

Thesis Production of Biogas by a Two-phase Anaerobic Digestion From
Pineapple Wastes

Name Chattrachai Intatha.

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Development)

Thesis Supervisory Committee

Usanee	Uyasatian, M.Eng.
Raywadee	Roachanakanan, M.Sc.
Rungjarat	Hutacharoen, M.Sc.
Morakot	Tanticharoen, Ph.D.

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ABSTRACT

The study was done to see the possibility of biogas production from pineapple wastes. It was divided into two parts. The first part was the study on the effect of incubation time at 1 and 2 days on the difference of organic acid produced. The second part was the study of the optimal conditions of methanogenic phase of pineapple wastewater which performed at the high organic loading rate, short retention time and gave maximum methane production per gram of COD reduction.

The first phase, organic acid could be produced from crushed pineapple wastes in the mixed liquid (acidogenic seed + effluent from settling tank) within the open tank and filtered before feeding into the methane reactor. Volumetrically fermentation in acidogenic phase depended on organic loading rate and HRT of methane reactor (in the second part). The second phase consisted of methane reactor and settling tank. Working volume of methane reactor was 100 litres. There were a stirring step in methane reactor and sludge recycled from the settling tank.

From the result in acidogenic phase, the chemical characteristics of acidogenic effluent at 1 and 2 days of incubation time indicated that the acidogenic phase effluent at 1 day of incubation time had digestive efficiency lower than the acidogenic phase effluent at 2

days of incubation time. From consideration of the ratio of the pineapple wastes and the fermented liquid, it was found that the acidogenic phase effluent at 2 days of incubation time which half ratio of pineapple wastes and fermented liquid of the acidogenic phase effluent at 1 day of incubation time could produce nearly the same concentration of VFA and COD. So it could be concluded that at the incubation time of 2 days could digest and give the VFA and COD better than the the acidogenic phase effluent at 1 day of incubation time because it had longer time to digest.

From the performance of methanogenic phase in the experimental series with incubation time of 1 day, loading rate to methane reactors were gradually increased carefully from 0.60 kgVFA/m³-d(1.94 kgCOD/m³-d) with HRT of 8 days to maximum organic loading at 2.10 kgVFA/m³-d (6.37 kgCOD/m³-d) with HRT of 2 days. VFA reduction was in the range of 85%-97% and COD reduction was in the range of 86%-98%. The percentage of methane component was in the range of 54%-77%. Finally the systems was overloaded at 2.60 kgVFA/m³-d or 7.33 kgCOD/m³-d with HRT of 2 days.

From the performance of methanogenic phase in the experimental series with incubation time of 2 days, loading rate to methane reactors were gradually increased carefully from 0.58 kgVFA/m³-d(2.04 kgCOD/m³-d) with HRT of 8 days to maximum organic loading at 2.15 kgVFA/m³-d (6.41 kgCOD/m³-d) with HRT of 2 days. VFA reduction was in the range of 84%-97% and COD reduction was in the range of 82%-98%. The percentage of methane component was in the range of 56%-74%. Finally the systems was overloaded at 2.60 kgVFA/m³-d or 7.42 kgCOD/m³-d with HRT of 2 days.

In the experimental series with incubation time of 1 day, the methane reactor gave the optimum methane yield of 0.36 lCH₄/gCOD reduced at the organic loading rate 2.37 kgVFA/m³-d or 6.18 kgCOD/m³-d with HRT of 3 days.

In the experimental series with incubation time of 2 days, the methane reactor gave the optimum methane yield of 0.37 lCH₄/gCOD reduced at the organic loading rate 2.19 kgVFA/m³-d or 6.05 kgCOD/m³-d with HRT of 3 days.