Continuous anaerobic digestion of swine manure: ADM1-based modelling and effect of addition of swine manure fibers pretreated with aqueous ammonia soaking

Anaerobic digestion of manure fibers presents challenges due to their low biodegradability. Aqueous ammonia soaking (AAS) has been tested as a simple method to disrupt the lignocellulose and increase the methane yield of manure fibers. In the present study, mesophilic anaerobic digestion of AAS pretreated manure fibers was performed in CSTR-type digesters, fed with swine manure and/or a mixture of swine manure and AAS pretreated manure fibers (at a total solids based ratio of 0.52 manure per 0.48 fibers). Two different simulations were performed. In the first place, the Anaerobic Digestion Model 1 (ADM1) was fitted to a manure-fed, CSTR-type digester and validated by simulating the performance of a second reactor digesting manure. It was shown that disintegration and hydrolysis of the solid matter of manure was such a slow process that the organic particulate matter did not significantly contribute to the methane production. In the second place, ADM1 was used to describe biogas production from the codigestion of manure and AAS pretreated manure fibers. The model predictions regarding biogas production and methane content were in good agreement with the experimental data. It was shown that, AAS treatment significantly increased the disintegration and hydrolysis rate of the carbohydrate compounds of the fibers. The effect of the addition of AAS treated fibers on the kinetics of the conversion of other key compounds such as volatile fatty acids was negligible.

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, Aalborg University, Institute of Chemical Engineering Sciences, National Technical University of Athens
Contributors: Jurado, E., Antonopoulou, G., Lyberatos, G., Gavala, H. N., Skiadas, I. V.
Pages: 190-198
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Applied Energy
Volume: 172
ISSN (Print): 0306-2619
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 8.44 SJR 3.162 SNIP 2.765
Web of Science (2017): Impact factor 7.9
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.78 SJR 3.011 SNIP 2.61
Web of Science (2016): Impact factor 7.182
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 6.4 SJR 2.835 SNIP 2.593
Web of Science (2015): Impact factor 5.746
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 6.93 SJR 3.158 SNIP 3.218
Web of Science (2014): Impact factor 5.613
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 6.59 SJR 3.06 SNIP 3.346
Web of Science (2013): Impact factor 5.261
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 5.69 SJR 2.778 SNIP 3.076
Web of Science (2012): Impact factor 4.781