Pocket Power! – Increasing the potential of farm-scale anaerobic digestion in Flanders

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To date the region of Flanders counts already more than 100 small-scale digesters. Such installations allow the conversion of proprietary biomass to provide energy for the company itself. However, almost all installations use cattle slurry as input. Other agricultural sectors can still not benefit from the (partial) fulfillment of the energy requirements this technology can offer while rising energy prices become a more and more determining cost. The project Pocket Power wants to meet these shortcomings by exploring the possible transfer of the positive experiences with small-scale anaerobic digestion of cattle slurry to other agricultural streams (e.g. pig manure, crop residues). In addition, Pocket Power will investigate to what extent pocket digestion could serve as a climate measure by quantifying the reduction in greenhouse gas emissions accomplished by implementing a farm-scale digester and in that way avoiding the uncontrolled anaerobic digestion that will take place during long-term biomass storage.

A physical-based model (based on mass balances) was set up considering hydrolysis as the rate-limiting step and including temperature dependency. Simulation studies were performed for an average Flemish dairy farm taking into account constraints for manure storage as imposed by the Flemish legislation. Scenario-analysis was carried out through simulation of a default dairy farm with a manure pit under the stable (reference) in comparison to an integrated digestion farm with a manure slide, short-term external manure storage, small-scale anaerobic digester and digestate storage to gain more insight into the greenhouse gas emission reduction potential. An intensive full-scale measuring campaign will be performed to collect field data on biogas concentrations in the pocket digester, manure pit and digestate storage. These data will be combined with model refinements and additional simulation studies to get a more detailed view on greenhouse gas emissions associated to pocket digestion. Moreover, emissions by potential leakages, methane slip or an active overpressure safety device will be monitored. Additional measuring campaigns may be set up to explore seasonal variability of the biomass temperature and emission rate. Furthermore, a sector scan will be performed for Flanders to define the potential of a transfer to other agro-sectors. Based on a multi-criteria analysis, the two subsectors with the highest potential will be selected. Since new feedstocks could cause new technical problems, hands-on solutions will be sought to enable the design of an adjusted pocket digestion concept. This design will be evaluated economically and ecologically. Finally, Pocket Power will assist in the implementation of a pilot installation within one selected subsector.

The overall aim of Pocket Power is to respond to the demand of other sectors than the dairy sector for a profitable valorization of their agricultural residues as well as to provide a framework for the development of operational strategies to further reduce greenhouse gas emissions. Moreover, the impact studies – if positive – may offer constructers a real help in expanding their business and may convince stakeholders of the benefits of this technology.

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