Regulation and optimization of the biogas process: Propionate as a key parameter

The use of volatile fatty acids (VFA) as process indicators in biogas reactors treating manure together with industrial waste was studied. At a full-scale biogas plant, an online VFA sensor was installed in order to study VFA dynamics during stable and unstable operation. During stable operation acetate increased significantly during the feeding periods from a level of 2-4 to 12-17 mM, but the concentration generally dropped to about the same level as before feeding. The fluctuations in the propionate were more moderate than for acetate but the average level rose during 1 week of operation from 0.6 to 2.9 mM. A process disturbance caused by overloading with industrial waste was reflected by a significant increase in all VFA concentrations. During the recovery of the process, the return of propionate back to the steady-state level was 2-3 days slower than any other VFA and propionate could best describe the normalizing of the process. In a lab-scale continuously stirred tank reactor experiment, with manure as main substrate, the prospective of using either propionate concentration or methane production as single process indicators was studied. Propionate was found to be the best indicator. Thus, a process breakdown caused by organic overloading with meat and bone meal and lipids was indicated by changes in propionate concentration 12-18 days before a decrease in methane production was observed. Furthermore, a more efficient and stable utilization of the substrate was observed when propionate was used as process indicator.

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