CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The objective of this work was to study the impacts of nickel and zinc on degradation of organic waste during acidogenic phases and methanogenic phase in landfill. Based on the results of this research study, the following conclusion may be drawn:

1. Both acid formation and methane fermentation phases of stabilization were established in the three simulated landfill reactors. This was confirmed by the indicator parameters examined, and included conversion or washout of initially high leachate COD, with low pH, to greatly reduced concentrations at the end of work.

2. Impact of nickel and zinc on landfill stabilization process as indicated by leachate and gas production parameters, especially ORP, COD, daily gas production, and methane gas production, was noticed. After addition of nickel and zinc during acidogenic phase and methanogenic phase in recycle reactors, ORP values became immediately less negative after day that heavy metals were added. Moreover, anaerobic environment in this system had to use long time to adapt oneself to circumstance, especially in acidogenic reactor. The significant decreases in daily gas production rate, methane gas production, and leachate COD concentration were observed after the addition of nickel and zinc to confirm the retardation of biological activity in the presence of heavy metals.

3. Impact of nickel and zinc were greater on degradation process when addition was done during acidogenic than during methanogenic phase as indicated by leachate and gas production parameters.

4. Nickel and zinc added during acidogenic phase could be stayed in liquid phase for longer time and remained more toxic to microbial community in the reactor than heavy metals added during methanogenic phase.

5. Heavy metals have extremely potential toxicity in acidogenic phase. Co-disposal, therefore, should be avoided in this phase.

6. Leachate recirculation management strategy offers opportunities for more rapid waste stabilization, provides more favorable environmental conditions for microbiological growth and proliferation, including attenuation of co-disposed heavy metals.

7. The utilization of pH adjustment and sludge seeding was effective in establishing a viable methane forming population with a concomitant production of additional intermediates and their collective conversion to CH_4 and CO_2.

Recommendation for future work

1. In real site, there are a large number of various heavy metals in landfill. Consequently, determining other heavy metals impact on landfill stabilization is crucial.

2. The leachate recirculation management strategy may be employed in modern landfills in Thailand by making the necessary modifications in the existing landfills, and taking the necessary safety precautions. The data obtained from this study are results of lab-scale laboratory work with constant operational conditions. To confirm the results obtained, a full-scale study is recommended.

3. Since the work reported here did not attempt to investigate the underlying mechanisms, the possible explanations given are conjecture. There could be

complicated mechanisms for attenuation of heavy metals; therefore, future studies are needed to investigate to the relationships among pathway and removal mechanisms.