

Smart energy days



H2 applications for high performance drones

Tecnodelta srl

Via Francesco Parigi 5/h

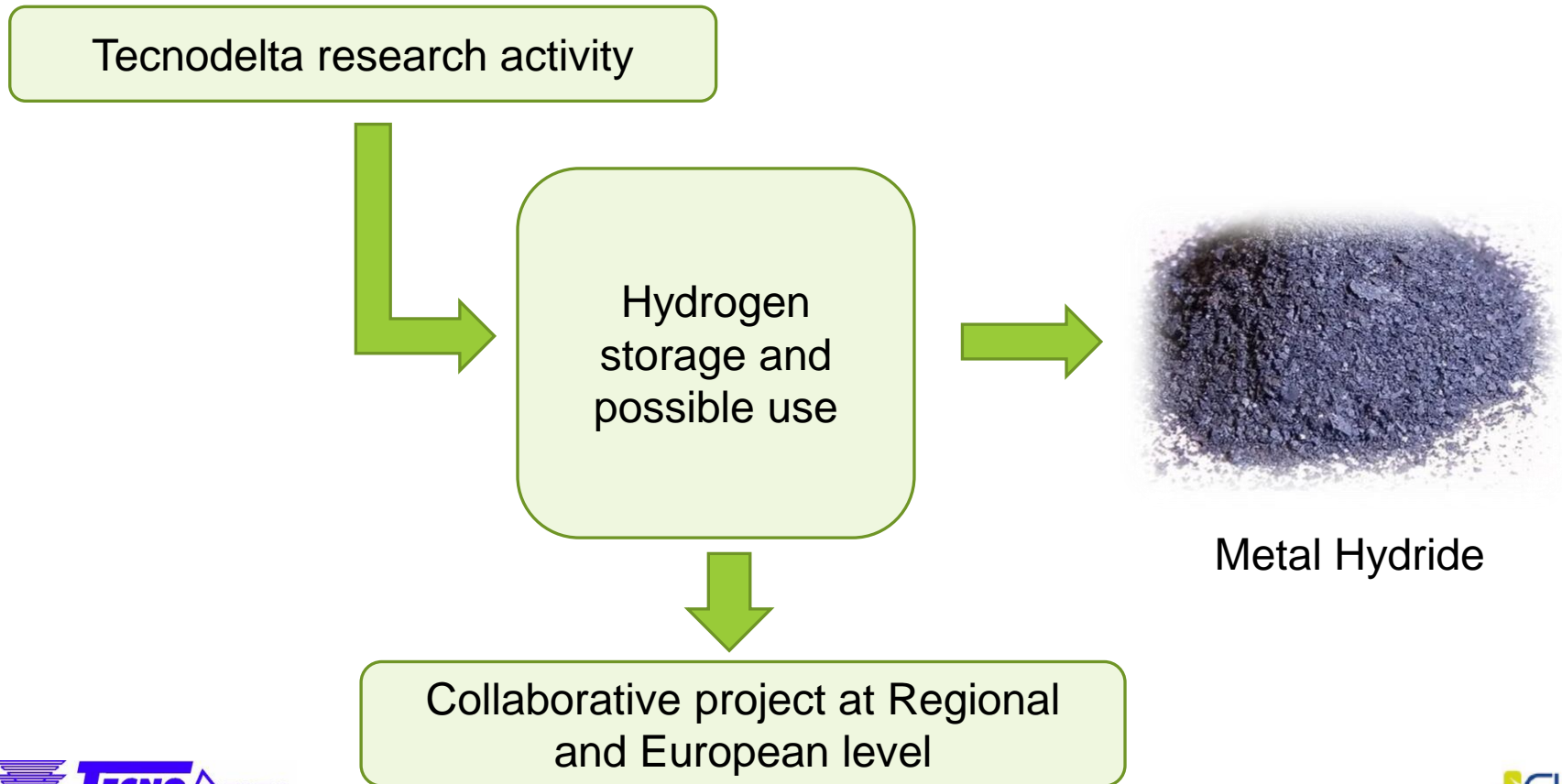
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Research activities

Since 2007 we are involved in research activity related to Hydrogen use

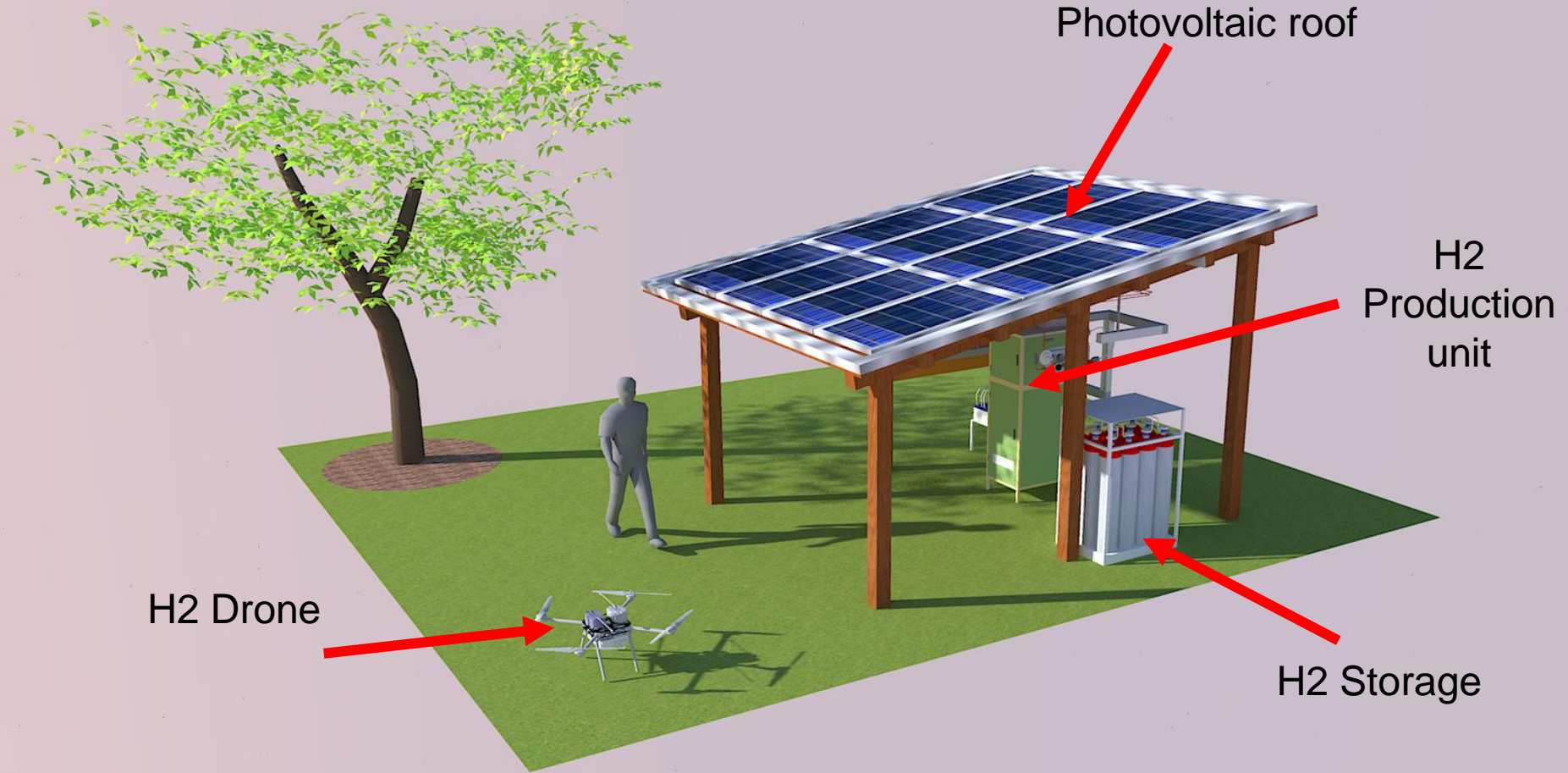




CLEAN
DRONHY
H2 - FUEL CELL POWERED DRONE



The aim of the project was to demonstrate the feasibility of manufacturing a drone complete with hydrogen production system and refuelling station



Collaborative project financed by Regione Piemonte



POR FESR PIEMONTE 2014-2020
Fondo Europeo di Sviluppo Regionale

The Partners :



Project coordinator
Production and refuelling station



Hydrogen Drone

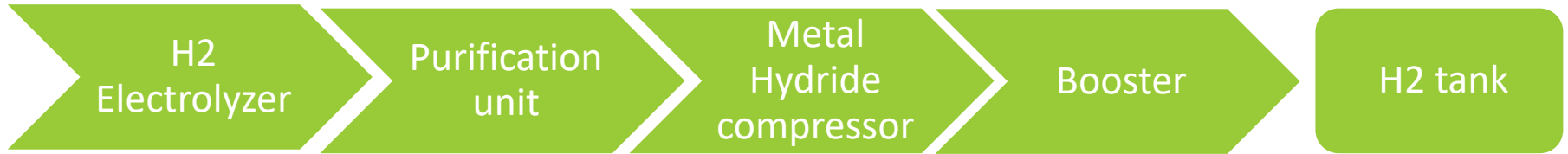


Electronic management of the Fuel cell

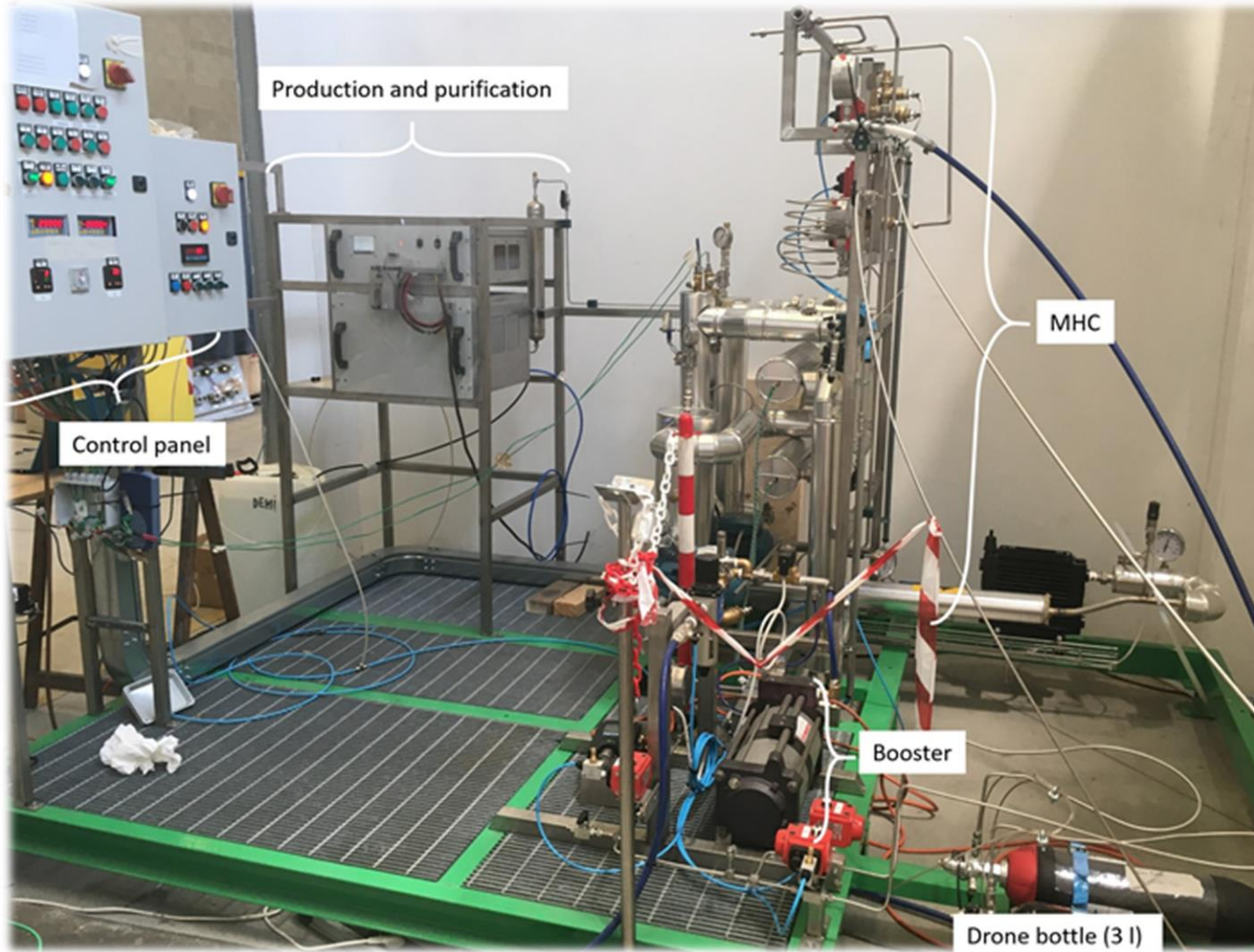


Compression system , Testing and LCA

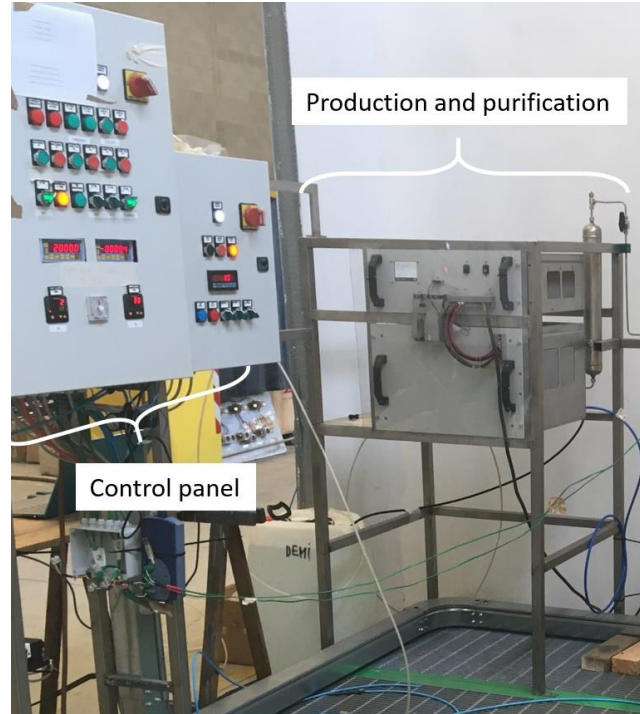
Celan Dronhy system



Celan Dronhy system

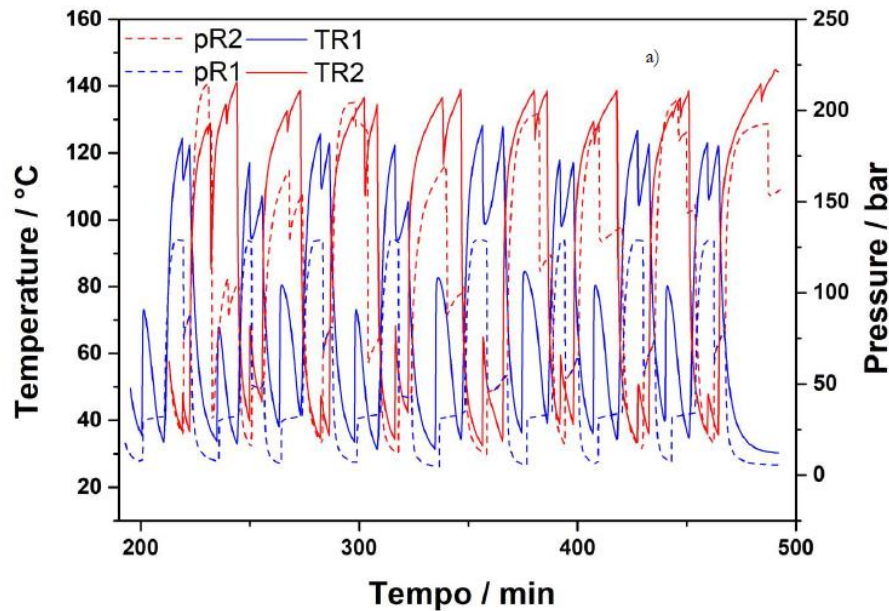


H2 Production



- Production: Electrolyser
- H2 supply pressure = 30 bar
- Power supply = Photovoltaic system or directly connected to grid at 220 V
- Purification stage = with zeolite

- Compression: Metal Hydride compressor + booster
 - H₂ flow with booster = 151 NI/h
 - Volume of the Drone tank = 3 l cylinder
 - Outlet pressure = 300 bar



Hydride compressor

MH Compressor

Working principle

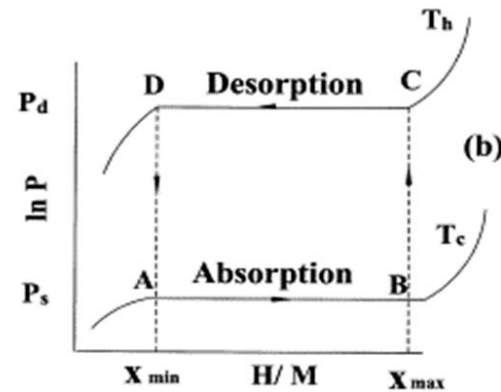
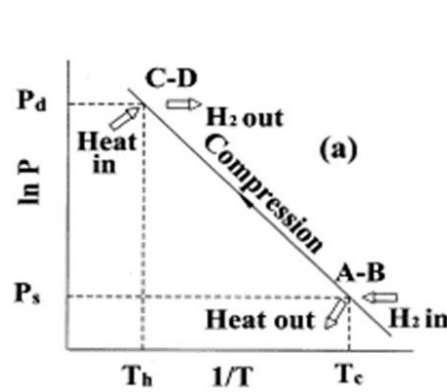
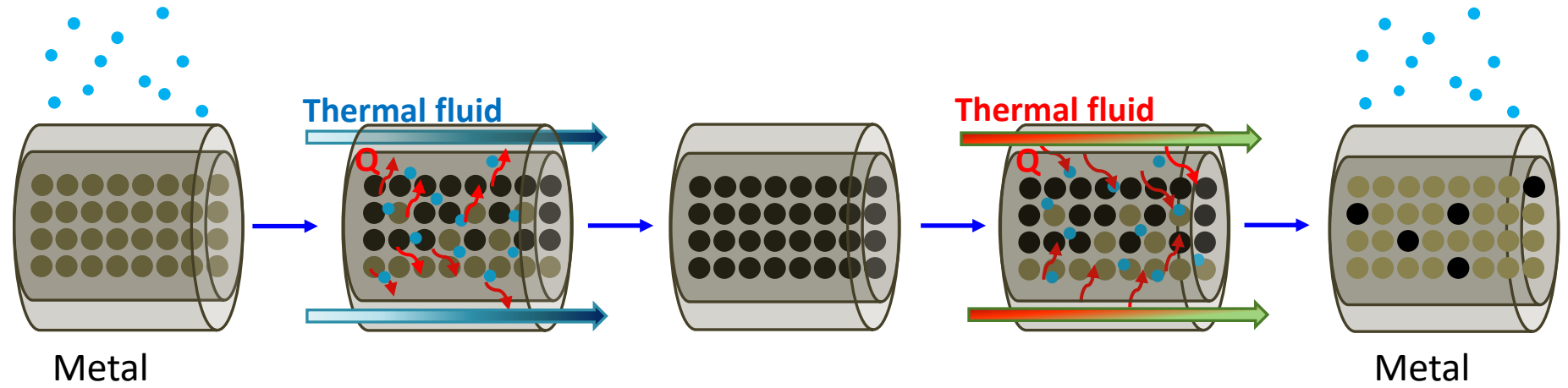
H₂ at inlet pressure

H₂ Absorption at low temp

Metal hydride formation

H₂ Desorption At High temp.

H₂ at $p_{out} > p_{in}$



MH Compressor

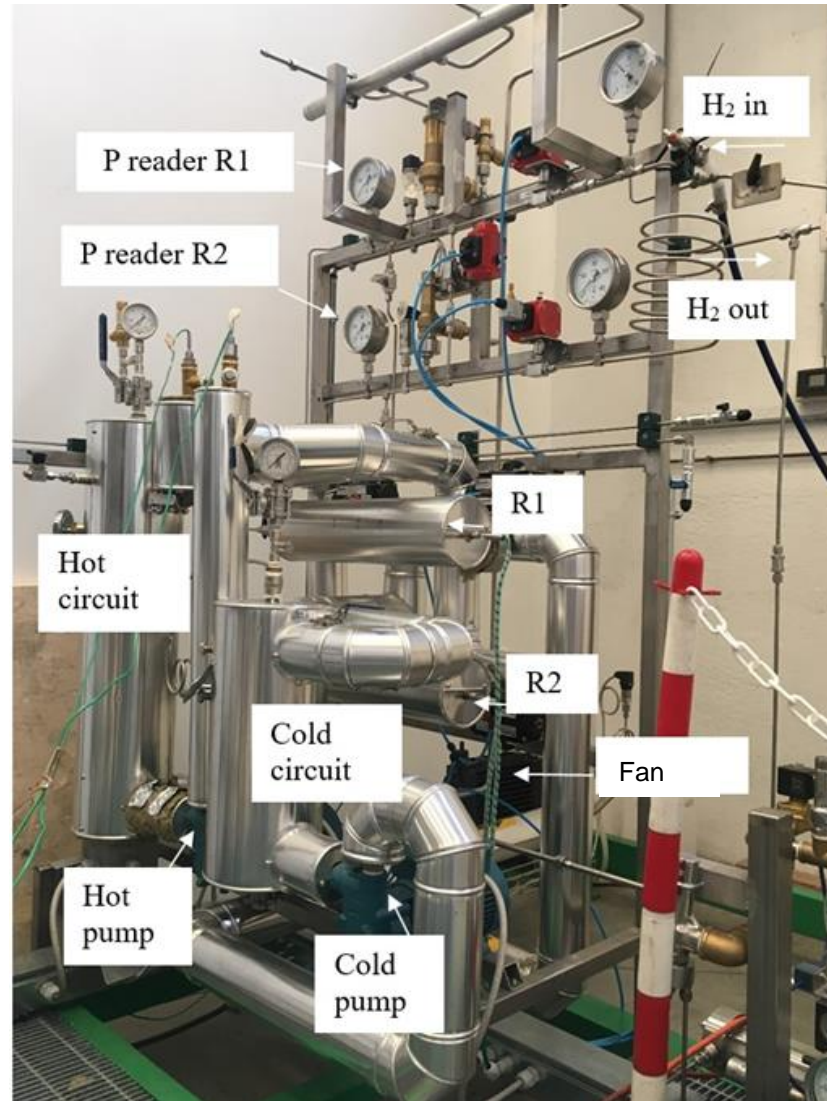
MH Reactor

- Filling material : different alloy of Metals
- Porous filter for inlet/outlet H₂
- Equal reactor dimension per stage
- Nr of stage 2
- Heat exchanger incorporated
- Sensor of pressure and temperature



H2 Refuelling station

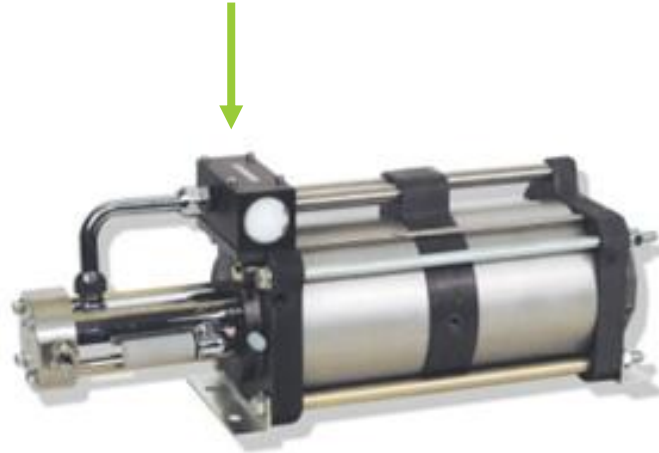
MH Compressor



H2 Refuelling station

Booster

Driven by Compressed Air



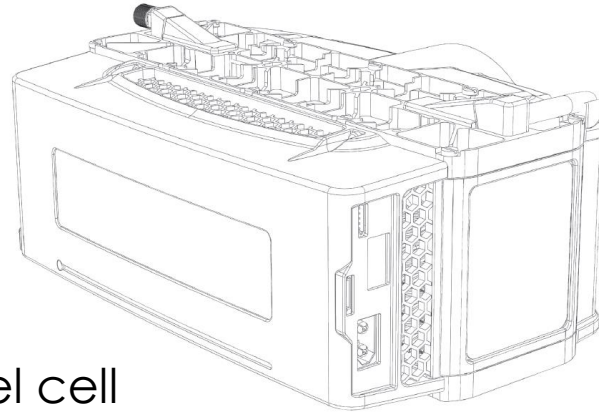
Pressure from Mh compressor = 220 bar



Pressure downstream H₂ booster = 300 bar

Electricity production

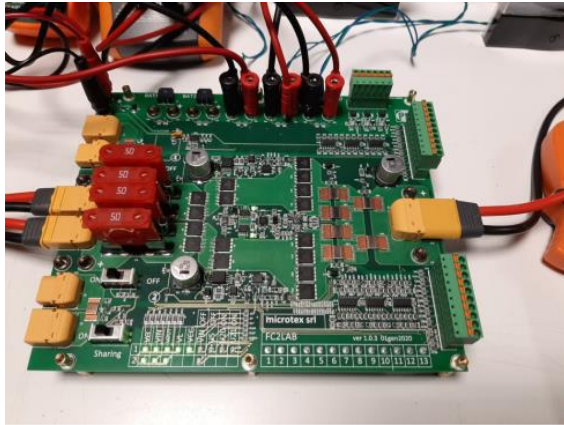
Fuel cell



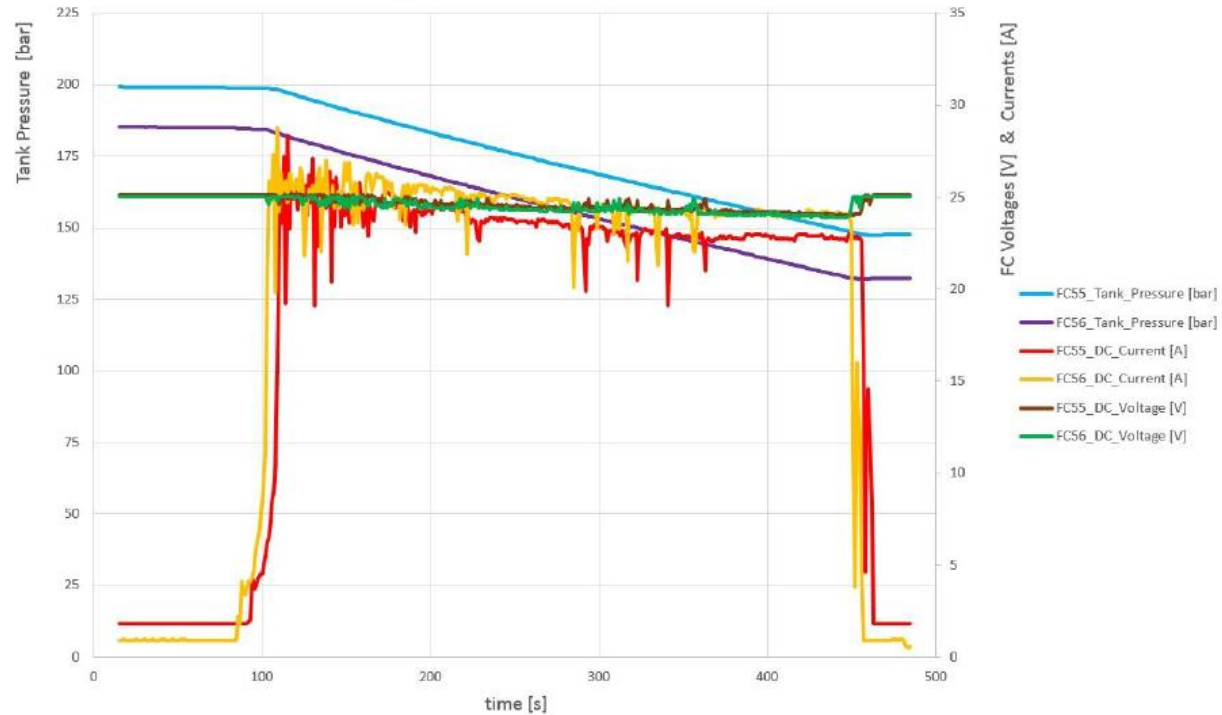
PEM Fuel cell

Gas supply =	H2@ 0,5 bar
Max flow rate =	16 NI/min
Power supply =	24 Vcc
Max power output=	2x650W
Operative temperature =	+5°..+35°C

Electricity production



Electronic management



Nr 2 FC 650W each

H2 Drone

Type	Quadcopter
Fligh time	approx 70 min
Working temperature	-20° C ...+ 50 °C
Power	1,3 kW
Power supply	24 V cc
Gas	H2 gas
H2 quantity	930 Nl
Totale weight	11Kg
FC Weight	1,3 Kg
Weight electronic unit	0,5 Kg
Weight H2 tank	3 Kg
Payload	1 Kg
Frame weight	4,5 Kg



- Possibility to monitor from control panel :
- H2 pressure
 - Alarm on FC system
 - Charge level of the emergency battery

H2 Drone



Flight time till 70 minutes with max payload



Thank you for your attention !

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