

BioRobur

Biogas Robust Processing With Combined Catalytic Reformer And Trap

Duration:

30 Months: June 2013 – November 2015

Application Area:

Hydrogen Production, Storage and Distribution

Budget:

Total budget: 3.909.726€

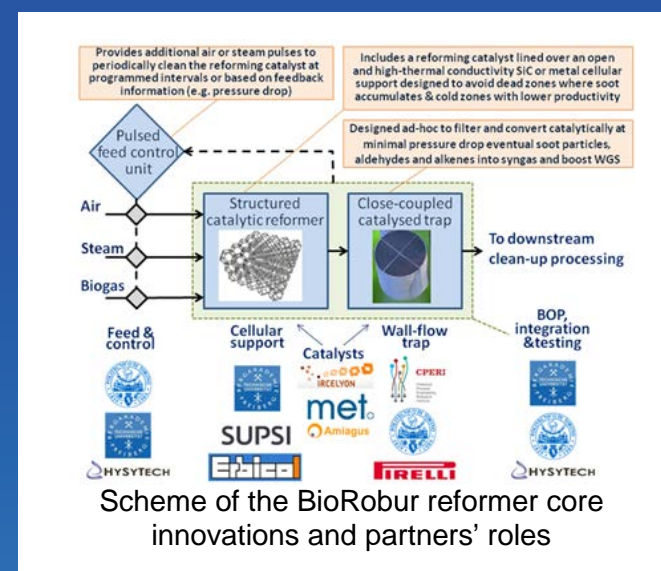
FCH contribution: 2.486.180€

Partnership / consortium list:

- Politecnico di Torino – Coordinator
- POLITO, Italy
- Technische Universität Bergakademie Freiberg - TUBAF, Germany
- Scuola universitaria professionale della Svizzera italiana – SUPSI, Switzerland
- Institut de recherches sur la catalyse et l'environnement de Lyon – IRCE, France
- Chemical Process Engineering Research Institute / Centre for Research and Technology Hellas - CPERI, Greece
- Erbicol SA – ERBICOL, Switzerland
- HySyTech srl – HST, Italy
- UAB Modernios E-Technologijos - MET, Lithuania
- Pirelli Eco Technology SpA – PET, Romania

Technical accomplishments / progress / results:

The project started last May. At the moment some preliminary possible Si-SiC structures designs have been selected for the BioRobur reformer.



	Inlet section	Reactor body	Outlet section
Structured support	SiC-based cellular ceramic: Provides static mixing at low pressure drop, enables high transfer heat conductivity to avoid hot spots. Size for 50 Nm ³ /h H ₂ : 5 litres to host oxidation and mix effectively	Ceramic or metal honeycomb: Provides the best performance in terms of low pressure drop and monolith costs. Size for 50 Nm ³ /h H ₂ : 15 litres to complete steam reforming at very low pressure drop	SiC-based wall-flow trap: Filters occasional soot emissions at low μ P, enables low mass transfer resistance for trace pollutants to the active sites. Size for 50 Nm ³ /h H ₂ : 20-30 litres depending on catalyst amount for μ P < 40mbar
Supported catalyst	Rh or noble metal catalyst: A typical C-POX catalyst provides good oxidation activity at the inlet and resists to coking and sintering in the most critical reactors location also due to the control strategies applied: the active species will be recovered via ad-hoc developed routes. Cost of catalytic brick: 2200€	Ni-based metal catalyst: A typical SR catalyst drives the SR reactions to completion at very low catalyst costs, long lifetimes is expected since C ₂ and part of C ₁ are consumed at the inlet and the catalyst operates at ca 700°C where C formation from CO (Boudouard) is low. Cost of catalytic brick: 1200€	Transition metal catalysts: A Ni-based catalyst may help decompose partially partial reforming products (ethane, aldehydes, soot), a Fe-catalyst coated over the downstream part of the filtering walls the WGS reaction so as to achieve low CO concentration. Cost of catalytic brick: 2000-3000€

Main materials addressed by the BioRobur R&D in the various reformers sections

Summary / main objectives of the project:

BioRobur project will develop a robust and efficient biogas reformer aimed at covering a wide span of potential applications, from fuel cells feed (both high temperature SOFC or MCFC fuel cells and low temperature PEM ones, requiring a significantly lower inlet CO concentration) up to the production of pure, PEM-grade hydrogen.

Contribution to the Programme Objectives:

OBJECTIVES OF THE CALL	OBJECTIVES OF THE PROJECT	CURRENT STATUS
50-250	100	N/A (test not started)
<10	<10	N/A (test not finalized)
<250,000	150,000	N/A (test not finalized)

Conclusions, major findings and perspectives:

The consortium have been started to work together few months ago. We expected to reach some important milestones during the next year in terms of the major constrains to build the future test rig.

Future Steps:

- 1 – Definition of BioRobur specifications to properly design all the components
- 2 - Setup for steady-state screening and transient regeneration experiments optimized
- 3 – Definition of optimal design for the reformer and the trap.
- 4 - Dissemination plan issued