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THE CARBON FOOTPRINT OF A BIOGAS POWER PLANT

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Abstract

In our study, we examined the annual carbon footprint and energy balance of a Hungarian biogas power plant with a power output of 0.637 MW in 2013, with reference to the complete life cycle of the biogas production. The life cycle analysis (LCA) considered the emissions of greenhouse gases (GHG) during the production of feedstock and its transportation into the power plant, during the operation of the factory and during the process of rendering the discarded waste materials harmless. We established that the highest GHG emissions related to the feedstock production in which both the use of machines and N_2O release from the use of artificial fertilizers played an important role. In 2013, the power plant produced 4347.21 MWh electric power and 4607.89 MWh thermal energy. The carbon footprint of the complete energy production life cycle was 208173 kg CO_2 equivalents (CO_2e). If the regular Hungarian energy structure produced such a quantity of energy, GHG emissions would be 15 times higher. Therefore, the energy balance of the power plant is positive; in contrast to its 8955.10 MWh energy production, its energy requirements were merely 2720.26 MWh, of which 1520.60 MWh as thermal energy served to heat the digesters. Unfortunately, more than 50% of the produced thermal energy is currently wasted; therefore, in the future, it is important to find a solution for the proper utilization of this valuable energy.

Key words: biogas, carbon footprint, energy balance, greenhouse gas emission, life cycle analysis

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