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Yuan Zhang[a], Guangren Yu[a], Liang Yu[b], Muhammad Abdul Hanan Siddhu[a], Mengjiao Gao[a], Ahmed A. Abdeltawab[c], Salem S. Al-Deyab[c], Xiaochun Chen[a,*]

[a] College of Chemical Engineering, Beijing University of Chemical Technology, Beijing 100029, PR China

[b] Department of Biological Systems Engineering, Washington State University, Pullman, WA 99164, USA

[c] Petrochemicals Research Chair, College of Science, King Saud University, Riyadh 11451, Saudi Arabia

* Corresponding author. Tel: +86 10 64433570; Fax: +86 10 64433570.

E-mail address: chenxc@mail.buct.edu.cn.

Abstract

Computational fluid dynamics (CFD) was applied to investigate mixing mode and power consumption in anaerobic mono- and co-digestion. Cattle manure (CM) and corn stover (CS) were used as feedstock and stirred tank reactor (STR) was used as digester. Power numbers obtained by the CFD simulation were compared with those from the experimental correlation. Results showed that the standard k-ε model was more appropriate than other turbulence models. A new index, net power production instead of gas production, was proposed to optimize feedstock ratio for anaerobic co-digestion. Results showed that flow field and power consumption were significantly changed in co-digestion of CM and CS compared with those in mono-digestion of either CM or CS. For different mixing modes, the optimum feedstock ratio for co-digestion changed with net power production. The best option of CM/CS ratio for continuous mixing, intermittent mixing I, and intermittent mixing II were 1:1, 1:1 and 1:3, respectively.

Keywords: computational fluid dynamics (CFD), anaerobic co-digestion, net power production,