

Abstract

The growing demand for cooking fuel and constant rise in the price of LPG along with insufficient supply to the consumers has become a major concern specially in a country like India. In case of residential institute, the requirement of LPG has grown to a significantly high level. In this context biogas can be a better supplement to the LPG. In India, small size biogas plants are mostly used in domestic sectors with mixed degree of success. However, the application of community size biogas plant is very limited. The feasibility of converting kitchen waste into useful cooking gas (biogas) using anaerobic digester has been found successful in a Hostel located at Tezpur University. In this work, a feasibility study of a community size (50 cubic metres) biogas plant installed in a student Hostel in Tezpur University has been made.

First the existing energy use pattern for cooking in hostels of Tezpur University has been investigated. It is observed that per capita LPG consumption varies amongst the hostels between 4.96 MJ/day/capita to 3.03 MJ/day/capita. It indicates the prospect of energy conservation practices in majority of the hostels. Also the demand of LPG is expected to increase in future due to increase in student population. Therefore the need of a feasible source of renewable energy is justified.

Biogas from food waste has been identified as a proven renewable energy technology. However it is expected that there are certain factors which pose as barrier. In the second phase of the study, all aspects of commissioning of 50 cum Biomethanation plant have been minutely studied. It is found that though a technology available at a remote location (Kanyakumari, Tamil Nadu), could be considered for this region (Assam) overcoming certain managerial issues. Promotion of local party would help to take care of these issues.

The performance of the 50 cum Biomethanation plant was thoroughly examined from the initial phase of operation (22 January, 2014 to 9 May, 2014). pH of reaction has been identified as a critical parameter for successful operation of the plant. The plant uses the food waste available in the hostels. The pH of the feedstock might vary and therefore should be critically monitored for better performance of Biomethanation plant. The experimental results indicate a pH range between 6.0 to 7.5 has optimum yielding upto 0.5 m³ of gas production per kg of total solid. The composition of the gas was also analyzed randomly during operation of this plant and found to confirm existing standard.

Finally the economic viability of the project (Installation of the 50 cum Biomethanation plant) was also assessed for the hostel under consideration having about 400 boarders. This 50 cum plant could result a saving of Rs 148920 during the first year of operation due to substitution of LPG by biomethane obtained from the Biomethanation plant. The prevailing rates are

considered for this economic analysis. While analyzing the economics for 20 years of operation, 7 years was found as a payback period of the project. Overall the conversion of available food waste into useful biomethane through a community size plant has been found as feasible option both in terms of technology and economy.