CHAPTER -9

CONCLUSION

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The present study provides information regarding fruitful utilization of kitchen waste adopting anaerobic digestion both continuous and semi–batch process for the production of biogas, which has great potential of energy and also about useful byproducts, obtained from the process of biomethanation.

It has been observed that the huge quantity of house hold refuses have enormous energy potential which may be used for cooking and heating purposes. The same is true for market waste also. Thus by recycling these waste, pollution hazards will be minimized and eco-friendly environment will be obtained.

For a very efficient biomethanation process parameters like pH, temperature, particle size, concentration ratio, etc, needs to be monitored and controlled.

During experiment, it has been observed that at the beginning of the digestion period, the pH value decreased to 2.90 and 3.15 for mixed kitchen waste (cooked) and food waste respectively as shown in the fig.no.8 (a) and fig. no. 8 (b) but after a few days pH value attains near neutral value of 7.

The study shows that continuous digestion process has many advantages giving better performance at lower temperature, which gives rise to more yield of methane at lower digestion temperature as compared to that for semi-batch process. It is observed that lower concentration of slurry and lower particle size enhances the biomethanation reaction. Moreover, vegetable wastes having low lignin content are easily biodegradable leading to higher net gas yield.

This study showed that two stage process provide biological stability by keeping the acidogenesis and methanogenesis phase separately and thus allowing higher organic loading rate without shock to

methanogenic bacteria. Two- stage digestion system would be right for developing countries like India as it is easy to operate and also facilitates better maintenance as compared to multi -stage digestion system.

It has been further observed that maximum yield of methane in continuous process is more as compared to semi-batch process. For optimum gas yield, loading rate, retention time, C/N ratio, toxicity and agitation of slurry inside the digester needs to be controlled.

Proper design of system for scum breaking, auto control of pH and maintaining solid –liquid ratio are very essential to obtain biogas continuously. The quality of biogas can be improved by removal of carbon dioxide, hydrogen sulfide, water vapour following various methods and the same can be used as auto fuel also.

As the digester is the heart of the biogas generation system proper emphasis on the design of the digester is of paramount importance and deserves due consideration so that optimum gas yield is ensured. It also reveals that gas yield mostly is dependent on the type of biomass rather than processes.

The digester has been designed in such a way that the slurry can be stirred periodically with the help of a motorized stirrer fitted from the top of the lid and the flap fitted with the shaft can helps for scum breaking. The digester is also jacked for circulation of hot water for temperature control.

Design of digester model for continuous digestion and semi-batch digestion process as proposed would produce useful guide for the production of biogas using kitchen waste as feed material.

Further more, attempt has been made to design suitable bioreactors, gasholder, machinery for the preparation of feedstock, separation of water and suspended solids.

Another factor that strongly favours energy recovery from waste is the Kyoto protocol and CDM, as waste processing via this rout is also a means of reducing green house gas and thus helps in reducing global warming.

Women particularly in developing countries like ours will be highly benefited by using biogas for cooking since the working condition in kitchen will be improved. They will face less drudgery in collection of firewood and also cooking in an unhygienic condition, as with the use of biogas- a smoke free environment will be ensured.

The solid left over after biomethanation is rich in nitrogen and also contains some amount of nitrogen(N), phosphorous(P) and potassium(K) making the material a very useful fertilizer for agricultural operation. .

The waste water (used for cleaning and washing the vegetables, fruits, cereals and pulses in the kitchen) containing organic substances should also be recycled back to the mixing tank for further processing. During the digestion process most of the pathogens in the manure are killed due to operational temperature and long retention period, which helps in maintaining hygienic condition.

The best practicable environmental option is to treat the kitchen waste via biomethanation route. It is clear that the most practicable option is to use the kitchen waste as feedstock for methanogenesis, so that benefits are additional energy, which goes to boost economic development and also preserve the environment. This in fact is a triple benefit scheme i.e., a booster for " Energy, Environment and Economy".

This indicates that the technology transfer is not complete and that it requires coordinated efforts of scientists, and engineers to overcome these limitations in order to translate this "high potential technology into a common place technology" or rather a household technology to enable common men to benefit from this technology. Then only sustainability will be ensured.

Large scale plant and equipment design to handle huge quantity of waste like municipal solid waste, market waste and also sewage should attract the attention of future researcher to enable the society to treat these waste for all round social benefits i.e., preservation of environment and boosting the economy.