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## Potentiality of a biogas membrane reformer for decentralized hydrogen production

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### **Highlights**

- Biogas steam reforming as promising technology for “green hydrogen”
- A 100 kg/day innovative system to produce hydrogen from biogas was analysed
- Adoption of membrane reactor increases the system efficiency
- Definition of the levelized cost of hydrogen production from biogas

### **Abstract**

This paper investigates the potentiality of membrane reactor for green hydrogen production from raw biogas. The assessment is carried out both from thermodynamic and economic point of view to outline the advantages of the innovative technology with respect to the conventional one based on reforming, water gas shift and pressure swing adsorption unit. Both biogas produced by landfill and anaerobic digestion are considered to evaluate the impact of biogas composition on system design.

BIONICO system model is implemented in Aspen Plus and Aspen Custom Modeler to perform respectively the balance of plant with thermal integration and a detailed fluidized bed membrane reactor design. Two permeate side configurations, sweep gas and vacuum pump, were modelled and compared. The adoption of membrane reactor increases the system efficiency by more than 20% points with respect to reference cases. Focusing on the economic results, hydrogen production cost show lower value respect to the reference cases (4 €/kg<sub>H2</sub> vs 4.2 €/kg<sub>H2</sub>) at the

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