Anaerobic treatment of wastewater with high fats content at various loading rates

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Key words: Anaerobic digestion, Volatile fatty acids (VFAs), Long chain fatty acids (LCFAs), Inhibition

Abstract: High fats content wastewater was treated by mesophilic batch anaerobic digester at different COD loading rates. Under anaerobic conditions, neutral fats are hydrolyzed first to long chain fatty acid (LCFA), and then are degraded to easily degradable and soluble volatile fatty acids (VFAs) via β-oxidation. VFAs are then converted to methane through acetogensis and acidogenesis, followed by methanogenesis. We performed batch experiments with three different loadings of a high fat content wastewater, varied by changing the wastewater to inoculum ratio. Results showed that different loading rates yielded similar volumetric methane production by the end of batch experiments (above 65% methane by volume). High loading rates led to higher COD removal efficiencies, yet caused extensive lag periods in methane production from VFAs. Sharp increases in both methane production and COD removal were correlated with the consumption of individual VFAs, that occurred at later stages for high loadings. Accumulated LCFAs likely hindered the production of acetate from other VFAs. Disappearances of acetate, butyrate and propionate at different time points in relation to different loading rates observed in this study points to an inhibition in VFA conversion by LCFAs.