

Biogas plant in Punjab's Bahadarpur village provides cooking fuel to all households

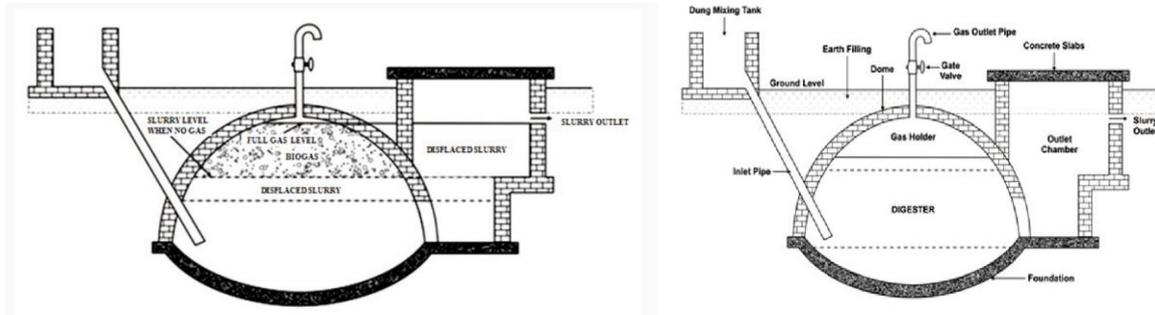


The community driven biogas plant, popularly known as RS Farms in Bahadarpur village of Roopnagar district in Punjab provides cooking gas, free of charge to the all the 83 households in the village, consisting of about 700 people. Spread across 2 acres of land, the facility is an initiative of resident Mr. S. Dilbar Singh, his way of giving back to the village in which he was raised.

In 2011, Mr. Singh who was engaged in business in Dubai wanted to contribute to his village's development by establishing a dairy farm. When the first division pre-engineering diploma holder shared his idea amongst his family, they recommended a biogas plant instead, which he agreed upon. Having dabbled in repair of electronic equipment and recycling junk, he found the idea of using the dung of cows and buffaloes which were in abundance in his village, to produce cooking gas fascinating.

Upon returning to his village, he held a round of discussions with the then Sarpanch of the Gram Panchayat, as well as other members of the community, enthusiastically relating to them his plan, seeking their assurance that they would take care of the assets created. The biogas plant was set up in 2011.

Technology Adopted: Following research, expert opinions and comparisons made, the Deen Bandhu Bio Gas model technology was unanimously agreed upon by the Gram Panchayat. Developed by AFPRO (Action for Food Production, New Delhi) in 1984, the Deen Bandhu model biogas plant is designed on the principle that the surface area of biogas plants is reduced (minimized) to reduce their installation cost without sacrificing the efficiency of the plant.



Design: The design consists of segments of two spheres of different diameters, joined at their bases. The structure thus formed act as the digester and fermentation chamber as well as the gas storage chamber. The higher compressive strength of the brick masonry and concrete makes it preferable to go for a structure which could always be kept under compression. A spherical structure loaded from the convex side will be under compression and therefore, the internal load will not have any residual effect on the structure.

The digester is connected with the inlet pipe and the outlet tank. The upper part above the normal slurry level of the outlet tank is designed to accommodate the slurry to be displaced out of the digester with the generation and accumulation of biogas and is called outlet displacement chamber. The size of these plants is recommended up to 6 m³ per day.

Working of the biogas plant: Initially the digester is filled with a uniformly premixed mixture of dung and water (1:1 ratio) and the digester can be filled in three or four days or more time depending upon the availability of the dung. In order to facilitate gas production, addition of 5 to 10% inoculums, taken from a running biogas plant, will hasten the process by three to four days. In case no inoculums are available, sewage sludge can also be added. The first two or three instalments of gas will not burn because of excessive CO₂.

When the cattle dung is used as feed stock, the biogas plant is to be filled with a homogenous slurry made from a fresh dung and water in a ratio of 1:1 up to the level of the second step in the outlet chamber.

As the gas generates and accumulates in the empty portion of dome of the biogas plant, it presses down the slurry of the digester and displaces it into the outlet chamber. The slurry level in the digester falls, whereas in the outlet chamber, it starts rising with the formation of gas. This fall and rise continue, until the level in the digester reaches the upper end of the outlet opening, and at this stage, the slurry level in the outlet chamber will be at the slurry

outlet. Any gas produced after this stage will escape through the outlet chamber if the gas is not used.

When the gas is used, the slurry which was earlier displaced out of digester and stored in the outlet chamber begins to return into the digester. The difference in levels of slurry in digester and the outlet chamber exerts pressure on the gas which makes it flow through the gas outlet pipe to the points of utilization of biogas.

Benefits: The simple low-cost technology encourages a circular economy. Under this, waste is converted into need-based resources such as renewable energy and organic fertilizer, improving sanitation conditions in the village, while checking environmental pollution.

Investment: The Singh family invested Rs.5 lakhs in the biogas project.

Construction: The biogas plant built which consisted of 2 bio-digesters with a capacity of 140 cubic meters was built within a year. Together with this, all roads were paved, all drains covered and underground pipelines were laid and storm water drains created with regular gaps in the covering slabs. The shed was 14 feet high and the floor had several 3X6 feet pits, constructed in such a way that cow dung or urine can flow into the pits by gravity and no extra effort was required to collect it. No water was needed to clean the floor.

Volume of dung: As many as 800 litres of dung is collected on a regular basis and converted into slurry for further use in the fields. Initially 65 cows including both local and jersey cows were bought and sheltered in the plant.

Challenges: Given that the concept was new, misconceptions had to be addressed regarding the use of biogas in the kitchen. As methane gas had to be kept at a certain temperature, production of adequate amounts of gas in winters was tough. They also needed to find ways to ensure sustainability of the plant.

Current Situation: Operating successfully for the past 10 years, the plant provides gas throughout the day to all households, free of cost. When there is a maintenance issue, households are asked to pay Rs. 100 each to the plumber. Having started with 65 cows, the unit now has more than 120 cows. Artificial insemination procedures are used for cattle breeding and adequate measures are taken to maintain their health. Cattle are fed a healthy diet of corn, soya and paddy straw to increase milk production.

A well-equipped milking parlour has been established in the plant where milk can be harvested from 6 cows at a given point of time. Approximately 700 litres of milk are harvested per day and supplied to Verka Milk Plant at Mohali. All the procedures are monitored mechanically. There is also a grooming station where cattle are groomed periodically.

Operation and maintenance: 3 persons including an accountant and 2 cleaners have been engaged for a monthly remuneration of Rs. 10,000-15,000 a month. Gurnam Singh who has been the accountant for the past seven years maintains records of the cattle feed received and other equipment; while Vikas Singh, a cleaner begins work at 5 am when he cleans the floor, provides cattle feed and then goes to collect fodder.

Benefits to the community: The Slurry generated is used in the fields, reducing the use of urea. The village looks visually clean as there are no heaps of cow dung. The project has benefitted women the most as they do not have to wait for gas cylinders. They receive regular supply of gas.

