

Yuwadee Sangsil 2014: Biomethane Production from Napier Grass by Two-stage Anaerobic Digestion. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Assistant Professor Suchat Leungprasert, Ph.D. 132 pages.

Digestion of napier grass at the cutting interval of 30, 45, 60 and 90 days was investigated in two-stage (acidogenic and methanogenic) anaerobic reactors. Five sets of reactors were constructed with plastic bottles. The reactor working volume was 4 and 5 litres for acidogenic and methanogenic reactor, respectively. Acidogenic reactors were fed once daily at a feed rate of 100, 150, 200, 250, and 300 ml/day with a slurry of 1:5 napier grass : water. Hydraulic retention times (HRT) were 40, 26.7, 20, 16, and 13.3 days respectively for acidogenic and 50, 33.3, 25, 20 and 16.7 days for methanogenic reactor stage. Mixed ruminal microorganisms of approximately 10 g mixed liquor volatile suspended solid/litre were used as inoculum. The reactors were operated at ambient temperature of 30 ± 1 °C. pH was adjusted to be 7.5 for all methanogenic reactors at the start-up period. The reactors functioned without pH control.

For napier grass at the cutting interval of 30 days, the maximum methane yield (CH_4 yield) was observed at an organic loading rate (OLR) of $0.97 \text{ kg COD/m}^3 \cdot \text{day}$ (HRTs 20 and 25 days for acidic and methanogenic stage). COD and TVS degradation efficiency was 69% and 71%, respectively. The average pH in the acidogenic and methanogenic reactors was 5.15 and 6.70, respectively. The CH_4 yield was 160 L at STP/kg of dry napier grass added to the reactor, which indicated that 6.25 kg of dry napier grass is needed to produce 1 m^3 of pure CH_4 . For napier grass at the cutting interval of 45, 60 and 90 days, the CH_4 yield was observed at 127, 104 and 74 L at STP/kg of dry napier grass added to the reactor, respectively (HRTs 20 and 25 days for acidic and methanogenic stage). Although the napier grass at the higher cutting interval gave lower CH_4 yield than that of the lower age, but when considering mass of napier grass annually obtained per area of cultivation, the napier grass at the cutting interval of 60 days gave the highest CH_4 yield per area and showed at $6500 \text{ m}^3/\text{hectare}/\text{year}$ (1040

Student's signature

Thesis Advisor's signature