Anaerobic digestion and nutrient recovery: a key linkage towards a closed recycling loop

Gregory Gregory Reuland[1,2], Erik Meers[1], Ivona Sigurnjak[1], Evi Michels[1], Stefanie Königsberger[2], Mieke Decorte[2]

[1] Ghent University, Faculty of Bioscience Engineering, Department of Green Chemistry and Technology, Ghent, Belgium.

[2] European Biogas Association (EBA), Rue d'Arlon 65, Brussels, Belgium.

The Renewable Energy Directive (RED) constitutes a pivotal contribution of European policy towards achieving global sustainability. It requires from EU countries that at least 20% of their total energy demand is met with renewable sources by 2020. The proposal for a revised RED would set the goal even higher as renewable sources would have to make up at least 27% of the final energy consumption. In the case of anaerobic digestion (AD) technology, this favourable wind can be counterbalanced by environmental regulations, namely the European Nitrates Directive 91/676/EEC, which impose strict limits on nitrogen application from processed manure derivatives. As manure-based digestate falls under this category, limitation on digestate utilization can hinder AD development, especially when considering the additional costs associated with digestate disposal and storage.

To tackle this issue, several European projects are currently developing innovative Nutrient Recovery and Reuse techniques (NRR) to combine the benefits of biogas production and digestate valorisation, thus paving the way for a range of novel products from digestate with high market value. More and more, AD is susceptible to be combined with NRR for the valorisation of biowaste in an economically viable manner.

In the Horizon 2020 Systemic project, five demonstration plants use refinery techniques to separate minerals (N, P, K) from the organic fraction of the digestate to produce high quality, calibrated mineral fertilizers. Moreover, the Key Performance Indicators are already providing robust evidence that the added value of NRR can potentially ease AD away from public subsidies, making the case for a profitable and self-reliant technology. The fact that 10 outreach plants and almost 20 associated plants, within the Systemic project, are already accounted for is a healthy signal that the interest lies not only within the scientific community but that it is also 'alive and kicking' among professionals of the AD sector.

In the same line, the Horizon 2020 Nutri2Cycle project aims to improve N, P and C flows in agricultural systems by reuniting the increasingly estranged pillars of crops and livestock, and by linking them with agro-processing. In this context also, AD will have a key role to play for processing by-products and recycling nutrients. As a third example, the Interreg project ALG-AD takes another path to deal with nutrient rich digestate by using it to produce algal biomass for the generation of protein, oil and peptide feed products for livestock.

For more information:

Systemic project: https://systemicproject.eu/

Nutri2Cycle: https://www.biorefine.eu/projects/nutri2cycle

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ALG-AD: https://www.biorefine.eu/projects/alg-ad

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