

Comparison of accelerated anaerobic granulation obtained with a bench-scale rotating bioreactor vs. a stationary container for three different substrates

ER Els* and K Keet

Department of Process Engineering, University of Stellenbosch, Private Bag X1, Matieland, Stellenbosch 7602, South Africa

Abstract

Anaerobic digestion is a very efficient technology for the treatment of wastewater from the food industries. The upflow sludge blanket reactor (UASB) is used to convert carbon in waste streams to CO_2 and CH_4 . The risk of a shortage of anaerobic granules in a situation that requires a replacement granule charge for the UASB is a barrier to implementation of anaerobic technology in countries without UASB reactors, producing a surplus of granules to provide for an adequate inventory of granules. Accelerated granulation provides a means to reduce this risk. Peach cannery effluent (PCE), sucrose and lactate were tested as possible substrates for accelerated granulation inducement for un-granulated sewage sludge. Six experimental runs of 20 d each were done to explore granule growth. Each substrate was seeded with sewage sludge in a 5.4 l bioreactor rotating at 2 r/min, as well as in a stationary container. A rapid drop in pH occurred during the first few days of every run. A lower overall pH in the bioreactor indicates a higher bacterial activity relative to the stationary container. The big drop in pH initially with PCE and sucrose inhibited methanogenic activity and granule growth for these substrates.

The settleability of the final effluent from the reactor is superior to that of the stationary container. The total suspended solids analysis showed that the reactor produced a marked increase in the larger particulate sizes, indicating the positive contribution of the rolling action towards growth of granules.

Keywords: anaerobic digestion, granulation, wastewater, accelerated granulation