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Nya Rya/Process

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Proposal for a master thesis

Master Programme Infrastructure and Environmental Engineering 2022-2023

Title: Assessment of biogas potential for aerobic granular sludge and activated sludge at Gryaab

Description

The wastewater treatment plant in Göteborg, operated by Gryaab AB, is planning for an increased treatment capacity by building a new parallel treatment plant. Several process options are assessed to find the most suitable technology. Aerobic granular sludge (AGS) is one of the options. It is a relatively modern type of treatment process where the bacteria form free-floating biofilms. The aerobic granules have excellent settling properties and this enables high concentrations of biomass in the reactor which gives small foot-print. Furthermore, the energy requirement is smaller compared to conventional activated sludge since removal of organic matter, nitrogen and phosphorus takes place in the same reactor as it is always operated as a sequencing batch reactor.

After the biological treatment it is common to anaerobically digest the sludge to produce valuable biogas that can be used for electricity production, fuel for vehicles and heat at the same time as the sludge is hygienised and reduced in mass. At Gryaab, the production of biogas is an important parameter for these reasons. However, limited amount of information is available in the literature regarding biogas potential from AGS. It is also relevant to investigate the influence of primary clarifiers on the overall biogas production of the new treatment plant. At Gryaab a pilot-plant AGS reactor is operated to assess if this process is a suitable alternative for the future treatment plant. This gives an opportunity to measure the biogas production from AGS and compare it to the activated sludge and primary sludge which are available in the existing plant.

The aim of this project is to investigate the biogas potential of biomass from the AGS pilot plant and compare it to activated sludge and primary sludge. Experiments will be performed in a biodegradability assay test equipment available at Gryaab.

Literature suggestions

Physicochemical properties and biogas productivity of aerobic granular sludge and activated sludge. K. Bernat, A. Cydzik-Kwiatkowska, I. Wojnowska-Baryła and M. Karczewska, Biochemical Engineering Journal 2017 Vol. 117 Pages 43-51, DOI: <https://doi.org/10.1016/j.bej.2016.11.002>

Digestibility of waste aerobic granular sludge from a full-scale municipal wastewater treatment system. H. Guo, J. B. van Lier and M. de Kreuk, Water Research 2020 Vol. 173 Pages 115617, DOI: <https://doi.org/10.1016/j.watres.2020.115617>

Special prerequisites

Advanced Wastewater Engineering, Biotechnology, Process Engineering or equivalent.

Specific timeframe

January-May 2023

Supervisors

From Chalmers: Professor Britt-Marie Wilén (britt-marie.wilen@chalmers.se) & Professor Oskar Modin (oskar.modin@chalmers.se).

From Gryaab: Therese Areskoug (therese.areskoug@gryaab.se) & Dag Lorick (dag.lorick@gryaab.se)

Examiner

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Other information

This thesis work can be performed by one or two master students.