Assessing the effects of intra-granule precipitation in a full-scale industrial anaerobic digester - DTU Orbit (12/08/2019)

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In this paper, a multi-scale model is used to assess the multiple mineral precipitation potential in a full-scale anaerobic granular sludge system. Reactor behaviour is analysed under different operational conditions (addition/no addition of reject water from dewatering of lime-stabilized biomass) and periods of time (short/long term). Model predictions suggest that a higher contribution of reject water promotes the risk of intra-granule CaCO$_3$ formation as a result of the increased quantity of calcium arriving with that stream combined with strong pH gradients within the biofilm. The distribution of these precipitates depends on: (i) reactor height; and (ii) granule size. The study also exposes the potential undesirable effects of the long-term addition of reject water (a decrease in energy recovery of 20% over a 100-day period), caused by loss in biomass activity (due to microbial displacement), and the reduced buffer capacity. This demonstrates how both short-term and long-term operational conditions may affect the formation of precipitates within anaerobic granules, and how it may influence methane production and consequently energy recovery.

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