BIONICO will develop, build and demonstrate at a real biogas plant (TRL6) a novel reactor concept integrating H2 production and separation in a single vessel. The hydrogen production capacity will be of 100 kg/day.

By using the novel intensified reactor, direct conversion of biogas to pure hydrogen is achieved in a single step, which results in an increase of the overall efficiency and strong decrease of volumes and auxiliary heat management units. The BIONICO process will demonstrate to achieve an overall efficiency up to 72% thanks to the process intensification.

In particular, by integrating the separation of hydrogen in situ during the reforming reaction, the methane in the biogas will be converted to hydrogen at a much lower temperature compared with a conventional system, due to the shifting effect on the equilibrium conversion.

The fluidization of the catalyst makes also possible to (i) overcome problems with temperature control (formation of hotspots or too low temperature), (ii) to operate with smaller particles while still maintaining very low pressure drops and (iii) to overcome any concentration polarization issue associated with more conventional fixed bed membrane reactors. Dedicated tests with different biogas composition will be carried out to show the flexibility of the process with respect to the feedstock type.

Compared with any other membrane reactor project in the past, BIONICO will demonstrate the membrane reactor at a much larger scale, so that more than 100 membranes will be implemented in a single fluidized
bed membrane reactor, making BIONICO’s
In this way a more easy operation can be carried out so that a stable pure hydrogen production can be
achieved. BIONICO project is based upon knowledge and experience directly gained in three granted
projects: ReforCELL, FERRET and FluidCELL.

Field of Science
/natural sciences/physical sciences/theoretical physics/particles

Programme(s)
H2020-EU.3.3.8.2. - Increase the energy efficiency of production of hydrogen mainly from water electrolysis
and renewable sources while reducing operating and capital costs, so that the combined system of the
hydrogen production and the conversion using the fuel cell system can compete with the alternatives for
electricity production available on the market

Topic(s)
FCH-02.2-2014 - Decentralized hydrogen production from clean CO2-containing biogas

Call for proposal
H2020-JTI-FCH-2014-1
See other projects for this call

Funding Scheme
FCH2-RIA - Research and Innovation action

Coordinator

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Activity type
Higher or Secondary Education Establishments

EU Contribution
€ 387 172,79

Participants (8)
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