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| Thesis Title   | Effect of Temperature and Pretreatment on Biogas Production<br>Efficiency of Decanted Cake from Palm Oil Mill Industry |
| Thesis Credit  | 12                                                                                                                     |
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| Program        | Master of Engineering                                                                                                  |
| Field of Study | Environmental Engineering                                                                                              |
| Department     | Environmental Engineering                                                                                              |
| Faculty        | Engineering                                                                                                            |
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### Abstract

The objective of this research was to study the effect of pretreatment and temperature on biogas production efficiency of the decanted cake from palm oil mill industry by using lab-scale anaerobic sequencing batch reactors operated under mesophilic ( $30 \pm 1^\circ\text{C}$ ) and thermophilic ( $55^\circ\text{C}$ ) conditions. For each condition, two types of waste were used, i.e., raw decanted cake (R1 30 and R3 55) and decanted cake with pretreatment with heat at  $90^\circ\text{C}$  for 2 hours and submerged in 0.1 N sodium hydroxide for 2 days (R2 30\_P and R4 55\_P). Two-liter erlenmeyer flasks were used as the reactors with the hydraulic retention time of 10 days and the organic loading rate of  $0.5\text{--}4.0 \text{ kgCOD/m}^3/\text{day}$ . Specific methane activities of the initial seed sludge were 0.108 and 0.104 gCOD/gVSS/day at 30 and  $55^\circ\text{C}$ , respectively. After 184 days of the experiment, this activity increased to 0.159 and 0.206 gCOD/gVSS/day for the R1 30 and R2 30\_P at  $30^\circ\text{C}$  and 0.210 and 0.213 gCOD/gVSS/day for the R3 55 and R4 55\_P at  $55^\circ\text{C}$ , respectively. All four scenarios provided higher than 90% removal efficiency for COD. At the organic loading of  $4.0 \text{ kgCOD/m}^3/\text{day}$ , the methane production yield reached 0.529, 0.737, 0.794 and  $0.968 \text{ LCH}_4/\text{L}/\text{day}$  and the methane composition in the biogas were 61, 70, 64 and 73% for R1 30, R2 30\_P, R3 55 and R4 55\_P, respectively. In addition, the methane production efficiency at  $55^\circ\text{C}$  was higher than at  $30^\circ\text{C}$ , i.e., the R3 55 and R4 55\_P were 51 and 62%, respectively, as compared to R1 30 and R2 30\_P of 34 and 47%, respectively. It was also found that the methane production efficiency of R2 30\_P and R4 55\_P were higher than R1 30 and

R3 55, respectively. This indicated that temperature and pretreatment could enhance the methane production efficiency.

**Keywords :** Pretreatment/ Decanted Cake/ Mesophilic/ Thermophilic/ AnSBR/  
Palm Oil Mill Industry