

PARC Innovation: Biogas Production and its Use for Pumping Water



Fixed Dome and Floating Type Biogas Digesters



Dual Fuel Engine (Biogas : Diesel \approx 62:38)



Biogas Purification, Compression and Storing System

Contributor:

Abdul Wahab Siyal, as a Coordinator/Principal Investigator conducted pilot study under the ALP funded project titled "Use of Alternative energy Sources for Pumping Water in Agriculture" under the administrative and technical guidance of Chairman PARC, Member, NRD and Director CAEWRI, NARC

Challenge:

- The major agricultural output comes from irrigated agriculture for which 50% of the irrigation is met from pumped water.
- Existing energy crises very badly affected the affordability of farmers to meet their requirement by using conventional energy sources (fossil fuel and electricity).
- Challenge was to develop indigenous and low cost biogas production system for pumping water. Biogas is one of the potential energy sources.
- The challenge was effective handling of biogas production, its purification and transportability to the point of use.

Intervention:

- Two types of biogas digesters (fixed dome 35 m³ and floating type 22 m³ capacities) were designed, developed and tested at several locations of the country. Capacity of local industry was developed to manufacture long-life (20 years) polyethylene UV resistant biogas digesters.
- Dual fuel (Biogas and Diesel) system has been developed for pumping ground water and generating electricity. In the dual fuel approach, a gas/air mixing chamber on the air-intake manifold added in the diesel engine. The diesel can be replaced with biogas up to 62%.
- PARC through Alternative Energy in Agriculture Program, Climate Change, Alternate Energy and Water Resources Institute (CAEWRI), NARC has developed water based Biogas scrubber to remove CO₂ and to compress and store biogas at pressure between 2 to 200 psi. By removing CO₂, biogas is upgraded to natural gas quality. This can now be used to run gas fired engines to run pumps and electricity generators. It is easy to operate and does not involve any chemical or complex machinery.

Outcome:

- Biogas digesters of 35 m³ and 22 m³ are made available at national level.
- Diesel can be replaced by biogas up to 62% in a dual fuel engine.
- Now biogas can be stored and transported and purification has further increased its efficiency.
- Capacity building of private sector (5 companies) in designing, construction and operation of biogas digesters has been successfully done at national level.
- Farming community specifically in Punjab is adopting PARC biogas model to operate dual fuel engines for pumping groundwater for agriculture.
- Formal education and training facilities for farmers have also been developed in biogas generation, maintenance and utilization

Way Forward:

- Up scaling the training of farmers in each region through R & D activities and enhancing the capacity of local industries to develop biogas purification system.