

Supanun Junpra-ob 2554: Improving of Biogas Quality by Hydrogen and Methane Production from Dairy Waste. Master of Science (Microbiology), Major Field: Microbiology, Department of Microbiology. Thesis Advisor: Mr. Pramote Sirirote, D.Agr.Sci. 118 pages.

The objective of this research is to improve the biogas quality by increasing hydrogen production in the first phase of biogas fermentation from dairy waste (invalid milk) from two-stage anaerobic condition (acid phase and methane phase). The preliminary experiment of hydrogen production by *Clostridium* sp. was found a problem of high amount of protein curd was accumulated until full of fermenter volume. So, the protein was must separated out by mixing with $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ 1 % in 95 °C for 15 minute and then the remained supernatant was used as raw material for hydrogen production. Hydrogen production was examined using immobilized cells and free cells of *Clostridium acetobutylicum* TISTR 1462. By immobilized cells system, a maximum hydrogen production was 3.81 mol H_2 /mol of lactose/day from using 145 ml of whey and 35 ml of immobilized cells. In the case of free cells system, a maximum hydrogen production was 4.67 mol H_2 /mol lactose/day from using 230 ml of whey and 10 percent by volume of inoculums. It's shown that free cells system produce hydrogen gas higher than immobilized cells system under the same incubation period. In the methane phase, effluent from the first phase of immobilized cells system was utilized to produce methane (because of the problem from cells separation of free cells system). The methane stage was operated in semi-continuous fermenter under a hydraulic retention time of 67 days which was a optimum time. It produced 1032.48 CH_4 /day and removed 87.64 % of total COD from the influent.

Student's signature

Thesis Advisor's signature