operation: The plant consists of **two 900 Nm3/h complete biogas purification lines** (with the set-up of a third line for a total potential of 2,700 Nm3/h); it recovers and treats the biogas generated by the anaerobic digestion of sewage sludge.

The upgrading and injection system is associated with **services dedicated to the supervision and control of the entire plant** and its integration with existing systems.
The project is acknowledged as **one of the most important projects at European level** based on integrated upgrading technology for the production of biomethane from sewage sludge.

Our project in **numbers**

1.800
NM³/H
Total biogas flow rate

2.700
NM³/H
Potential biogas flow rate

99,5%
Biomethane recovery

12 BARG
Injection pressure

The new challenge for the **gas network**

Decentralised production of renewable gases exploits the existing distribution network. The challenge coming from renewables is, however, knowing how to manage the difference between injection and delivery to guarantee the gas injection regardless of consumption. Our family of BiRemi™ products was created **to respond to the new needs of automation, treatment and gas targeting systems**.

Gas in the **liquid state**

In order to be stored and transported, natural gas has to be taken from a gas to a liquid state. When at destination, it can be returned to a gaseous state or be kept liquid to be used in motor vehicles.
In this process, our solutions **regulate the pressure of gas** coming from the pipeline, and enable **treatment and filtering systems** that guarantee quality and that there are no harmful chemical elements.

Power to gas: at the service of renewables

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With Power-to-methane solutions we make green gas completely compatible with the energy infrastructure.

Enhancing **green gas**

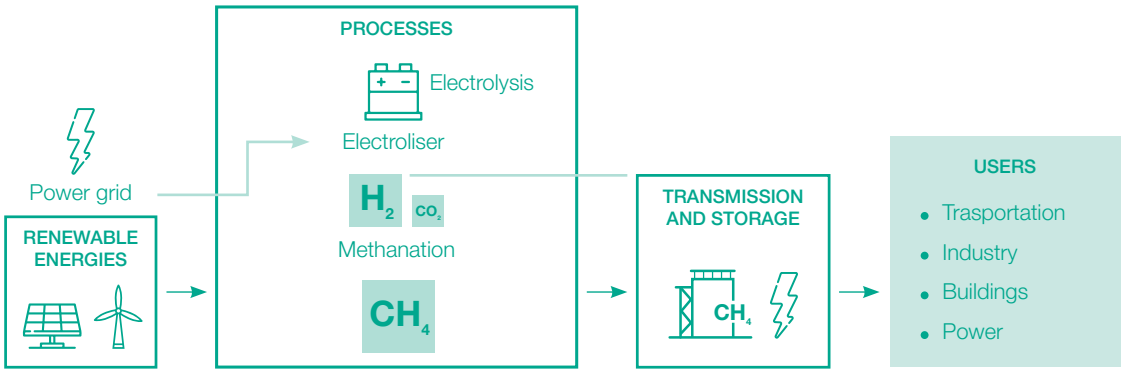
One of the main needs when producing electricity from renewable sources, especially wind or solar, is storing the energy surplus to make it available if needed. Power to gas technologies are based on this; they transform excess electricity into green molecules that can be transported long distances at low costs and increasingly less relevant losses, while offering the possibility to have seasonal storage for renewable energy.

MICROPYROS

The **Micropyros** experience in the Pietro Fiorentini Group

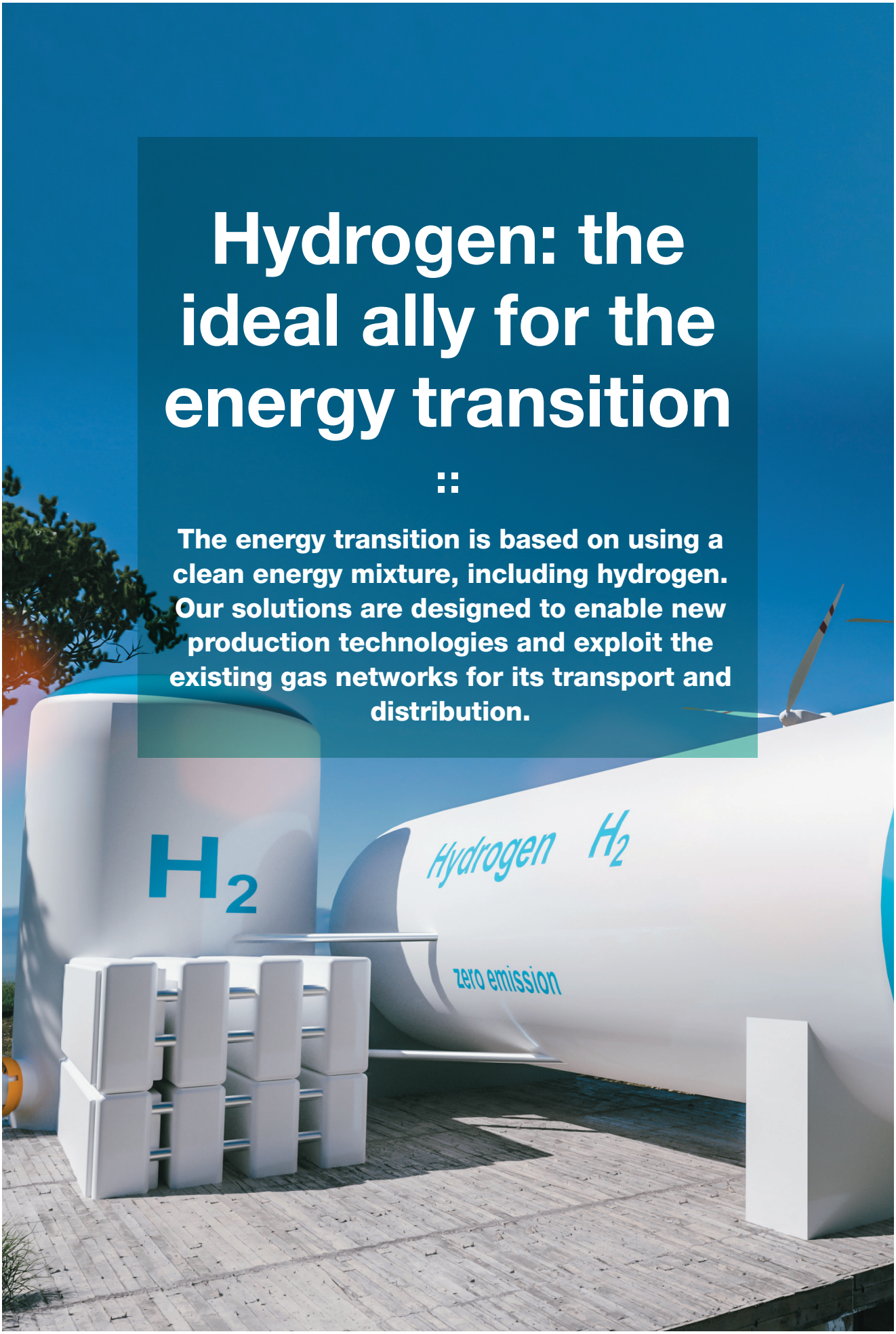
MicroPyros BioEnerTec GmbH™, a biotechnological company with headquarters in Straubing, Germany, is one of only **three companies in the world** able to apply **organic methanation to industrial processes**. It joined Pietro Fiorentini Group in May 2021.

With more than 40 years of experience, MicroPyros supports companies and administrative bodies in the production of renewable natural gas, sustainable and with no CO_2. In the organic methanation process, billions of micro-organisms metabolise the hydrogen and carbon dioxide in methane and water in an anaerobic environment. **This process is entirely "green"**. Besides exploiting the sewage present as nutrients for the micro-organisms, it captures the carbon dioxide released in the methanation phase and is one of the most promising sources related to Power-to-gas.



Hydrogen: the ideal ally for the energy transition

The energy transition is based on using a clean energy mixture, including hydrogen. Our solutions are designed to enable new production technologies and exploit the existing gas networks for its transport and distribution.



Pietro Fiorentini **hydrogen journey**

2019

JULY

Development of new products:
Hy4Heat project:
startup meter project 100% H_2

2020

MARCH

Compatibility analysis of materials
Research project with PoliMI

SEPTEMBER

Compatibility test
Tests on materials in certified laboratories

DECEMBER

Preliminary tests
Leak test on products in portfolio with He e H_2

2021

FEBRUARY

Field test
H21 project: pressure reducing station for 100% H_2

JULY

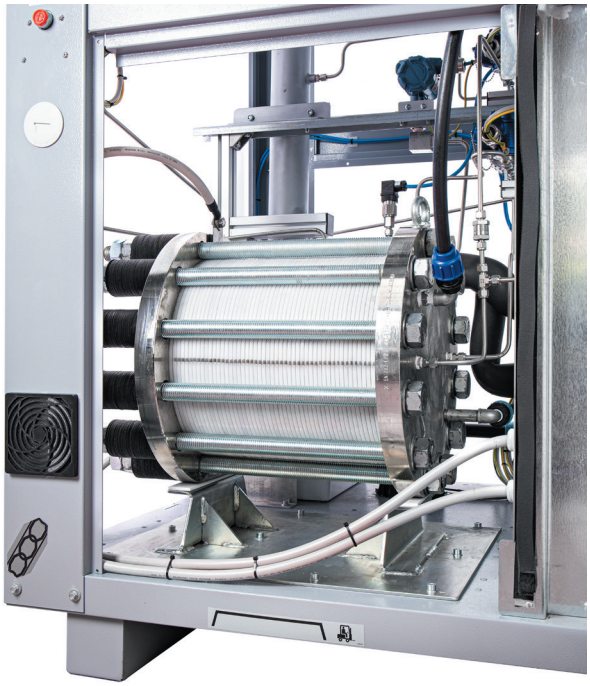
M&A
Hyter

2022

Q1 2022

Test in-house
New laboratory dedicated to H_2

HYTER
NEW ENERGY ROUTES



The **Hyter** experience in the Pietro Fiorentini Group

Hyter is a company operating in the hydrogen sector since 2011. It joined Pietro Fiorentini Group in July 2021. The company develops **solutions to generate green hydrogen through the electrolysis of water**, using a process based on anionic exchange membrane technology (AEMWE).
Using these technologies satisfies multiple needs in the energy transition process. For example, it enables **storing and consuming the hydrogen produced**, thus stabilising the variability of the production of electricity from renewable sources, very often not aligned with consumption. There are also umpteen potential applications, like sustainable mobility, sector coupling or solutions to satisfy residential uses.

Zero emissions target in the United Kingdom

Our first step in the hydrogen world was taken in the **Hy4Heat** project, wanted by the United Kingdom to achieve the target of being a **zero emissions Country by 2050**. More specifically, the project aims to check the safety and technical-economic feasibility of **replacing methane gas with 100% hydrogen** in the domestic/industrial networks. Working packages were assigned to us in the Hy4Heat project. These include the supply of a **residential meter** and all the upstream and downstream components. The result is **SSM-H2**, the first static, ultrasonic meter developed to measure up to 100% of hydrogen, currently in its preliminary test phase with the Hydrogen Home in the United Kingdom.

A project for future **hydrogen** networks

Also in the United Kingdom, and in the field of renewable gases, we have taken part in **H21** as well, a group of industrial work programs launched by the city of Leeds to demonstrate that existing gas networks will be able to transport hydrogen safely in the near future. In H21 we worked on **supplying a pressure reduction station for a line powered 100% by hydrogen**, currently installed in the Spadeadam experimental centre.

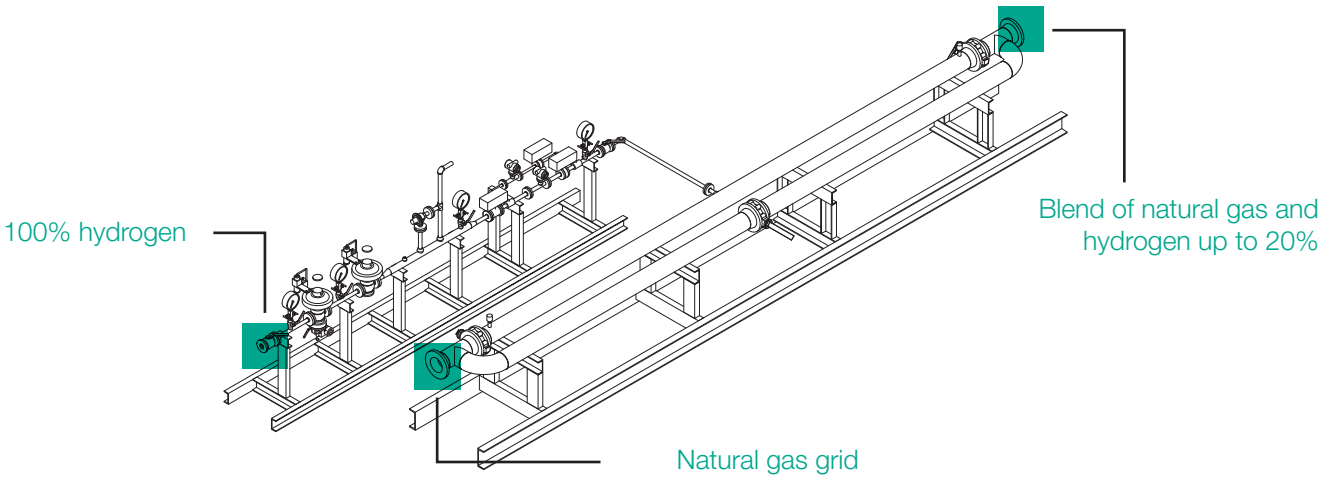

H2

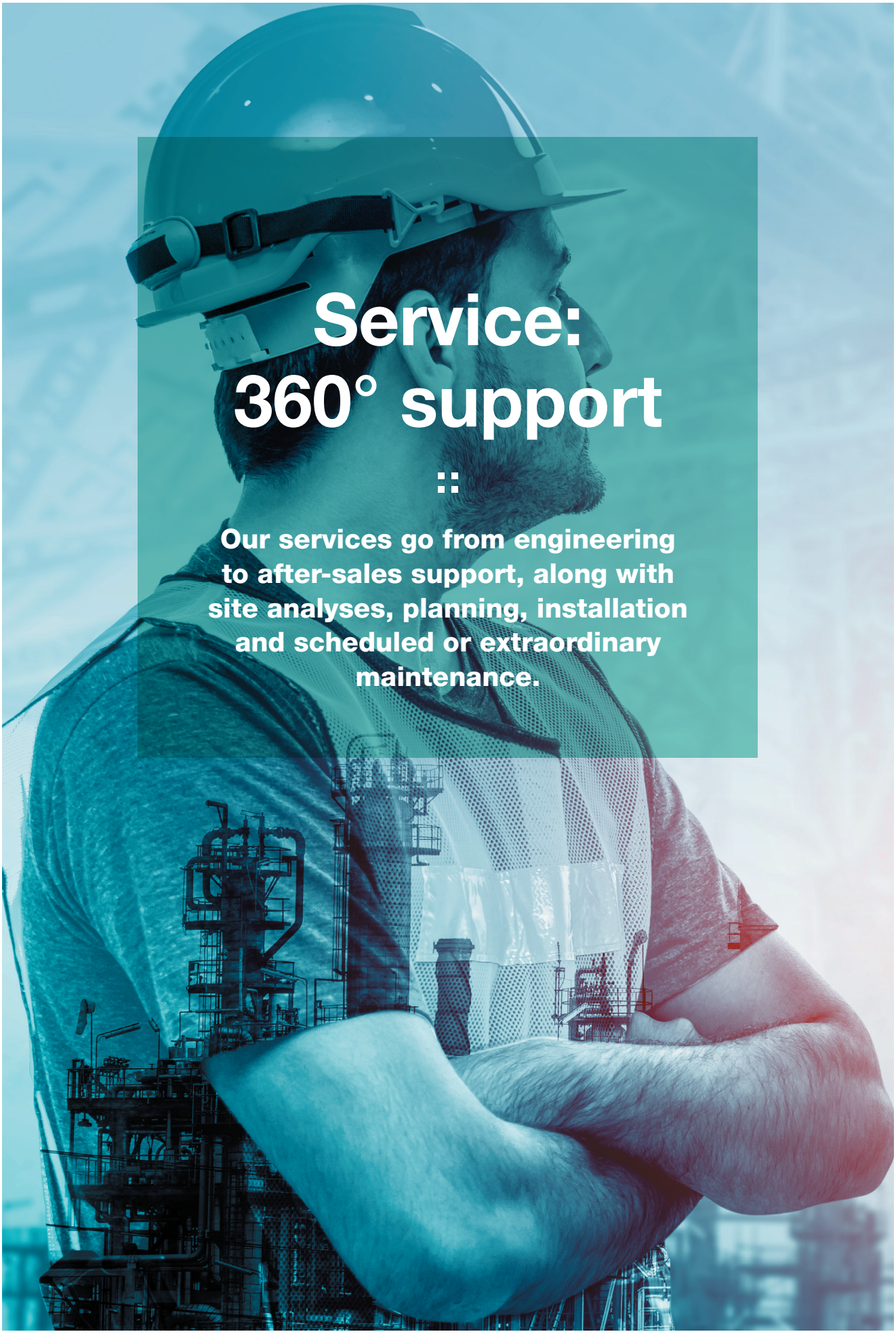
Towards **100% hydrogen** networks

The path towards **being able to inject hydrogen with percentages of up to 100% into the existing gas infrastructure** is one of the most important challenges for the energy transition we are part of. The connected issues concern both the conduct of devices to be installed along the route, and regulatory and operational aspects, like compatibility with the Atex directive, aspects related to measurement and maintenance.

Systems for hydrogen **injection** into the network

We are working on enabling the supply of hydrogen into the transport and distribution networks, combining **our experience in regulating the pressure of natural gas** with recent studies on the **injection of biomethane into the networks**. Our target is to create automated control stations for the injection of hydrogen, able to regulate, based on project specifications, the hydrogen percentage in the mixture based on the network's natural gas flow rate.



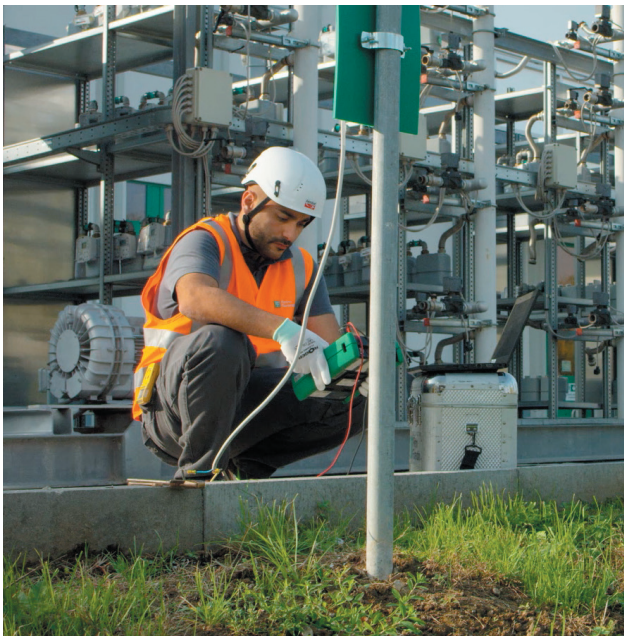


Service: 360° support

Our services go from engineering to after-sales support, along with site analyses, planning, installation and scheduled or extraordinary maintenance.

Remote service…

Service is a fundamental point in our solutions. We handle inspections, metrological controls and maintenance work, up to complete plant management. We measure operating parameters directly and continuously. We can **manage remote automation and promptly notify any anomalies**. Thanks to a capillary presence all over the world, we reduce intervention times and manage emergencies in the best way possible.



… and **in the field**

We follow all the process phases of each plant to guarantee continuity, efficiency, quality and low cost management of all interventions, requested and planned. We manage the **scheduled maintenance and functional tests for the gas pressure reduction stations**, for the mechanical revision of the reduction lines, for the release of fumes and the revision of the indirect heaters.

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www.fiorentini.com

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