The aspect of biofilm formation during start-up period of anaerobic hybrid reactor: feeding velocity

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One of the limitation factors of anaerobic hybrid reactor (AHR) is slow growth rate of anaerobic bacteria on supporting media, hence resulting in long period of start-up. Therefore, this research aims to elucidate the aspect of biofilm forming on supporting media in order to accelerate biofilm in start-up period.

Different upflow feeding velocities, 0.007 m/h and 1.0 m/h, with and without substrate supplement were selected to study its influence on microbial attachment in packed bed zone using nylon fiber as supporting media. When the upflow velocity of feeding at 0.007 and 1 m/h were operated without substrate, rate of microbial attachment on supporting media in two reactors were 9.48 and 22.1 mg VSS/m²/h, respectively (P-value=0.0000232). The higher velocity resulted in considerably higher in bulk concentration of biomass near the surface of supporting media (P-value=0.00000214). It was shown that upflow velocity greatly affects microbial transportation from suspended bed zone to packed bed zone that resulting in the enhancement of microbial attachment. When supplemented with media, rate of biomass attachments were 35.53 and 360 mg VSS/m²/h at feeding velocity of 0.007 and 1.0 m/h, respectively (P-value=0.001831). It is noticed from the overall results that the aspect of biofilm development at low feeding velocity was only attachment from suspended bed to packed bed zones and no growth on biofilm due to no substrate was available. While, the development of biofilm at high flow feeding was occurred via microbial attachment and growth. The results suggested that high feeding velocity with substrate would enhance the biofilm formation during the start up period of AHR.