



Farm-scale energy and nutrients circulation through an on-farm micro biogas plant

A cattle farm of Ryszard Strug, located in Poland, keeps dairy and meat cattle in a close circuit system, including the full production cycle from birth to dairy or meat production. On average, the farm rears 120 calves, 150 dairy cows and 130 meat cattle and the farm covers 430 ha of arable land. Cattle slurry is the only feedstock supplied to an on-farm biogas plant, which is technologically and functionally integrated with the dairy cows' shed.

During the technological process, slurry is transported to a mesophilic digester. The biogas produced there (60% CH₄ and 40% CO₂) passes through an air lock, an electric valve and a carbon filter, and feeds two electric engines, each with the power of 11 kW. The heat generated in the engine, water-cooled exhaust manifold and combustion gas heat exchanger are used to heat the digester and produce hot water for the internal on-farm use. Digestate is collected in a tank and used for fertilization of the farm's fields.

The on-farm micro biogas plant with the range of electric power from 10-50 kW_e has several benefits. The solution promotes prosumerism where the energy consumer also produces energy increasing energy self-sufficiency and mitigating the need to purchase energy.

The solution also promotes ecofriendly activities related to on-farm utilization of generated waste. The micro biogas plant is also an integral part of agricultural production (livestock in this case) securing internal circulation of nutrients in the farm and mitigating emission effects.



KEY WORDS

Micro biogas plant, prosumer

COUNTRY

Poland

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ADDITIONAL INFORMATION

This Practice Abstract is an example of an agricultural micro-scale biogas plant with a good replication potential, and which is an integral part of a production process that closes the circulation of organic matter at a farm level. The presented farm with cattle production utilizes slurry at a farm level, reduces the costs of energy and fertilizers, and enriches the fertility of its soils by fertilizing the soils with digestate. Thus, it is an example of both an energy prosumer, when the production and consumption of energy is entirely performed on the farm, and an industrial prosumer, when the production and consumption of the fertilizer entirely takes place on the farm. From the social perspective, the micro biogas plant primarily contributes to the reduction of odors from animal production and to the long-term effects of improving the living conditions of the local community, e.g., by reducing greenhouse gas emissions and contributing to cleaner air and reduced eutrophication of local waters and soils.

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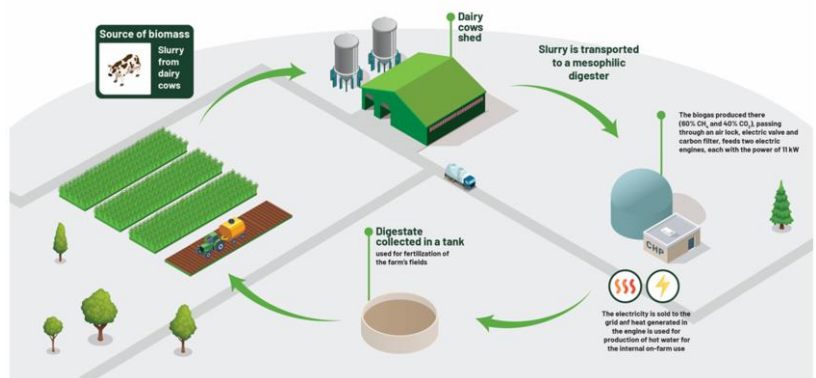


Photo: UWM in Olsztyn

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 101000375

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