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**EXTENDED SOLIDS RETENTION PROCESS WITH SLUDGE RECIRCULATION
 FOR INCREASING BIOGAS PRODUCTION AT ANAEROBIC DIGESTION**

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In 2008 IVL Swedish Environmental Research Institute and KTH Royal Institute of Technology jointly took over the responsibility for the R&D facility for wastewater purification Hammarby Sjöstadswerk. The facility consists of different pilot-scale lines for wastewater and sludge treatment/handling. The facility with the possibilities for tests, demonstration, analyses, etc. is used for education, including degree projects and collaboration with national and/or internationally scientists.

One of the projects that have been initiated at Sjöstadswerket aims at increasing the biogas production by optimized the digestion process. The overall goal is to increase the degree of digestion to over 60% and reducing the hydraulic retention time from 20 days to 10 days. To achieve this an extended solids retention process with an anaerobic mesophilic digestion combined with a sludge recirculation was used. The effluent from the digester was dewatered with a centrifuge and recirculated to maintain a relatively high solid content within the digester.

The results obtained are very promising. The hydraulic retention time was reduced to 10.6 days while the sludge retention time increased to 218 with 78,7 % reduction of VS, organic content in the sludge. However, OLR, organic load rate to the digester, of 0.69 kg VS/(m³·day) was relatively low compared to sludge digestion at Henriksdal wastewater treatment plant with 1.5 kg VS/(m³·day). In order to increase the load external sludge had to be taken from Henriksdal wastewater treatment plant. At increasing the OLR from 2.05 to 3.15 kg VS/(m³·day) measurement of biogas production indicated that biogas yield was enhanced by 73%, with a maximum production of 14.5 m³/day and methane content was merely promoted by 10.5%, to the highest value of 63%. Specific gas production (SGP), was observed to be 0.65 Nm³/kg VS_{in}.

BMP, Biochemical Methane Potential tests of gas potential was made to determine the effect of sludge reprocessing on the activity of the methane bacteria. BMP tests are normally used to measure in batch digestion the anaerobic degradability of a given substrate, which are mixed with an inoculum, source for methane bacteria. In this study digested sludge from Sjöstadswerket (S1) and Henriksdal (H2) was used as inoculum. At BMP tests with an inoculum to substrate ratio of 2:1 based on VS content, S1 and H2 production of CH₄ (in NL, Normal Liters) during the 20 days test period was 0.29 NL/gVS and 0.33 NL/gVS respectively. In a second BMP tests with the same amount of substrate and inoculum for each sample, S1 had a higher methane potential than H2, 0.31 NL/gVS and 0.29 NL/gVS respectively. All BMP tests with Sjöstadswerket inoculum produced a larger volume of total accumulated gas. This imply that methane bacteria grown in the digester at Sjöstadswerket can endure a higher OLR and that the digested sludge has high potential to produce biogas.

http://www.sjostadsverket.se/Start_en.html

<http://www.kth.se/en/abe/inst/lwr/grupper/va-teknik/va-teknik-1.47297>