Abstract

Modelling and Multi-Criteria Analysis of Anaerobic Digestion Process to Get Upgraded Methane from Bio-Residues in the City of Reykjavik †

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Abstract: Anaerobic digestion of urban organic wastes, farming slurries or sewage sludge is a common practice in waste treatment plants. In the city of Reykjavik, the organic waste fraction constituted by 60% of biomass and 40% of food waste will be transformed by the local waste company SORPA providing biofuel for up to 10% of the cars. Such measures belong to the 2018-2030 Climate Action Plan from the Icelandic Government.

The main challenge of this work consists of the integral use of bio-residues in the urban biosphere of Reykjavik by interlinking resource flows and its application in urban transportation; farming and/or construction sectors from a circular bio-economy perspective. The aim of this research is to analyse the life cycle of biomethane from the organic waste feedstock to end-use as upgraded fuel, by simulating different approaching models improving the methane yields and efficiency of the entire mill

First, bio-residues composition, pre-treatment and fractionation options and how fractionation affects the digestion process will be analysed. Secondly, the biogas reactor will be modelled using Aspen Plus software under different pre-treatment and fractionation scenarios considering not only the methane yield and digestion efficiency but also by analysing the solid digestate composition and its application into the urban area. Finally, Multi-Criteria Analysis (MCA) decision-making tool using Definite 3.0 software will check the proposed alternatives and select the best solution considering tailor-made environmental, technological and economic indicators.

The authors will conclude the presentation with the preliminary results of this ongoing research and hope to engage in a constructive dialogue on sustainable waste management.