

UNLIMITED HYDROGEN

AUGMENTED
McFiling



CLEAN MOBILITY
REVOLUTION



CLEAN FACTORY
REVOLUTION

AUGMENTED
McLyzer

BY **McPhy**

OUR MANIFESTO UNLIMITED HYDROGEN

There is a global consensus: hydrogen makes a positive contribution to the world around us, by providing a solution for energy, environmental, societal and economic challenges.

Whether facilitating the incorporation of renewables into the energy mix, decarbonizing industrial practices or the transport sector: hydrogen is a plural energy that opens up major possibilities for success in revolutionizing our energy models.



As a pioneer of hydrogen technologies in the service of energy transition, the McPhy Group has in ten years positioned itself among the leaders in clean hydrogen by developing cutting-edge technologies.

Our “Unlimited Hydrogen” vision is an empirical approach to hydrogen solutions, in support of the massive growth in clean energy needs. It’s more than scaling up, it’s about offering **smart, low carbon technologies that are modular, without any limits in terms of capacity, and are capable of both responding to contemporary issues and preparing for the future.**

“Fit for purpose. Ready for the future.”

To support this transformation, at McPhy we have the right level of technologies and industrial infrastructure, without - most importantly - forgetting the almost one hundred employees committed to the success of your projects and the roll-out of #CleanEnergy hydrogen.

“Clean. Smart. Scalable. Unlimited Hydrogen.”

We have concentrated our research and innovation on **modularized solutions capable of producing and delivering the hundreds, even thousands, of kilos of low carbon hydrogen per day** required by the necessary zero-emissions transformation of industry and transport.

“Modularized solutions without limits in terms of capacity, combining our latest technological and digital advances.”

The result of our latest technological and digital advances, our “Augmented” generation of electrolyzers and stations is **the perfect combination of proprietary innovations and “standardized” components**, to guarantee you the best performances in an optimal cost structure.

They also incorporate a **digital intelligence module**, which makes our equipment responsive and capable of reconfiguring itself dynamically according to data collected in real time.

We offer solutions that adapt to your application requirements and your usage scenarios, whatever size they may be, and not the other way around.

Welcome to the “Unlimited Hydrogen” era.



Pascal MAUBERGER,
McPhy’s Chairman and
Chief Executive Officer

OUTSTANDING INDUSTRIAL INFRASTRUCTURE,
WITH 3 CENTERS OF EXCELLENCE IN EUROPE



100 EMPLOYEES

LEADER IN HYDROGEN TECHNOLOGIES

MAJOR REFERENCES
IN KEY MARKETS AND GEOGRAPHIC AREAS:
EUROPE, CHINA, NORTH AMERICA

MORE THAN 15 YEARS
OF RESEARCH AND INNOVATION



EnergieDienst, a 1 MW Power to Gas project in Germany

CONSOLIDATED EXPERIENCE

21 HRS
A DAILY POTENTIAL OF
64,500
ZERO-EMISSION KILOMETERS
#CLEANMOBILITY

MCPHY WILL HAVE INSTALLED
16 MW
OF HIGH CAPACITY ELECTROLYZERS
= MORE THAN
7 TONS OF CLEAN HYDROGEN
PRODUCED PER DAY

CLEAN INDUSTRY REVOLUTION

MCPHY
SUPPLIES INDUSTRIALISTS
WITH DECARBONIZED
HYDROGEN.
RECONCILING PRODUCTIVITY,
COMPETITIVENESS AND SOCIAL
RESPONSIBILITY

WIDELY USED FOR ITS FLEXIBILITY, MULTISECTORAL APPLICATIONS AND ITS ENERGY EFFICIENCY, HYDROGEN IS A COMPETITIVE AND ATTRACTIVE STRATEGIC TECHNOLOGY FOR INDUSTRIAL COMPANIES.

BY REPLACING EXISTING CARBONIZED ENERGIES WITH CLEAN HYDROGEN, PRODUCED BY ELECTROLYSIS FROM RENEWABLE SOURCES, INDUSTRIALISTS ARE ENTERING A NEW LOW-CARBON ERA.


Low carbon, responsible, innovative and profitable: WELCOME TO THE INDUSTRY OF THE FUTURE


Already used in industry for more than 100 years, hydrogen has seen its development accelerated. This clean energy offers industrialists the possibility to create new forms of value: decarbonization of their processes, creation of new processes and markets, or valorization of their pollutant emissions.

By producing low-carbon energy on site, on demand, to their specifications, industrialists ensure:

- ☉ Security of supply and energy independence (freedom from logistic constraints),
- ☉ Control over their costs,
- ☉ Reliability and continuity of service,
- ☉ Drastic reduction of the CO₂ footprint,
- ☉ Within the best security conditions.

"POWER TO INDUSTRY": ALL SECTORS ARE CONCERNED

 **Petrol and gas refineries**
fuel desulfurization, e-fuels

 **Chemical processing**
methanol, synthesis of ammonia for fertilizers

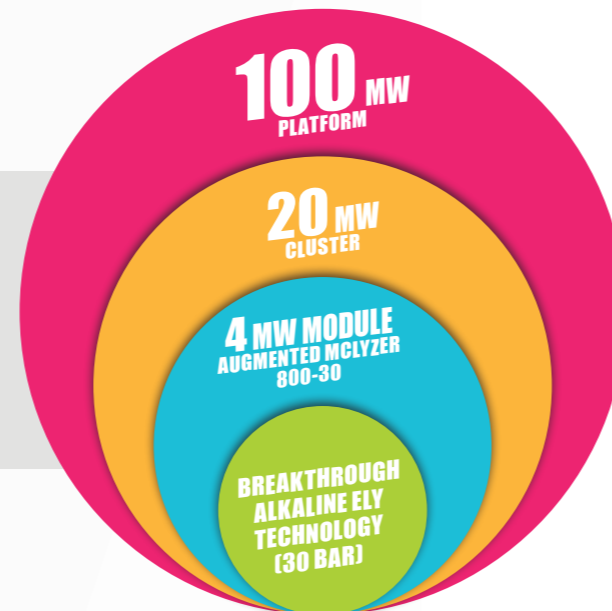
BUT ALSO:

Steel mills, coal-fired plants, thermal power stations (cooling system for alternators), metallurgy, glass production, electronic components,...

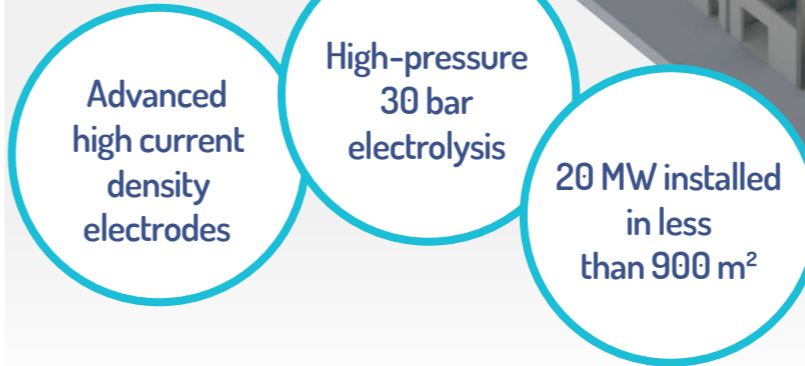
FOCUS ON CCU:

With "Carbon-Capture Utilization", polluting industrial emissions are captured before being released into the atmosphere and then added to hydrogen, allow synthetic molecules to be created and channelled into new uses: methanol, biodiesel, e-fuel...

Qualified and selected by numerous industrialists and/or gas companies, our electrolyzers integrate perfectly into industrial systems, whatever their size or business sector.



AUGMENTED McLyzer



McLyzer: electrolyzers up to 800 Nm³/h in series

Augmented McLyzer: 20 to 100 MW
(and more) platforms for large-scale industrial applications: chemical processing, methanol, e-fuel, refineries, ...

30 bar: high pressure production

Quick response

High energy efficiency

A mature, industrialized process

Robustness

Simple installation and commissioning

Compactness

Remote supervising and piloting

Economic competitiveness

AUGMENTED MCLYZER: NEW GENERATION ALKALINE ELECTROLYSIS FOR 20 TO +100 MW ARCHITECTURES

A true **breakthrough technology**, our "Augmented McLyzer" electrolyzers combine the **reliability and the maturity of alkaline technology with great flexibility**. They use new generation **electrodes with high current density** (doubled compared to standard electrodes) that significantly increase the performance of our equipments, all within a compact design. Based on a 4MW module design, our systems are created to scale up with your operating rhythm.

"**Bigger scale, lower costs**": the scaling up and industrialization of electrolyzers will make it possible to bring about a drastic reduction in the purchasing costs and the democratization of hydrogen.

FOCUS ON PIEL

[From 0,4 to 12 Nm³/h | 1 to 8 bar]
Perfectly in line with discontinuous applications and the requirements of light industry, the new generation PIEL by McPhy offers a solution that is perfectly adapted to the jewellery sectors – goldsmithing, meteorology, and the glass industry, or welding operations – brazing, and thermal processing.



CLEAN MOBILITY REVOLUTION

McPHY
CLEAN HYDROGEN
PRODUCTION AND
DISTRIBUTION SOLUTIONS
FOR ZERO-EMISSION
MOBILITY

HYDROGEN ESTABLISHES ITSELF AS A CLEAN ALTERNATIVE FUEL THAT CAN SIGNIFICANTLY REDUCE AIR POLLUTION IN THE TRANSPORT SECTOR BY ELIMINATING THE EMISSION OF POLLUTANTS AND CO₂.

ENSURE HIGH-QUALITY SERVICE, ALL WHILE CONTRIBUTING TO IMPROVE AIR QUALITY AND PUBLIC HEALTH

With their great autonomy and fast refueling, hydrogen vehicles are attracting a growing number of communities, manufacturers or managers of automobile fleets and plants or logistic platform operators.

They find the perfect union of operating convenience, continuity of service and participation in the fight against air pollution.

All types of mobility are concerned:



Land: utility vehicles, passenger cars, buses, big rig trucks, lift trucks, ...



Railway: trains,

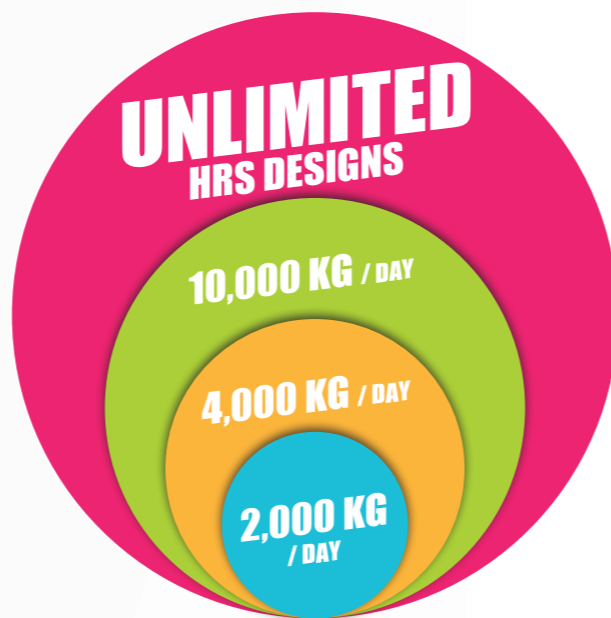


Or maritime: river shuttles, boats.

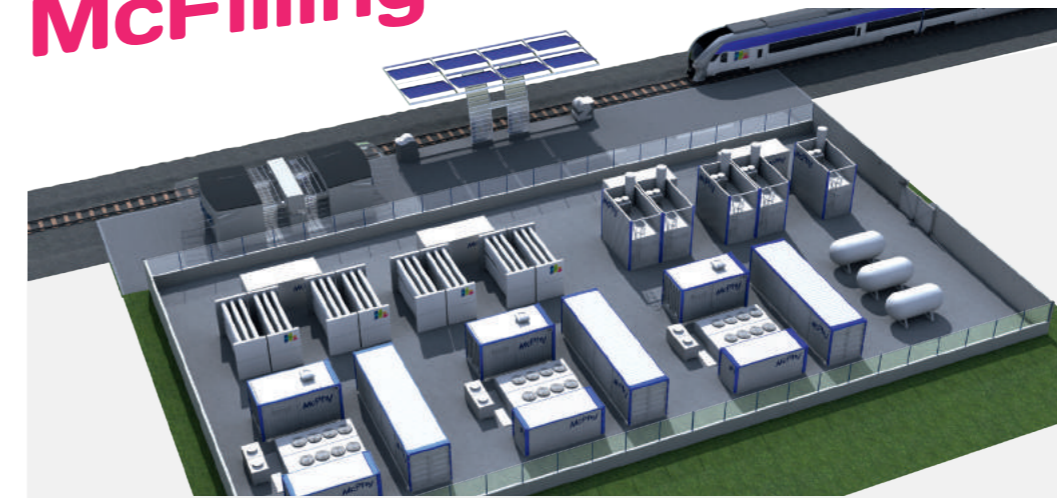
TOWARDS "ZERO EMISSIONS" HEAVY TRANSPORTATION

Hydrogen is **the only scalable technology, capable of meeting the massive needs of heavy-duty transportation**, which amount to hundreds or even thousands of kilograms of hydrogen each day:

- A low-carbon hydrogen, produced on site by alkaline electrolysis, cost-competitive with carbonated hydrogen (SMR),
- A clean alternative fuel, whose price at the pump is competitive with diesel,
- "Bigger scale, lower costs": the scaling up and industrialization of hydrogen stations will make it possible to bring about a drastic reduction in the purchasing costs and the democratization of hydrogen mobility.



AUGMENTED McFilling



Augmented McFilling hydrogen station: 2,000 kg per day configuration / 12 trains scenario, including 6 MW of electrolysis (3 x Augmented McLyzer 800-30 HC)

McFilling: a wide range of small, medium and large capacity stations

350 and/or 700 bar

Augmented McFilling: as of 2,000 kg per day, a modular solution with no limits in terms of capacity

Interfaces with an **electrolyzer** for true clean mobility chain

Zero-emission mobility: zero particles, zero CO₂, zero noise

Compact and modular

EXAMPLE OF POSSIBLE SCENARIOS



12 TRAINS



50 TRUCKS



100 BUSES

AUGMENTED MCFILLING: A NEW GENERATION OF HYDROGEN STATION FOR HEAVY-DUTY TRANSPORT

A true concentration of **technological and digital innovation**, Augmented McFilling by McPhy is a **unique and proprietary design philosophy** that supports the heavy-duty transport sector's transition towards the large-scale use of low carbon hydrogen. Combining the best of alkaline electrolysis and hydrogen station technologies, Augmented McFilling is an intelligent system capable of being **dynamically reconfigured** to offer you multiple modes of operation that will **optimize your TCO** (Total Cost of Ownership) in real time.



FOCUS
ON SUPERVISION
SOFTWARE

Embedded supervisory software makes our Augmented McFilling station dynamically reconfigurable. The station autonomously defines its optimal operating scheme and (re)routes the flows, from production to distribution to the vehicle, via compression and storage steps to deliver hydrogen at the lowest cost while ensuring service continuity and maximum availability.



FaHyence, the first hydrogen station connected to an electrolyzer in France

CLEAN ENERGY REVOLUTION

MCPHY
AGILE HYDROGEN SOLUTIONS
TO SUCCEED IN THE ENERGY
REVOLUTION

BY TRANSFORMING SURPLUS RENEWABLE ELECTRICITY INTO HYDROGEN, MCPHY FACILITATES THE LARGE-SCALE INTEGRATION OF CLEAN ENERGY INTO THE ENERGY MIX.

INCREASING THE SHARE OF RENEWABLES IN THE ENERGY MIX

Solar, wind, hydraulic: energy transition depends on renewable energies. They can answer the growing needs for energy, all while:



HYDROGEN, AN AGILE ENERGY

In the face of the massive deployment of renewable energies, by nature intermittent and difficult to predict, hydrogen seems to be a flexible and competitive solution.

- Flexibility and balance for the network: compensate for the intermittence of renewable energies,
- Matching supply and demand thanks to hydrogen storage,
- Reliable energy reserve for insular or off-grid locations and a backup solution and/or autonomous energy (buildings, telecom antennas, data centers, ...).



MCPHY ELECTROLYZERS: A DEMONSTRATED DYNAMIC RESPONSE

The McLyzer range is positioned as the ideal tool to stabilize the electric grids confronted by a growing influx of renewable electricity and participates in the primary and secondary reserves.

Its dynamic response to power fluctuations and its durability have long been demonstrated through data collected since 2014 on the "H₂Ber" Power to Gas project in Berlin.

Designed by McPhy to limit their operating impact on the environment, these hydrogen generators combine a zero-loss purification unit with a closed-loop system to reduce the consumption of water to the strict minimum during its transformation into hydrogen.

Instantaneous adaptability

to power fluctuations in electricity from renewable energies

System services participation (primary and secondary reserves)

High energy efficiency

Economic competitiveness



FOCUS
ON POWER
TO GAS

A true "bridge" between the electric and gas grids, Power to Gas brings flexibility and can increase the clean energy share, all while managing investments:

- Using existing grid infrastructures
- Coupling with other industrial or mobility applications

This solution has been widely adopted by large companies around the world.

AUGMENTED SOLUTIONS HYDROGEN

AN INTEGRATED APPROACH TO RESPOND TO YOUR LARGE-SCALE APPLICATION NEEDS

TO STRENGTHEN THE ATTRACTIVENESS AND PROFITABILITY OF CLEAN HYDROGEN, MCPHY RELIES ON ITS CAPACITY FOR RESEARCH & INNOVATION, BACKED BY A PREMIER INDUSTRIAL INFRASTRUCTURE.

RESEARCH & INNOVATION Constant technological innovation, enhancing your performance

As a forerunner in hydrogen, McPhy has an unequalled know-how that enables our teams to work for continuous improvement in our equipments and for the continuous development of new technology.

DESIGN & ENGINEERING Modularized, scalable systems without limits in terms of capacity

All around the world, hydrogen has seen its development accelerated. McPhy designs modularized architectures ready for scaling-up.



MANUFACTURING & COMMISSIONING A premier industrial infrastructure

In addition to a global commercial reach, McPhy has 3 centers of excellence in Europe:

- France: innovation platform, test bench and industrial manufacturing site dedicated to our hydrogen stations,
- Germany: engineering for multi MW electrolysis systems,
- Italy: a large industrial site, a veritable "stack factory" for the assembly of PIEL electrolyzers and the production of our large capacity stacks (multi MW).

For the installation and commissioning phases, McPhy relies on a network of premier partners and subcontractors in Europe, China and North America.

Our sites in La Motte Fanjas (France) and San Miniato (Italy) are certified ISO 9001.

McPhy is certified for the conception, manufacturing, installation and operational maintenance for flexible systems of production and implementation of hydrogen.



CLIENT'S PROCESS A "value creation" approach

We design, manufacture and install hydrogen solutions that are adapted to your reality and your issues. Our vision is pragmatic: it's about using our expertise to serve your productivity, energy efficiency and economic performance.



Piel Electrolyzers
From 0,4 to 12 Nm³/h
1 to 8 bar



McLyzer Electrolyzers
From 10 to 800 Nm³/h in series
10 to 30 bar

Augmented McLyzer
Multi MW concepts:
20 to +100 MW (30 bar)



McFilling Hydrogen stations
Small, medium and large capacities in series
350 and/or 700 bar

Augmented McFilling
2,000 to +10,000 kg / day



Services
A wide array of services:
remote supervision,
preventive maintenance,
training of your staff, ...



Driving
clean energy
forward

WELCOME TO THE “UNLIMITED HYDROGEN” ERA.

Injected into the natural gas network, used as a storage solution or as a raw material in industry, transformed into clean fuel: hydrogen plays a key role in the ongoing clean energy, clean industry and clean mobility revolutions.

A forerunner in hydrogen technology working for energy transition, in a decade McPhy has positioned itself among the world leaders in clean hydrogen, by developing an integrated approach and cutting-edge technologies to fit with your large-scale applications.

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