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CONTINUOUS FERMENTATIVE HYDROGEN PRODUCTION IN DIFFERENT PROCESS CONDITIONS

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ABSTRACT Hydrogen is a clean energy carrier which has a great potential as an alternative fuel. To produce hydrogen by fermentation of biomass, a continuous process using a non-sterile substrate with a readily available mixed microflora is desirable. This work investigates a continuous procedure at pH 5.2 and 37°C, using heat treated digested sewage sludge of a wastewater treatment plant, and continuous hydrogen production from waste sugar in different stirring speeds and Hydraulic retention times (HRT). For continuous biohydrogen production the experimental setup of three 5.5-L-working volume continuously stirred tank reactors (CSTR) in different stirring speed (240, 135, 80 rpm) were constructed. At the optimum operation condition seven HRTs and different organic loading rates (OLR) of 3-11 kg DOC/m³.d (Dissolved Organic Carbon) was examined. The results indicated that the stirring speed of 135 rpm had a beneficial effect on H₂ fermentation. The best performance was obtained in 135 rpm and 8 h of HRT. The gas amount varied with different OLRs, but could be stabilized on a high level as well as the hydrogen concentration in the gas with 62-64%. No methane was detected in the HRTs less than 16 h. The most stable result achieved with reactor at 135 rpm. In addition the highest specific rate of hydrogen production was reached at with 2.13 LH₂/Lmedia.d.

Keywords: Biohydrogen, Dark fermentation, Stirring, Hydraulic retention time, CSTR.