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DEVELOPMENT OF A ON-SITE POWER GENERATION MODULAR SYSTEM FOR AGRICULTURAL WASTES VALORISATION

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The question about which is the **best available technology for the management of the waste generated from the extraction of olive oil** has become more and more important these days. As an answer to this issue, a group of key European RTDs and SMEs joined efforts to conduct the project **"Biogas2PEM-FC: Biogas Reforming and Valorisation Through PEM Fuel Cells"**, carried out under the EU Seventh Framework Programme, a tool from the European Union devoted to provide funding for the research and development of promising technologies.

Concretely, **Biogas2PEM-FC is an industrial research project** aiming to develop the technologies that compose a novel and integrated solution for the aforementioned waste valorisation. **The proposed solution that brings together environmental remediation and energetic valorisation** has, as first step, biogas production through anaerobic digestion (AD). Then, this biogas is valorised through catalytic reforming technologies coupled with a proton exchange membrane fuel cell (PEM). Such a solution provides a modular, reliable, cost-effective and efficient combined heat & power (CHP) system suitable for a distributed, on-site power generation from agricultural wastes.

MAIN PROJECT OBJECTIVES

- Regarding AD, an objective of around 0,005 m^3 of biogas/kg olive mill waste in co-digestion is expected to be achieved.
- As for the reforming process, the developed reformer should consume around 0.56 Nm^3/h of biogas in order to produce 1 Nm^3/h of hydrogen demanding no more than 0.8kW.
- As for the PEM-FC, membranes suited to the reformate hydrogen with a service life of about 40.000 hours are advisable.
- The system to be developed should integrate all the aforementioned technologies in a modular and easy-to-install& operate way with an overall efficiency of up to 80% (electricity + thermal).

RESEARCH BEING CONDUCTED

- Research for the increase of biogas production yield, using physic-chemical and biological pre-treatment technologies and investigating different inoculates and co-substrates.
- Development and optimization of current biogas reforming technologies: new catalysts for an efficient conversion of biogas to hydrogen.
- Research for the integration of PEM technologies using hydrogen produced from biogas.
- Construction and field tests of a pilot plant located in a real olive oil mill exploitation.
- Techno-economic and environmental evaluation of power generation using integrated Biogas2PEM-FC technology.

Moreover, not only limited to olive mill waste valorisation, **Biogas2PEM-FC technology can also be extrapolated to other agricultural wastes**. Additionally, this technology can be used to valorise biogas produced from other processes such wastewater treatment plants, landfill gas installations, and industrial biowaste processing facilities.

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