THE INFLUENCE OF HYDRODINAMIC (OFF-BOTTOM CLEARANCE) FACTOR ON THE FERMENTATIVE HYDROGEN PRODUCTION IN STIRRED TANK REACTOR

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Abstract

Hydrogen is an ideal energy source that is environmentally friendly. Hydrogen can be produced from renewable materials and produce a higher energy compared to hydrocarbon fuels. During this time, hydrogen production process by fermentation (bio-hydrogen) more review from chemical and biological factors, and physical factors such as hydrodynamic factors are rarely studied. Hydrodynamic factor is one of the important factor affecting the bio-hydrogen production processes involving multiphase system. Therefore, this research aims to study the influence of hydrodynamic factor that is off-bottom clearance (position of the impeller from the bottom of the tank) influence to the hydrogen production process by fermentation. Off-bottom clearance is one of the important hydrodynamic factor because it can affect the flow pattern and then can affect the distribution of microbes in the media and mass transfer of hydrogen gas from liquid phase to the gas phase. Glucose is used as substrate that will be fermented by EnterobacteraerogenesADH-43 bacteria. The reactor will be used is a stirred tank equipped with a single impeller type 6-blade 45° pitched blade turbine which can be set to the position of the impeller from the bottom of the tank at constant rotation speed of 200 rpm. The off-bottom clearance was varied 0,2H, 0,33H, 0,5H and 0,75H. The analysis of glucose and analyses of bacteria by using a spectrophotometer UV-Vis, and the analysis of hydrogen gas by using a hydrogen analyzer. The result showed that off-bottom clearance affect the release of hydrogen gas from the substrate, with the best configuration is 0,75H and the yield was 0,5821 mol hydrogen/mol glucose converted.

Keywords: hydrodynamics, Enterobacteraerogenes, pitched blade turbine, off-bottom clearance, impeller configuration.