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Syngas Biomethanation

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Biogas as a heat and power resource as well as a vehicle fuel has been commercialized well in many countries such as Germany, Sweden etc.. However, further development of the biogas market is limited by the amount of available organic waste as well as the number of biogas filling station. On the other hand, biomass can be gasified into syngas and then synthesized into bio-SNG through catalytic methanation, or biomass gasification can be integrated into the biogas system to produce methane through biological methanation. In this way, biomethane can give a significant contribution to the energy market to replace natural gas. Biogas can be an important energy carrier in the future smart energy grids. By means of biogas system for electricity and vehicle fuel production, the increased proportion of variable renewable electricity (solar and wind) on the grid can be balanced. More importantly for the countries with rich biomass residues, biogas production can be increased to a full scale to meet heat & power and transport fuel demand by integrating biomass gasification into biogas system. For this purpose, a novel pathway is proposed to be studied in this project: Biomass gasification > H_2+CO > Biogas digester > Upgrading > Natural gas networkThe review paper emphasizes 1) to develop suitable biomass gasifier for production of a good quality syngas, and 2) to study the biogas production from biological methanation or bio-methanation of syngas. The technology feasibility, the bioreactor design, the process synergy and the integration of the gasification plant with the biogas plant will be addressed. It can be concluded that the dual-fluidized bed gasifier can be a good choice to produce high concentration hydrogen syngas. It is possible to convert the most of CO_2 in biogas from digesters into biomethane when syngas is added in the digesters. The commercialization of syngas biomethanation is discussed.

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