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Enhancement of sludge reduction by ultrasonic pretreatment and packing carriers in the anaerobic side-stream reactor: performance, sludge characteristics and microbial community structure

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Abstract: Effects of ultrasonic pretreatment and packing carriers on sludge reduction, settleability, dewaterability and microbial community structure in the anaerobic side-stream reactor (ASSR) were investigated with three anaerobic reactors operated in parallel. Ultrasouction from 3.65% in the ASSR to 5.08%, and packing carriers further enhanced the efficiency to 19.2%. Ultrasonic pretreatment of sludge decreased oxidation-reduction potential in ASSR and enhanced the release of intracellular substances. The deterioration of sludge settleability and dewaterability in the ASSR after ultrasonic pretreatment was improved by packing carriers. *Illumina-MiSeq* sequencing showed that microbial richness and diversity increased after ultrasonic pretreatment and packing carriers in the ASSR. Packing carriers favored the growth of slow grower (*Dechloromonas*), fermentative bacteria (*Draconibacteriaceae*, *Fusibacter*, *Acidaminobacter*) and floc-forming bacteria (*Zoogloea*), while hydrolytic and predatory bacteria (*Saprospiraceae_unculture*) and slow grower (*Thauera*) was enriched in the

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