

# BIOGAS TECHNOLOGY – EXPERIENCE OF PCRET

Biogas plants could be broadly classified into three types:

- **Plants with moveable gasholder**
- **Plant with built-in fixed dome gasholder**
- **Low cost bag / balloon type plant**

PCRET has installed all the three types of biogas plants on experimental basis in a quest of selecting an appropriate design that could suite the socio-cultural norms & skill level of the rural masses. A brief history is given below:

Pakistan Council of Appropriate Technology (PCAT), now PCRET undertook propagation of Biogas Technology (BT) in the mid of 1976 and 21 fixed dome (Chinese type) biogas plants were installed in order to assess the workability of Chinese design. These plants did not work due to leakage of gas from the hairline cracks developed in the domes / gasholder. Thus Chinese design could not get ground due to lack of the experience and for want of proper technical skill required for construction of leak proof biogas plant.

Henceforth, Indian design (Moveable gasholder) was adopted with certain modification and for the first time, in the year 1979, 10-biogas plants were installed in Distt. Mirpur, Kotali and Rawalakot (AJK) in collaboration with Local Government and Rural Development (AJK). These plants worked satisfactorily. The first biogas plant installed by this Council is reported to be still functional.

Encouraged by the performance of biogas plant installed in AJK, 100-biogas plants were installed through out the country in the year 1980 under a PSDP project. These plants worked satisfactorily. As a result a number of Provincial Departments started installation of biogas plants in the country with technical assistance of PCAT. About 350-biogas plants were installed by this Council upto 1983 in collaboration with Provincial Government Departments.

In the mean time, Directorate General of New and Renewable Energy Resources (DGNRER), got mandate for mass scale installation of biogas plants in the country, and the activities of PCAT were curtailed to R&D and installation of pilot plants only.

DGNRER installed about 4000 biogas plants under a PSDP project upto 1986. However, due to lack of technical know how and poor field experience, they could not implement this project properly. The implementation methodology was not well devised, particularly involvement of the contractors devastated the things and as a result most of the plants failed to work. **It causes a great set-back to the technology.**

PCRET, however, continued R&D activities for development and promotion of Biogas Technology (B.T), as summarized below:

- Community size biogas plants based on poultry dropping were designed and installed at poultry farms in Karachi for meeting cooking needs, besides generation of electricity.
- A portable type biogas plant consisting of metallic Digester and Rubber tube Gasholder was developed for a private entrepreneur at Karachi with a view to

promote this technology as a commercial product / activity. However it could not be adopted as commercial activity.

- A bag type, low cost biogas plant made of low density polyethylene was also design and installed for field testing. It was observed that high density polyethylene or some other composite material having good elasticity and pierce strength is required for a sustainable bag type biogas plant.
- R&D studies on integrated biogas generation system were conducted in collaboration with PCSIR labs. Lahore and Karachi. Different substrates were used in combination and in different composition, so as to develop appropriate composition and evolve optimum parameters for better functioning of biogas plants.

In the year 1993, the functions of DGNRER, particularly, “Dissemination of Biogas Technology” was again entrusted to PCAT (Now PCRET). Henceforth, this Council re-started revival and promotion of biogas technology in the country. After concerted and dedicated efforts, 50-biogas plants were installed in the out-skirts of Islamabad / Rawalpindi in collaboration with and financial support of an NGO, “Initiative for Rural and Sustainable Development (IRSD) for demonstration purpose. Efficient performance of these biogas plants helped removing skepticism of the stake holders about biogas technology.

Consequently, a project (PC-1) was approved in June 2002 at a cost of Rs.22.02 million for installation of 1200 biogas plants in a period of 4 years. This project was completed well in time and 1600 biogas plants were installed vis-à-vis target of 1200 plants, upto June 2006. Under an other PSDP project commencing from June, 2007, this Council has to install 2500 biogas plants in a period of two years (ending June 2009) on 50% cost sharing bases.

PCRET has standardized two family size models of biogas plants; 3M<sup>3</sup> and 5M<sup>3</sup> daily gas production capacity. As per demand of the beneficiaries mostly 5M<sup>3</sup> biogas plants are being installed. The total cost of 5M<sup>3</sup> biogas plant including appliances is Rs.35000/=. As such the cost per cubic meter of gas production comes to be Rs.7000/=, viz-a-viz Rs.14666/= of fix dome biogas plants installed by RSPN.

Both the movable gasholder type biogas plant and fixed dome type biogas plant have their advantages and disadvantages as given below:

## Advantages

<b>Moveable Gasholder</b>	<b>Fixed dome gasholder</b>
<ul style="list-style-type: none"> <li>• Gas pressure is regulated by the weight of the gasholder.</li> <li>• Gasholder helps in stirring / scum breaking</li> <li>• Easy to construct, (can be constructed in a week time) easy to repair.</li> <li>• Due to black painted metallic gasholder, the green house cover works effectively, to raise temperature in the top layer of slurry in winter season.</li> <li>• Easy disposal of exhaust slurry due to gravity flow</li> </ul>	<ul style="list-style-type: none"> <li>• Since it is underground, the plant space can be utilized.</li> <li>• Fairly steady temperature can be maintained inside the digester.</li> <li>• Post installation maintenance like painting, plastering is seldom needed.</li> </ul>

## Disadvantages

<b>Moveable Gasholder</b>	<b>Fixed dome gasholder</b>
<ul style="list-style-type: none"> <li>• Metallic gasholder is exposed to the atmosphere and causes heat losses.</li> <li>• As it dips in the slurry anti corrosion treatment is required.</li> <li>• Periodical painting of gasholder is required to avoid rusting.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction needs special skills.</li> <li>• Stirring and scum breaking is generally difficult.</li> <li>• Gas pressure control is difficult.</li> <li>• Leakage of gas from hairline crack developed in the dome.</li> <li>• Leakage of gas from sides of manhole cover.</li> <li>• A good quantity of gas produced in the slurry displacement chamber is not captured / utilized and is emitted in the air.</li> <li>• Exhaust slurry is to be taken out manually.</li> </ul>

**PHOTOGRAPHS OF FIXED DOME BIOGAS PLANTS VISITED, AT PASRUR**



**PHOTOGRAPHS OF MOVEABLE GASHOLDER 5M<sup>3</sup> BIOGAS PLANT INSTALLED BY PCRET AT JHANG BAHATAR, RAWALPINDI – USING BIO-FERTILIZER**

