INNOVATIVE TECH START-UP

Acca Industries S.r.l

HYMOOV Device: Evolution

Short Presentation

- Acca industries srl is an **innovative startup with an "eco-industrial" vocation** established in October 2019, specialized in the research, development, production and marketing of innovative products and services with high technological value in the electrochemical, basic, metalworking, mechatronics, for the controlled production of hydrogen, understood in the broad sense.

- The startup has designed, **developed and patented the HYMOOV device for the production of hydrogen and oxygen on-demand (without storage),** to be installed as a retrofit on any internal combustion engine (MCI) to improve their performance and reduce CO2 emissions and pollutants, to optimize engine combustion and reduce consumption (4 patents registered, 2 of which are international).

- The company has a **highly qualified internal team** with decades of experience made up of 4 full-time employees, 4 external consultants with continuous contracts (researchers and engineers). The company has also activated R&D collaborations with UNIPD (1 PhD student contract) and with UNIVE for the Eco-Design of devices.

- The final objective of the entrepreneurial project is **to produce green hydrogen with our device** (from 2025) which promises to offer the best contribution to decarbonisation, and therefore a safe alternative on the path towards a cleaner society.

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Today:
State of Art

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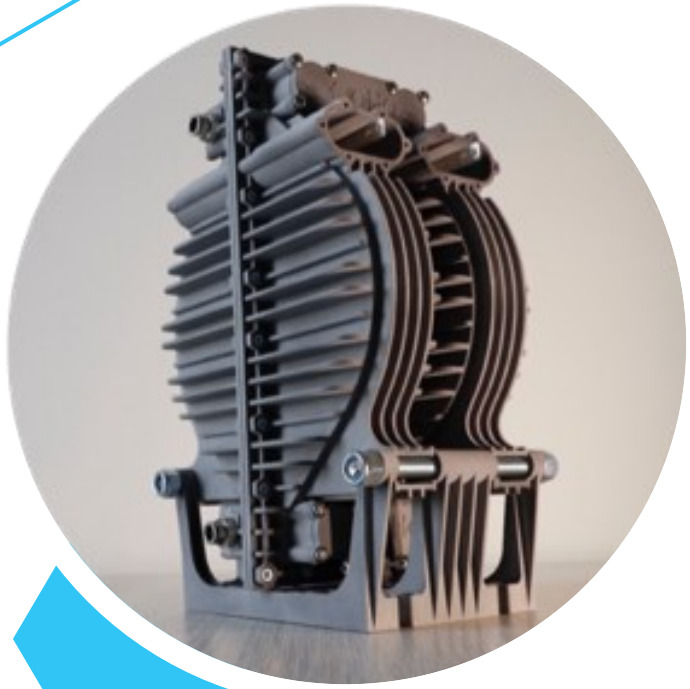


01 – Today: State of Art

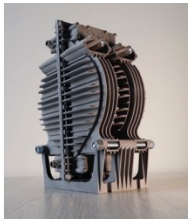
Existing device ready for Market

- Acca Industries s.r.l. has **developed and patented a device for the production of hydrogen and oxygen** to be used in internal combustion engines, allowing important **environmental and economic benefits** to be obtained.

- Solution that is part of a transitional phase where **current engines are "transformed" into less polluting engines.**

01 – Today: State of Art

Existing device ready for Market



TECHNICAL INFORMATION - MODULAR CELL	
DIMENSIONS	L 500mm X H 610mm X D 280mm
EMPTY WEIGHT	29 KG
POWER SUPPLY	24 VDC nominal
IP	IP20
HYDRAULIC CIRCUIT PRESSURE	<0.5 bar
ELECTRONICS	Microprocessor with PWM
SECURITY SYSTEMS	Active
	Passive
COOLING SYSTEM	Yes
CONNECTIVITY	Bluetooth
CONTROL AND MONITORING	APP, WEB-APP
ELECTROLYZER	Model No. 26 Blades in AISI 316L
ELECTROLYZER TYPE	AEC (Alkaline Electrolytic Cell)
ELECTROLYTE	Potassium hydroxide (KOH) >85%
PRODUCT GAS MIXTURE	Oxyhydrogen (HHO)
GAS MIXTURE PRODUCTION	2.5LPM with 560W
DEMINERALIZED WATER CONSUMPTION	0.1 NL/H at 25°C
MAX APPLICABLE POWER	840W at 25°C
CERTIFICATION	CE – RoHS,
APPROVAL	UN/ECE R10
MANUALS	Installation-use-maintenance
CONSUMABLES	Tank: Distilled or demineralized water
	Bubbler: KOH electrolyte
	Cell: KOH electrolyte

01 – Today: State of Art

How it's work

Demineralised Water with Electrolyte

The hydrogen/oxygen gas mixture is produced, through the electrolysis process, on request, only when the engine is running, and injected into the air-intake of the combustion engine.

The HFI device is not a fuel cell (AFC).

Remote Control Dashboard (RCD) - via web application or mobile app

ENERGY
Internal combustion engine power supply

ENERGY
Power supply **from renewable sources**

Installazione Plug-&-Play

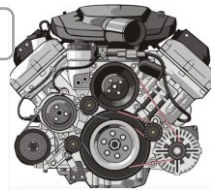
production

on-demand

HYDROGEN OXYGEN GAS

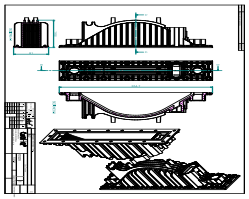
Air-Intake

INTERNAL COMBUSTION ENGINE



The device adds a hydrogen-oxygen mixture to hydrocarbon combustion.

01 – Today: State of Art
Goals achieved in 2023



- FINAL EXECUTIVE PROTOTYPE : complete device WITH OVAL BLADES and first APP version

- STRUCTURED SALES PACKAGE (user manual, technical sheets, pre-sale agreements, framework agreements)
- PRE-SERIES PRODUCTION
- PRE-SALES (MAY 2023)

Consorzio di Bonifica Verona

FLAG COSTA D'ARGENTO FEAMP

PATENT B5 | **COMPLETE DEVICE** | **CERTIFICATION HOMOLOGATION** | **PRE-SERIES / PRE-SALES** | **"FERST" FISHING PROJECT**

- B5 PATENT REGISTERED
- Two patents have been extended internationally

- CERTIFICATION HOMOLOGATION **UN/ECE_R10**

- FERST PROJECT (May 2023)

Paid experimentation to obtain the Carbon Footprint ISO 22948:2020 standard

01 – Today: State of Art

2023: Certified Experiments and Partnership

FERST PROJECT

- FLAG "Costa d'Argento"
  unicipalities: Monte Argentario, Orbetello, Capalbio, Isola del Giglio in the Grosseto province
- Test in operational environment
  n°2 large-ton fishing vessels (22,000cc engines)
- Primary engine retrofit
  Fishing boats Diesel
- Consumption reduction
  (-) 14,85%

SERIT

- SER.I.T. s.r.l Verona
  Waste collection companies test on **ISUZU P75 -5.2 vehicle**
- Testing on a compactor
- Associated with IFAI Verona
- Try Dimsport's BPP: Copy and PR
- Test WLTP cycle

CASA DEL PESCATORE

- **Casa del Pescatore**
  Soc.Coop a r.l. - Navy of Catholic Gabicce Mare
- Test in operational environment
  n°1 small ton fishing boat (4000cc engine)
- Auxiliary engine retrofit
  fishing boats
- Consumption reduction
  (-) 16,49%

CONSORZIO DI BONIFICA

- **Districts:** Adige Garda, Agro Veronese Tartaro Tione and Valli Grandi and Medio Veronese
- Test in operating environment on excavator
- Consumption reduction
  (-) 16,91%

01 – Today: State of Art

2023: Certified Experiments and Partnership

MAN PROJECT

- TEST on EURO2 TRUCKS
  FAI/VR member
- Test in operational environment
  MAN vehicle cat. N1
  Km 1,091,000 kW 265
  Cl. EURO 96/1 (2)
- HYMOOV Technology Promotion - Fishing boats
- Tests carried out on the road and on BPP MaHa.
- Consumption reduction
  (-) 19,40%

SEG GENERATOR

- Private company
- Test on cogenerator with 21.9L, 400kW MAN engine
- Fuel: Animal Fat or Sunflower Oil
- Consumption reduction
  (-) 11,22%

BPP TESTS

- BMW car
  VW PASSAT
- MAHA brand power test bench
- Measurements carried out Torque and power at the wheel

Showcase Cogenerators

- **400kW** cogenerator
- MAN engine
- Model **D2848LE**
- Volume **21,927L**
- **12 cylinders** in V Form - **RPM 1,500**
- Fuel Animal fat or sunflower oil
- Consumption of demineralised water **L/day 9**
- Power used **3.6kW**

HYDROGEN (H2) AND OXYGEN (O2) BASED ADDITIVE FOR COGENERATION PLANTS UP TO 1MW

	OPERATION WITHOUT ADDITIVE	OPERATION WITH HHO ADDITIVE
CONSUMO kWh/Kg	3,96	4,46

Profit (Loss) 11,22%

DEPRECIATION PLAN STATEMENT

DATA	ITEMS
CONSUMPTION KG/DAY	2,000
kW/hour	400
REDUCTION	% 11.22
REDUCTION KG/DAY	224.40
REDUCTION KG 30/DAYS	6,732

Photo showcases







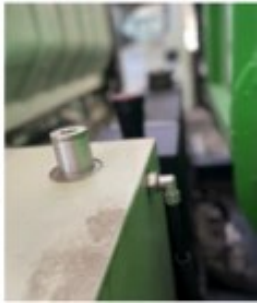
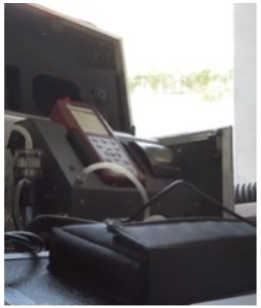
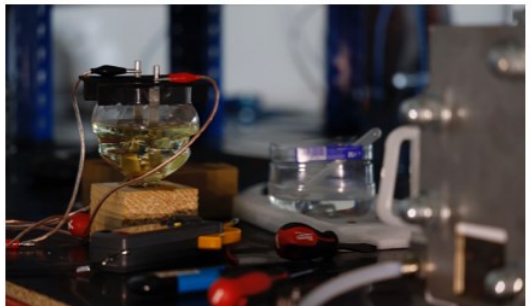
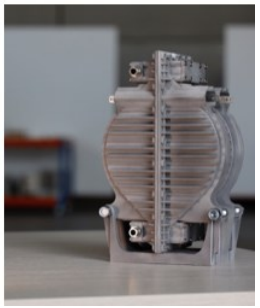



Photo showcases







02

Intermediate step
Green hydrogen testing from waste

H2E Hydrogen Supply Chain Project

H2E

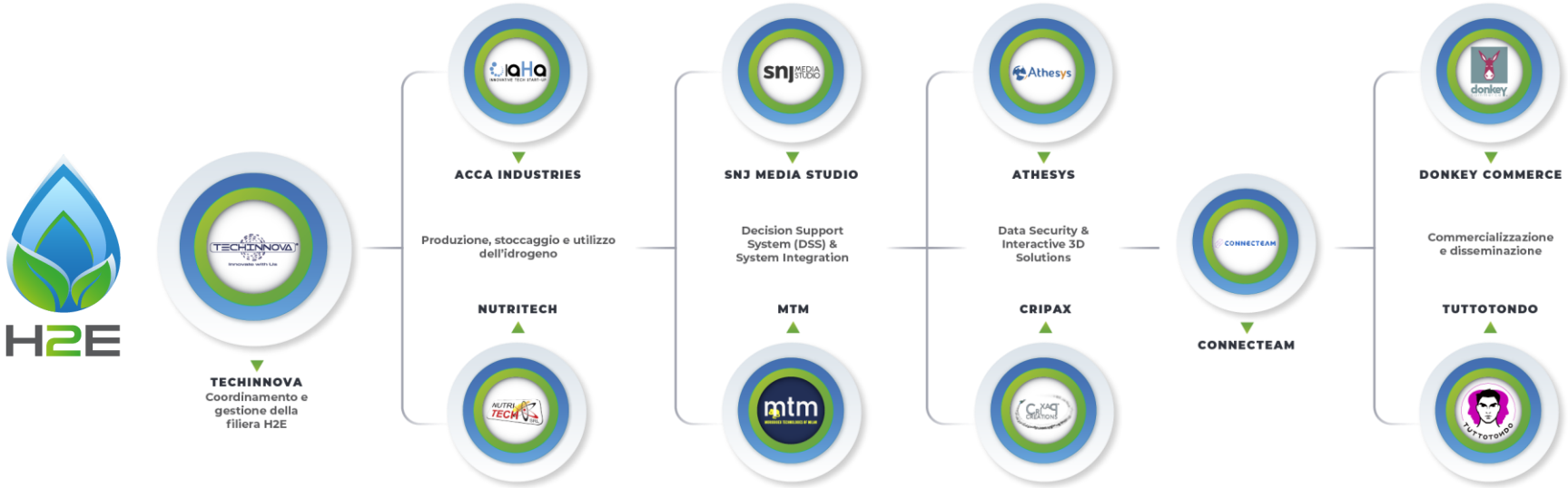
aHa

02 – H2E Project

www.h2e-project.eu

IN PROGRESS

The **H2E project** was born as a **partnership of companies** that work together to create a complete supply chain for the production, storage and use of green hydrogen in **Lombardy**, according to the logic of circular economies.



02 – H2E Project

www.h2e-project.eu

IN PROGRESS

PRODUCING HYDROGEN FROM ZOOTECHNICAL LIQUIDS AND FISH FARMING TO DECARBONIZE THE AGRICULTURE AND FISHERIES SECTOR

The H2E project not only aims to make hydrogen usable on existing engines, but also aims to develop a **NEW SYSTEM FOR THE PRODUCTION OF GREEN HYDROGEN**, starting from secondary raw materials.

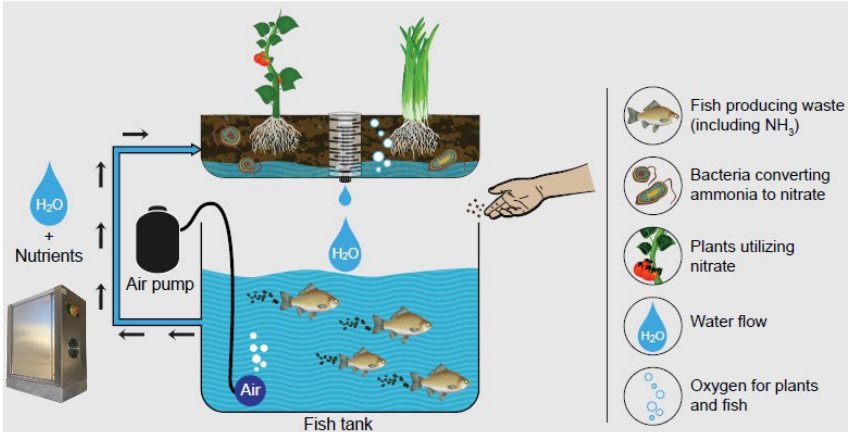
Unlike what happens with electrolysis, in which hydrogen is produced starting from water, Acca Industries and Nutritech, partners of the H2E project, have developed **a hydrogen production system starting from ammonia (NH3) deriving from zootechnical liquids and fish farming**. The technology used to complete this process is a catalyst dedicated to stripping hydrogen at low temperatures.

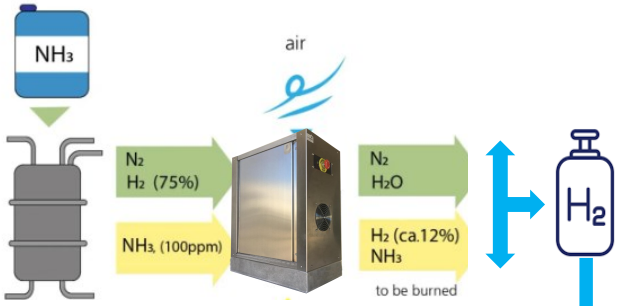
02 –H2E Project

IN PROGRESS

Simplified explanations of the entire project process

Production of hydrogen from animal waste

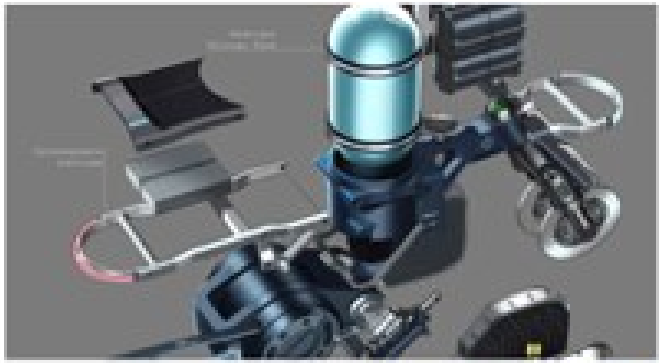




Test of experimentation with a hydrogen-powered bicycle

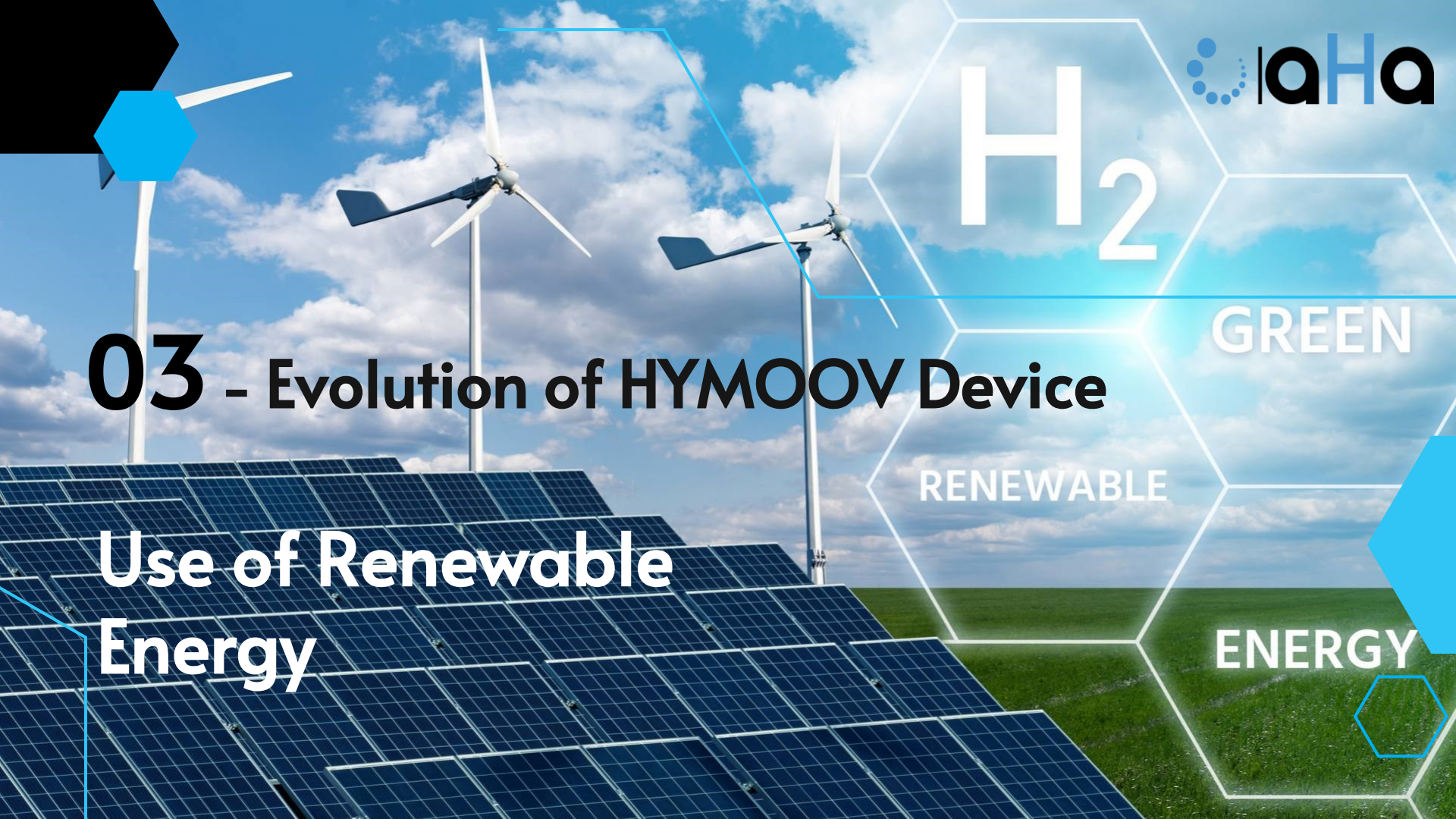
02 – H2E Project

IN PROGRESS



03

HYMOOV Device Evolution (from 2024)



03 - Evolution of HYMOOV Device

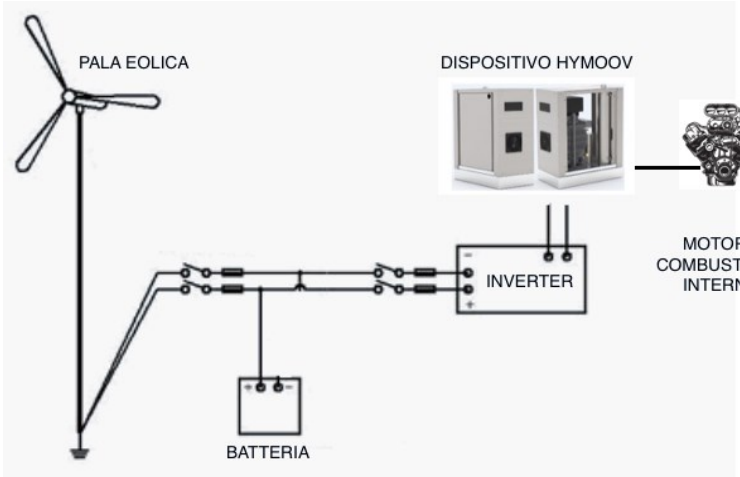
Use of Renewable Energy

03 HYMOOV Device Evolution (2024)

Use of Renewable Energy

COMPLETION of the DEVICE with the installation of a SMALL WIND BLADE for GREEN HYDROGEN PRODUCTION

- The HYMOOV device, completed with a small wind turbine, will be the first step towards a very interesting new way of producing and using clean energy (green hydrogen) to power our device, instead of the energy used taken from the engine battery.
- We will soon create and install integrated on-site systems capable of allowing self-production during fishing vessel activities.
- Micro wind system for electricity production to power our device: system components, applications, hybrid systems.



03 HYMOOV Device Evolution (2024)

Use of Renewable Energy

COMPLETION of the DEVICE with the installation of a SMALL WIND BLADE for GREEN HYDROGEN PRODUCTION

The system is designed for self-consumption on site and completes the HYMOOV device, thus creating a HYBRID SYSTEM in which wind power is one of the components of the overall system.

A micro wind system serving an isolated user usually completes the HYMOOV device consisting of:
- a wind generator
- a charge regulator
- an inverter

The electricity produced by the wind generator is direct current.

The function of the **inverter is to "adjust"** the current from direct to alternating, so as to make it usable for utilities, which in most cases operate on alternating current.

The charge regulator has the task on the one hand of protecting the batteries from excessive charging/discharging, and on the other of regulating and supervising the operation of the system.

This is a "minor" and small-scale application, often below 1 kW of power.

04 — HYMOOV Device Evolution (2024 onwards)

Green Hydrogen Production and Storage

04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE

AN INTEGRATED H2 SOLUTION FOR GREEN HYDROGEN PRODUCTION AND STORAGE

Starting from HyMoov technology and the H2E HYDROGEN SUPPLY CHAIN Project

Development of a **HYGREEN device/system** which:

- **t will contribute to the On-Demand production of green hydrogen.** It will allow the self-production of green hydrogen at an unrivaled cost. CO2 emissions will be zero, thus allowing the objective of total decarbonisation of emissions to continue.

- **It will include a high-pressure storage device for surplus self-produced energy from photovoltaic panels or wind turbines.** The surplus will be used for the generation of hydrogen which will then be stored in appropriate containers developed and patented by us. If necessary, the latter can be used as energy for various purposes.

04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE

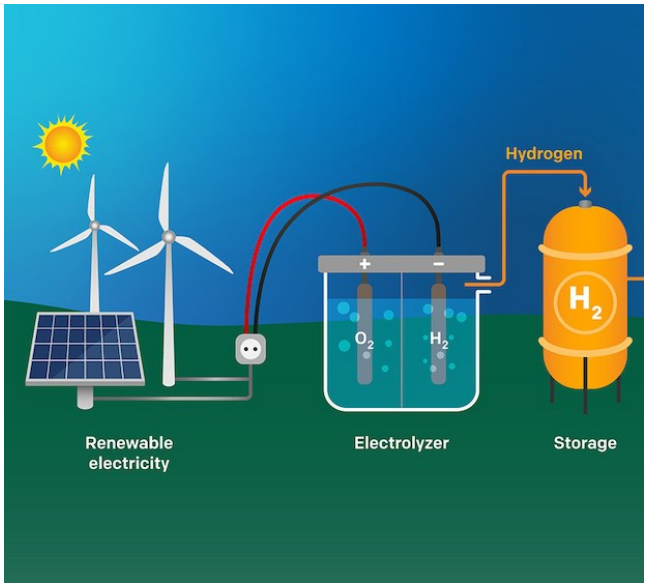
ACHIEVING THE MISSION

Producing "green" hydrogen and oxygen from water using renewable energy and secondary energy as waste.

VISION

Today, Acca Industries S.r.l has a standardized Device that can be stacked and combined for different sized projects, modulated and plug-and-play.

Tomorrow the Acca Industries technology, at the basis of water electrolysis, will make the use of the 100% green hydrogen carrier more convenient and accessible to all thanks to the design of a new compact electrolyser which will produce and store the green hydrogen produced.



04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE

PROCESS

- A direct and more efficient method to produce "green" hydrogen and oxygen from water using renewable energy or secondary energy (such as animal waste - H2E Project).
- Create an extremely compact, monobloc device/equipment, designed for direct connection to the current Acca industries HYMOOV device.
- A system that also allows the coupling of already installed solar photovoltaics and innovative Acca alkaline electrolysers and which will allow you to double the efficiency and produce 100% green hydrogen.

04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE

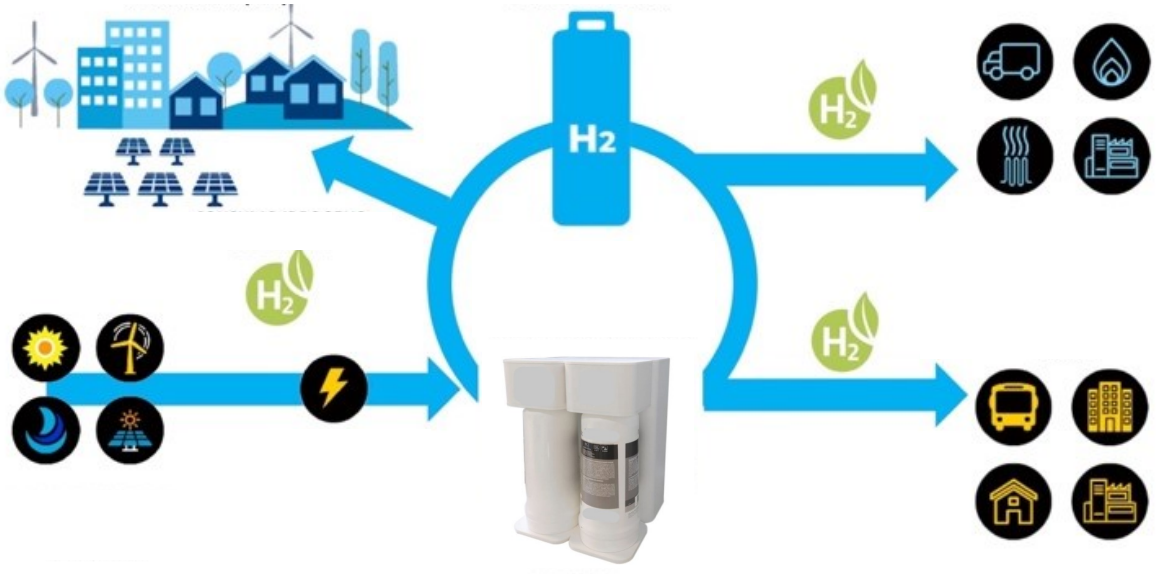
OBJECTIVES

- The device was created with the aim of providing a product that can be easily installed and integrated, a more compact "plug & play" system than the current Acca system, which can significantly reduce installation time.
- Massive price reduction through large-scale green hydrogen production.
- Check the entire cycle; from the production of green hydrogen for "on-demand" consumption to storage for postponed use of the hydrogen produced.

Green HYMOOV
Project Renders

04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE – Possible Applications



First Market:
Hydrogen Bike Sharing
RECHARGES

04 HYMOOV Device Evolution

GREEN HYMOOV DEVICE – Possible Applications

OBJECTIVES

- ✓ Contribute to the production of **100% renewable shared hydrogen for civil** (refills for municipal Hydrogen Bike Sharing service) **and industrial energy communities.**
- ✓ Propose a device that joins the energy mechanism of energy communities interested in acquiring, from shared photovoltaic systems, **hydrogen production from 100% renewable sources** to offset their consumption on their bills.
- ✓ Insert a device on the energy market capable of allowing every citizen **to produce and consume clean "green hydrogen" energy on-demand** or storable through their direct participation in the renewable energy market (incentivised and not).
- ✓ This is to give new and greater impetus to the Energy Transition, as part of a European request.

TEAM (01/09/25)

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