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Developing Dry Anaerobic Bioreactors Aiming in Optimum Utilization of Mediterranean Agro-waste for Energy Production

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Abstract

Research regarding the use of lignocellulosic materials as substrates for anaerobic digestion (AD) has been increasing in the last years with agricultural and agroindustrial waste representing a viable and low cost option, due to their high production rates and availability. Utilization of this waste biomass as a renewable feedstock to produce energy and valuable products will not only improve the sustainability of agricultural and forestry systems, but also reduce dependency on fossil fuels and minimize greenhouse gas emissions. Dry digestion is a suitable technology for treating organic wastes with high total solids content and compared with conventional wet AD will enhance digestion and reduce liquid digestate generation. Dry anaerobic digestion was not so popular due to lack of adequate knowledge and operational complexity. The first aim of DRYGAS Project is to determine the optimum inoculum to substrate ratio and operational conditions (temperature, moisture, Hydraulic Retention Time) in batch dry anaerobic digestion that will allow the maximization of the efficiency of the system, and therefore lead to the development / optimization of dry anaerobic digestion as a technology of energy utilization of the Mediterranean Agro-waste. A second step of DRYGAS Project will be to identify all the parameters in order to develop a dry anaerobic bioreactor (Solid State Anaerobic Bioreactor), which will be able to manage in an automated and optimal way, all the Mediterranean Agro-waste and produce the maximum possible volume and optimal biogas composition. The final outcome of DRYGAS will be the development of two basic types of dry anaerobic reactors (batch mode), with the maximum possible degree of automated operation through the design, synthesis, testing and improvement of different electromechanical structures. Key technical questions that will be answered through the project are how to safely remove biogas, how to heat bioreactors, the material and design of structures inside them, and the operation of sensors and data transfer. The expected results from the DRYGAS implementation is an optimum management especially for the residues produced in the Mediterranean basin, and a technological step, which will allow

the transfer of knowledge from the laboratory to the field, allowing the commercial development of dry anaerobic digestion.

Keywords: Solid anaerobic digestion, biogas, Mediterranean Agro-wastes

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