CHAPTER 5

CONCLUSIONS

5.1 GENERAL

The rapid growth of population combined with higher standard of living, increased industrial and commercial activities which in turn has caused enormous increase in the quantity and composition of solid wastes that present a vast disposal problem. A large quantity of wastes is dumped in an uncontrolled manner or burned in open air. This has adverse impacts not only on the ecosystem but also on the human environment. Because of their potential to cause environmental contamination, the impact of disposing of such wastes may be considered. Insight into the pollution potential of solid waste disposal on land forms an important background for the waste management practices.

The present work was taken up to study the problems of open dumping of MSW at Vellalore site of Coimbatore city. The study also suggests a sustainable solution for the solid waste problem by converting the biodegradable portion of the solid waste to biogas by subjecting to biomethanation process. A simulation software HYDRUS-1D was used to study the changes in soil quality beneath the solid waste in terms of Electrical Conductivity in the soil profile over time which can be used for future assessment of the disposal site in identifying the contamination zone and leachate migration.
5.2 CONCLUSIONS FROM THE PRESENT STUDY

The following are the salient conclusions drawn from the present study.

1. Composition data of MSW showed that biodegradable portion constitutes to about 68.95% with volatile solids concentration of 72%. Hence, bio-methanation of MSW is a viable technique for converting waste to energy.

2. Results of composition analysis also indicate that MSW has high moisture content with relatively low energy content which makes incineration process ineffective in managing solid waste.

3. Leachate characteristic study showed high concentrations of TOC, total solids, volatile solids, chlorides, sulphates, COD and BOD for leachate from fresh MSW as it contains organic compounds that are readily amenable to biodegradation giving rise to increased concentration of the pollutants.

4. During second sampling, the concentration of characterizing parameters of MSW leachate decreased because of stabilization of organic matter but the waste is in the acidogenic phase as BOD/COD ratio lies between 0.5-0.7.

5. Among the parameters analysed to characterize the quality of leachate, chlorides and sulphates showed increased concentration during second sampling. High concentrations of the above two parameters are caused due to infiltration of water dissolving large concentrations of these ions from the...
refuse. This is again because of higher solubility nature of these ions.

6. Soil quality study of Vellalore site showed that soil texture has been altered up to a depth of 60 cm and soil colour has also been changed up to the same depth due to the deposition of leached constituents from the refuse by the percolating water.

7. Physico-chemical characteristic study of soil shows that soluble salts from the refuse are carried by the infiltrating water and deposited at different depths which increase the pH of soil, salinity and CEC values of soil layers to a great extent. The increase in the above parameters is due to the accumulation of soluble salts and organic matter content of the refuse in the soil.

8. Chemical characteristics of soil revealed that the soil under the refuse is enriched with organic carbon, total nitrogen, trace elements and heavy metals such as cadmium. The concentrations were found to be high at the top layer of the soil and were comparatively lower at the bottom layers.

9. Ground water quality analysis results indicate that almost all the chemical parameters except sulphate and biological parameter such as Total Coliforms exceeded the drinking water quality standards prescribed by both BIS and WHO during monsoon and non monsoon seasons of the study period.

10. The concentrations of water quality parameters were found to be considerably higher in the ground water samples in monsoon season compared to non monsoon season due to
significant movement of leachate constituents by the infiltrating water.

11. The ground water samples are characterized as not suitable for drinking purposes and the water quality analyses serve as an indication of migration of refuse contaminants away from the site.

12. Air quality measurements at the sampled locations indicate that the concentrations of particulate and gaseous pollutants were well within the air quality standards and hence no adverse environmental effects are expected at the present state.

13. Anaerobic digestion of MSW with high solids concentration showed decrease in the value of bioconversion parameters with increase in digestion period. The HSAD process at steady state removed 56.7% of the feed COD and approximately 45% of initial volatile solids. Under the experimental conditions, the biogas yield was observed to be 3.2 litres in 120 days.

14. The results of numerical model indicate that the concentration of EC increased over time for all layers and decreased down the soil profile. Fluctuations in the value of EC were observed during precipitation due to leaching of salts only at small depths from the top surface.

15. Concentration of EC predicted was found to be close to the observed value. Hence, the software HYDRUS-1D can be used for mass transport in subsoil to predict the leachate contaminant in the disposal site.
5.3 RECOMMENDATIONS FOR FURTHER STUDY

1. In the present study, ambient air quality monitoring was carried out only for a short period. Further study can be done by monitoring the quality of air for long term and at different seasons. The study can also be done for the presence of greenhouse gases in ambient air.

2. High solids anaerobic digestion process was carried out at a fixed total solids concentration. Future studies can be done by varying the total solids content to find the optimum TS for dry process.

3. The present study of HSAD was carried out without the aid of mixing device in the reactor. To provide maximum contact of micro-organisms with the substrate, the reactor contents may be mixed thoroughly by providing mixing units inside the reactor. Such improvements may be taken up in the future studies.

4. Numerical modeling in the present study used only a single solute as the leachate contaminant. The same model can be applied for multiple solutes at a time to study the concentration of number of leachate contaminants in the subsoil.