Raw materials tested for biochemical methane potential in Billund Biorefinery

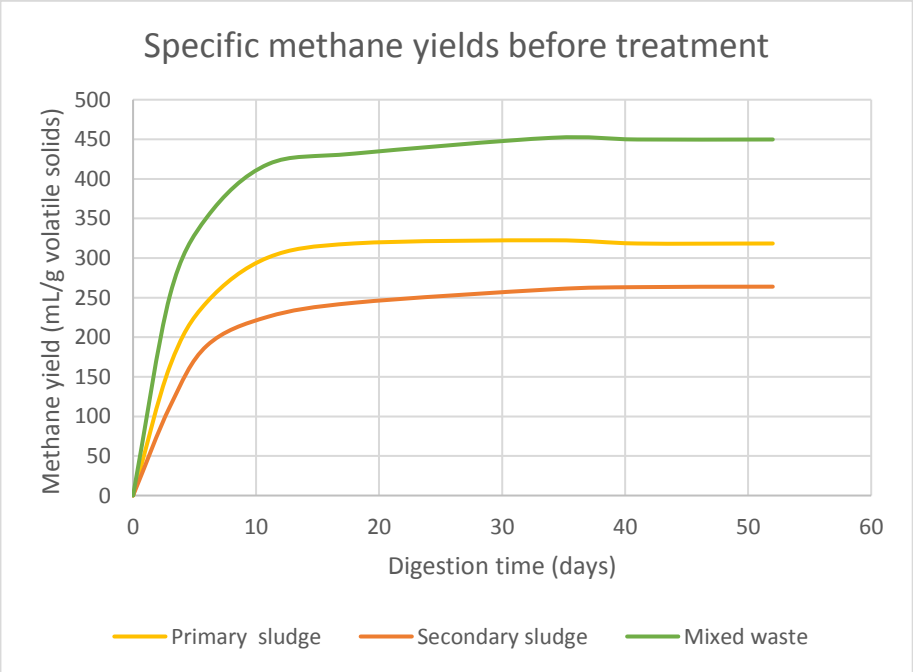
Raw materials used in the Billund Biorefinery have been tested for their biochemical methane potential. The inputs to the process are primary sludge, secondary sludge and food waste. Due to the nature of the plant, it was not possible to collect food waste that had been separated (from non-degradeable materials) and macerated.

Instead, a mix of the two sludges with food waste was tested and the methane potential of this material was calculated by subtraction. The mix was representative of that fed to the primary (thermophilic) biogas reactor at the plant, from where the digested material is treated by the Exelys pressure cooker before adding to a second (mesophilic) biogas reactor.

The three collected substrates have been digested in a laboratory scale continuous flow anaerobic digester to provide similar conditions prior to pressure cooking as that at the full scale plant, but the laboratory scale experiments were carried out individually to gain a better insight into the contribution from each of the three substrates.

Results show that biogas production in the continuous processes were highly variable for the mixed sludge and food waste, with approximate mean values of 1.5 litres of gas per litre of digester volume per day, with maximum values of approximately 2.5 L/L/day. The individual primary and secondary sludges were, as expected, much lower yielding than the mixed substrates, with productivity values of around 0.5 L/L/day with maximum values of 1.2 L/L/day.

The methane potentials of the substrates were tested at two different inoculum to substrate ratios (2:1 and 6:1) to check for any problems with substrate inhibition. Inhibition was not found for any substrate but primary sludge had a large variation between replicates, which was expected to be due to poor homogeneity of the substrates at laboratory scale. The biogas yields were found to be 479 mL/g of volatile solids (VS) for primary sludge, 383 mL/g VS for secondary sludge and 688 mL/g VS for the mixed substrate. Methane yields were found to be 318 mL/g VS for primary sludge, 264 mL/g VS for secondary, and 450 mL/g VS for the mixed waste.



The continuous flow pressure cooker is undergoing optimization of treatment parameters and useful data for post-treated substrates will be available soon.

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