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Project Summary

Project Title: Pilot Studies on Optimization of Biomethanation Process Parameters for Biogas Production from *Jatropha* and *Pongamia* Oil Seed Cakes.

The main goal of project was optimization of biomethanation process parameters for biogas production from *jatropha* and *pongamia* de-oiled seed cakes.

Objectives of the Projects

- Batch feed biomethanation of Jatropha and Pongamia oil seed cakes under laboratory conditions.
- Field investigation on biomethanation of Jatropha and Pongamia oil seed cakes for one year under continuous feeding.
- Determination of Biomethanation Process parameters and their optimization for optimum biogas production from Jatropha and Pongamia oil seed cakes.

To study the potential of biogas from seed cakes, lab scale as well as field level experiments were conducted at IIT Delhi. Lab scale work was done in 5 L aspirator bottles as digester. After preliminary batch biomethanation study it was found that methane content is very low in the gas produces from oil seed cake as compared to other feed used to produce biogas, so there was need to developed special inoculum for biogas production from seed cake. The peak biogas production rate was observed between the 30 to 40 day hydraulic retention time for batch production. After successful batch experiment six 2 m^3 capacity plants were installed in sintex biogas plant at IIT Delhi to achieve the goal.

Conclusions:

The minimum and maximum temperature varied at site from 7°C to 44°C. A minimum and maximum temperature of 7°C to 25°C and25°C to 44°C was recorded in the winter and summer seasons respectively. It was seen that the biogas production would vary with change in temperature. The highest production was 741 liter/day/kg at 44°C, while the minimum was113 liter/day/kg at 7°C at the same loading rate.

The pH of the input and digested slurry was measured every week as the input substrate was more acidic, this indicated proper biomethanation process. The pH of Pongamia de-oiled seed cake substrates was found marginally lower than Jatropha de-oiled seed cake substrates. This lower pH

of Pongamia de-oiled seed cake substrates might be due to higher content of volatile fatty acids present in it as compared to Jatropha.

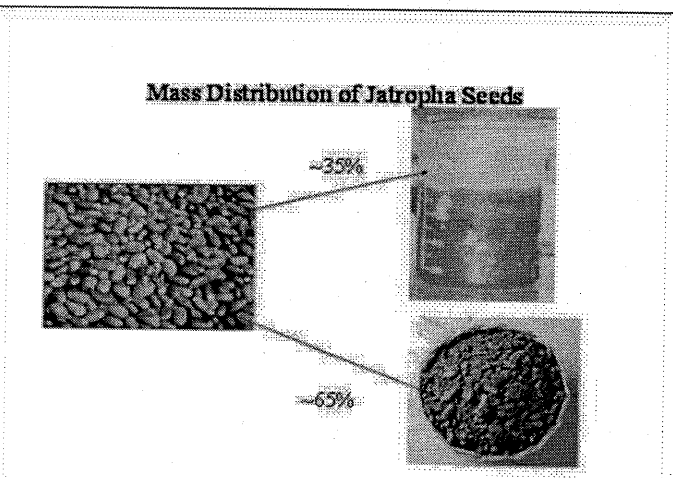
The daily biogas production was measured on the basis of per day feed. The daily biogas yield for Jatropha de-oiled seed cake substrate was ranging from113 (winter) to 663 (summer)liter per day per kg while for Pongamia 299 (winter) to (summer)741 liter per day per kg.

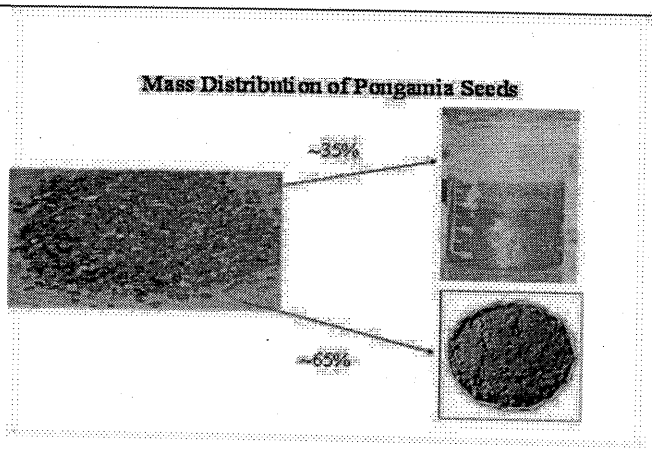
Scope of future work:

- Microbial profiling need to be done for the detecting microbial population in the reactor to determine the mutated species developed in the reactor running on de-oiled seed cake.
- Process optimization of system on large scale and testing is needed to be done with continuous feeding.
- Testing of de oiled seed cake for its biogas production potential when co-digested with other biomass as different pulses, poultry waste, food waste, agricultural waste etc.

Pilot Studies on Optimization of Biomethanation Process Parameters for Biogas Production from Jatropha and Pongamia Oil Seed Cakes

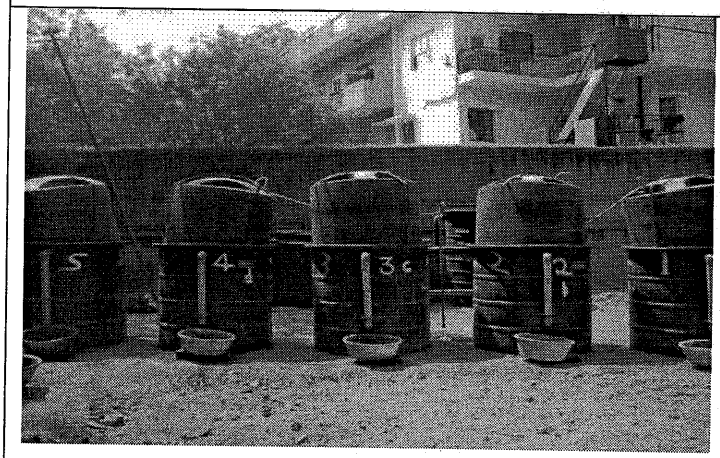
Seeds and Cakes

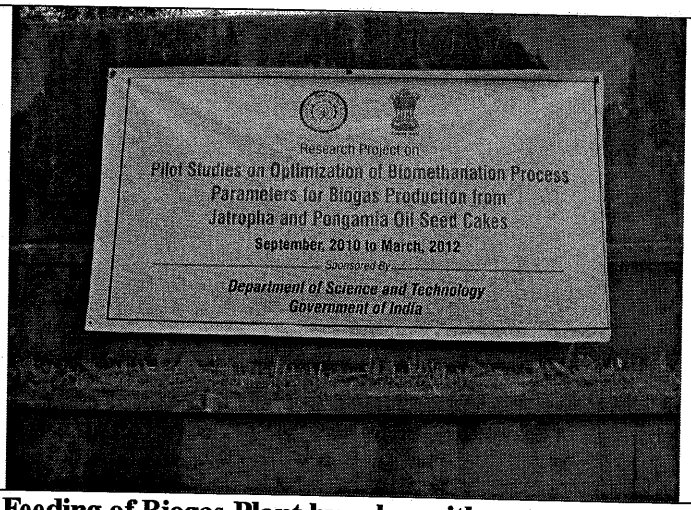




Biogas Plants commissioned at Micromodel, IIT Delhi for field experiment of Jatropha and Pongamia oil seed cakes

Banner at the field experimentation





Measurement of volume of Biogas Produced by Gas Flow Meter

Feeding of Biogas Plant by cakes with water