

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY,
BELGAUM**



A Project Report on

**ANAEROBIC DIGESTION OF DEVARAJA MARKET VEGETABLE
WASTE WITH GLYCERINE AS AN ADDITIVE**

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ABSTRACT

The depletion of non-renewable source of energy in the world has resulted in search for renewable and eco-friendly energy sources which has been going on since a longer time. Research studies on conversion of biomass into energy has received increased attention in recent years because of the upward spiral in the price of fossil fuels and its shortages. Biomass represents a renewable, low sulphur energy resource.

Vegetable waste is produced in large quantities in markets and constitutes a source of nuisance in municipal landfills due to high biodegradability. The disposal by open dumping or spreading over land results in unaesthetic conditions giving rise to obnoxious odour. One of the available methods of manoeuvring the problem is to reuse this waste for production of biogas which could be suitably utilized in the surrounding areas and the digested slurry as organic manure.

In this research work, an attempt is being made to quantify the methane generation from the vegetable waste generated in Devaraja market, Mysore, using Glycerine as an additive. The vegetable waste generated in the market is 1.5 tonnes/day approximately. These wastes are presently disposed at Pinjrapole located in Mysore-Ooty road near Chamundi hills. Glycerine is readily biodegradable sugar alcohol which stabilizes the C/N ratio and thus increases the yield of methane gas. The commingled vegetable waste was collected and ground into slurry (6.5 kg weight) and introduced into the reactor with Cow Dung as the seeding material. The process of digestion was carried out in anaerobic conditions. The methane gas generated was quantified using Orsat apparatus.

The two mix proportions of vegetable waste and cow dung, considered for the study were, 1:0.13 and 1:0.17 and each cycle ended for 7 days. The biogas yield for the observation period of 7days/cycle was 2540 ml and 1220ml respectively for the aforesaid mix proportions. The BOD reduction was 205 mg/L to 175 mg/L and 205 mg/L to 165 mg/L. The COD reduction was 560 mg/L to 240 mg/L and 640 mg/L to 240 mg/L respectively. On the other hand, the nitrate, phosphate and sulphate concentration increased marginally. The nitrate concentration was increased from 0.35 to 0.36 mg/L and with increase in seeding material

proportion, the nitrate concentration increased was more than double (0.12 to 0.28 mg/L).

The phosphate concentration increased from 0.26 mg/L to 0.28 mg/L and 0.14 mg/L to 0.16 mg/L. The increase in phosphate concentration was same (7.14%) for both mix proportion. However the sulphate concentration increase was high (27%) for the mix proportion 1:0.13 compared to 1:0.17 mix proportion and the sulphate concentration were increased from 1.09 mg/L to 1.50 mg/L and 0.60 mg/L to 0.71 mg/L respectively.

In the third cycle, for the enhancement of biogas production, glycerine was introduced as an additive. For the mix proportion of 1:0.53, 1% of glycerine by volume was added for which the BOD and COD values reduced from 250 mg/L to 200 mg/L and 560 mg/L to 200 mg/L respectively. The nitrate, phosphate and sulphate concentration increased considerably from 0.20 mg/L to 1.08 mg/L, 0.26 mg/L to 0.33 mg/L and 0.57 mg/L to 0.74 mg/L respectively. With the addition of glycerine, the biogas yield was increased by 65% (3340 ml). Hence, it can be concluded that the addition of glycerine has certainly enhanced the biogas generation.

It was observed that the average methane percentage of two trails conducted using an Orsat apparatus was 76% with other compositions i.e., CO₂ (13.53%), O₂ (11.5%) and CO (0.00055%). Therefore, it can be concluded that the biogas generated has high calorific value and can be efficiently used as a fuel.

Keywords: Biogas, renewable, vegetable waste, glycerine, BOD, COD, NPS, orsat