



Hydrogen and Energy Production Systems



History and Profile of HELBIO S.A.



- Helbio has expertise in the areas of catalysis, reaction engineering and process design.
- Helbio's HQ and facilities are located in Patras Science Park (PSP). Helbio has strong collaborating ties with the University of Patras and other institutions in R&D projects.
- The company consist of a team of seven professionals with combined experience of over 80 years in hydrogen generators, power systems and other processes related to catalyst development, reactor design, system manufacturing, automatic control and field testing.
- The company has five patents, while three more are under development. The patents describe processes, reactors and catalysts for hydrogen production from biofuels and conventional fuels.

TECNHONOLOGY: Advanced Reactors - HIWAR CONCEPT

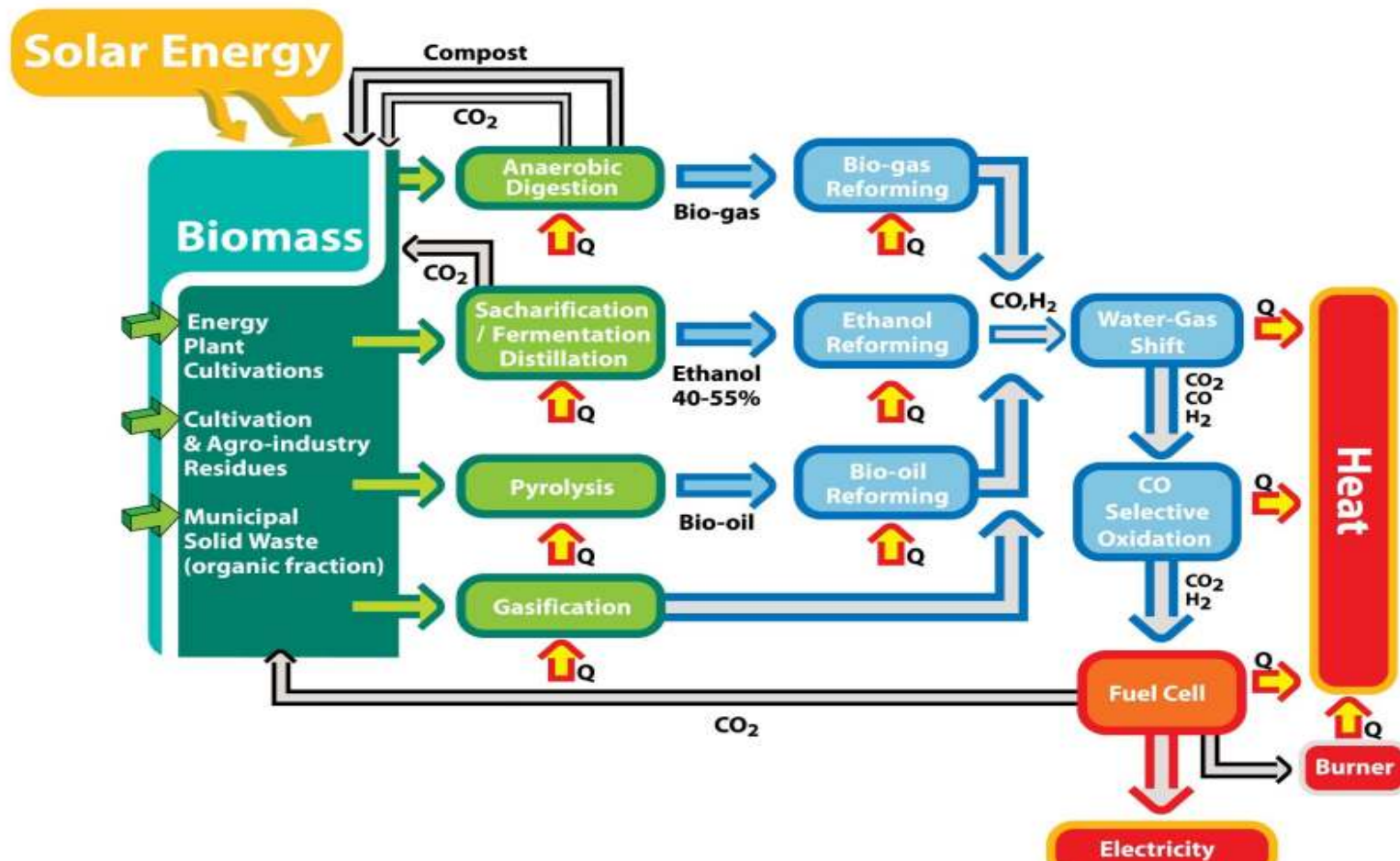
Tubular



Plate



Technology: Energy from biomass process





Products: APU-300

Fuel cell systems, running on LPG derived-hydrogen, hold a great deal of market potential, as they offer a ready and widely available source of power for mobile or stationary applications, especially when integrated with batteries.

Main markets :

- **Recreational vehicles (motorhomes and caravans) and campers**
- **Refrigeration applications**





Products: CHP- 5KW

There is market potential for Combined Heat & Power (CHP) cogeneration systems running on Natural Gas-, LPG- or diesel – derived hydrogen, as they offer a ready and widely available source of power for many applications, such as:

- **Trucks (Auxiliary Power)**
- **Boats (auxiliary power and/or propulsion)**
- **Households (Power or heat & power)**
- **Telecommunications**





Products : CHP-5KW

Advantages of Helbio Fuel Cell technology

The Advantages of Fuel Cell over other technologies are:

- **Higher efficiency** - Efficiency can easily exceed 30 % compared to 15-20% for ICE and 6-7% for ECE
- **Enhanced reliability** – no moving parts, 98% uptime
- **Lower maintenance and electricity cost** - The lack of moving parts, the high maintenance intervals and the high system efficiency results to power production with higher availability and reduced overall cost per kWh.
- **Lower emissions (no SO_x, very low NO_x)** - Sulfur removal from the fuel feedstock and the use of catalytic combustion ensures that the system emission will comply with the most strict standards.
- **Low noise level** - The extremely low noise level makes the unit ideal for use in any place including environmentally sensitive areas, households, boats etc.

PRODUCTS : Biogas – to - electricity



PRODUCTS: SMALL SCALE INDUSTRIAL POWER GENERATORS

BIOGAS COMBINED HEAT AND POWER (CHP) SYSTEM GH2-BG-20

Technology

Reformer..... Steam reforming
Water Gas Shift..... High and low temperature
CO minimization..... Selective CO methanation
Fuel Cell..... Low temp. PEM

Specifications

Power..... 20kW
Thermal power..... 25kW (hot water@ 65 °C)
Voltage..... 400V 3ph
Fuel..... Biogas*
Dimensions (LxWxH) 5m x 2.4m x 2.5m

**Unit includes complete sulfur and other pollutants removal from biogas*

Applications

Farms, landfills, waste water treatment facilities, industrial
Waste treatment facilities





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