

Abstract

Title of Document : Optimization of performance of Biphasic Anaerobic Digestion System by Model Predictive Control

Written By : Saikat Sen
Chemical Engineering, 2018

Supervised By : Dr Babji Srinivasan
Dr Vanita Prasad

Anaerobic Digestion is a renowned technology of waste reduction and energy production that is being practised from the past few decades. In efforts to improve the energy output and effective waste stabilisation the idea of biphasic anaerobic digestion is put forward which facilitates retention of biomass in digesters producing bio-H and biogas rich in methane. This system was modelled in a mathematical framework by using Siegrist model and its agreement with the process inside the digestion system was successfully observed by simulations. Due to the complex non-linear nature of AD process and the limitations of conventional controllers, advanced control method of model based predictive control was implemented with state estimation by EKF for three different sampling times of 15 mins, 1 hr and 4 hrs. MPC was able to optimise methane output of the biphasic system in terms of mole fraction and was found to gradually tend to maxima values for all three sampling times with proper adjustments of acid and alkali flowrates to maintain pH of the system.