Compact Biogas Plant

Tom Miles tmiles at TRMILES.COM
Mon Jan 5 20:00:47 EST 2004

- Next message: New Member and Member Database
- **Messages sorted by:** [date] [thread] [subject] [author]

Digestion List:The following post to the REPP Stoves Discussion List (http://listserv.repp.org/archives/stoves.html) should be of interest to those on the Digestion list. Dr. Karve is President of the Appropriate Rural Technology Institute in Pune, India. I have added a list of some technologies they have developed and use.Tom
MilesDate: Mon, 5 Jan 2004 05:58:20 +0530
Reply-To: "A.D. Karve" <adkarve at PN2.VSNL.NET.IN>
Sender: The Stoves Discussion List <STOVES at LISTSERV.REPP.ORG>
From: "A.D. Karve" <adkarve at PN2.VSNL.NET.IN>
Subject: compact biogas plant
Content-type: text/plain; charset=us-ascii; format=flowed

Several members asked me to provide more details about the compact biogas plant being developed by us. I give below the latest status of this technology.
The biogas plant consists of two cylindrical vessels telescoping into one another. The larger vessel, called the fermenter, has a total internal volume of about 500 lit. A drum having diameter of 85 cm and height of 85 cm would have the desired volume. The smaller vessel, which
telescopes into the larger one, serves as the gas-holder. The diameter of the gas holder is about 2 cm smaller than that of the fermenter. The
fermenter vessel is provided with appropriate inlet and outlet pipes for
introducing the feedstock into it and for removal of spent slurry from it. The gas holder is provided with a gas tap, through which the gas is
led to the burner. This system uses starchy or sugary material as feedstock. 1kg of sugar or starch yields about 400 litres of methane,

within a period of 6 to 8 hours. This quantity is enough for cooking one
meal for 5 to 6 persons. The biogas produced by this system contains theoretically about equal volumes of carbondioxide and methane, but in reality, it turned out to have less than 5% carbondioxide. This phenomenon is explained by the fact that carbon dioxide dissolves in thewater in the fermenter vessel and diffuses out of it through the 1 cm
gap between the fermenter and the gas holder. The gas produced by this system has thus almost the same calorific value as LPG. It burns without
smoke or soot, producing an almost invisible bluish flame similar to that of LPG.

Several prototypes, in operation for more than a year, have been successfully tested using various feedstocks. The potential candidate feedstocks, namely rain damaged or insect damaged grain, flour spilled on the floor of a flour mill, oilcake from non-edible oilseeds, seed of
various tree species, non-edible rhizomes (banana, arums, dioscoreas), leftover food, spoiled and misshapen fruits, non-edible and wild fruits,
spoilt fruit juice, etc. are readily available in rural areas. This system is much easier to operate than the dung based biogas plant, because of the relatively small quantities of feedstock and effluent slurry to be handled. The effluent slurry generated daily by the plant is just a couple of litres. It can be used as manure for plants growing
around the house. The 500 litre biogas plant, mass produced from moulded
plastic drums, would cost about Rs. 3,500 (US$ 78). The smallest cattle-dung based domestic biogas plant costs about Rs. 12,000 (US $267).
It requires daily 40kg dung, and owing to the retention period of almost
40 days, such plants have a minimum capacity of 2000 litres. They generate daily 80 to 100 litres of effluent slurry. Daily handling of such large quantities of feedstock and effluent is considered to be arduous and bothersome by users.
Preliminary studies indicated that the amount of biogas produced and the
retention period varied from feedstock to feedstock and from season to season. Also, when the feedstock was changed from one form to

another,
the system took a few days to stabilise. Our studies also indicated that
the gas yield could be increased by using combinations of feedstock materials. We are now looking at additives such as micronutrients, nitrogen, phosphorous compounds etc., which might bacterial action and yield more gas at a faster rate. Since the users would depend mainly upon locally available feedstock, field trials are essential to determine the retention periods and gas yield for different raw materials.
Many people in India, who read my article in a local neuspaper, copied our design and have started to use this biogas plant in their households. A schoolgirl submitted a working model of it in a statewide
science project competition and won the first prize in the state. A company supplying science equipment to educational institute wants to manufacture models (50 litre capacity) for supply to schools and colleges.
We have supplied 200 litre models to 10 voluntary agencies in different
regions for demonstrating this technology to villagers in their respective areas. This model is meant for areas where the main diet is rice. This model yields enough gas to operate a pressure cooker to cook
rice, beans, vegetables or meat for a family of five. In areas, where the main diet of the people consists of unleavened flat bread, somewhat
like the tortilla, each piece of bread is made individually, and therefore the stove has to be in operation for a longer time. In such cases, we recommend the five hundred litre model.

A.D.KarveI enclose a list of rural household technologies developed by us. Rural energy from agrowaste: The fraction of the total crop biomass, that is economically not useful, is called agrowaste. Its proportion canvary from 20 to 70% of the total biomass.It is estimated that agriculture in India generates annually about 500 million tonnes ofagrowaste. ARTI has developed a number of technologies to utilise the agrowaste as domestic fuel. They are as follows:Improved cookstoves: Woody agrowaste such as stalks of cotton and pegionpea are burnt directly in a woodburning cookstove. A traditionalrural cookstove, made of unfired clay, has a very low efficiency, it produces a lot of smoke and soot and it has a life of just a couple ofyears. The cookstoves developed by ARTI not only have a high efficiency of about 25%, but they also reduce the indoor air pollution. Being madeof cement concrete, they last for at least 5 years.Fuel briquettes from light Agrowaste: Because most agricultural species are herbaceous, agricultural waste is generally in the form of leavesand thin stems. The act of threshing also results in generating powdery agrowaste. Agrowaste in these forms cannot be used as fuel in a woodburning stove, but it can be converted into charcoal briquettes by using a charring kiln based on the oven and retort system. The charcoalproduced in this kiln can be easily powdered, and mixed with a suitablebinder, it can be extruded into char briquettes. Sarai stove-and-cooker system: This is an assembly, which is capable of cooking a meal for a family of five using just 100 g of char briquettes.A housewife, using a traditional wood-burning cookstove, would have to use about 3 kg wood for cooking the same amount of food. User friendly biogas technology: The traditional biogas technology, based on cattle dung, is useful only to families having at least 6 to 8heads of cattle. Because of the low rate of gas generation per unit mass of dung, and long retention time of about 40 days, the smallest domesticdigester has a volume of about 2000 litres. Feeding daily about 40 kg cattle dung into the digester and disposing of daily about 80 kg ofeffluent slurry is a great bother. The new biogas plant developed by ARTI is much more user friendly. Having a capacity of 400 litres, ituses daily just 2 kg of starchy agrowaste (e.g. rhizomes of banana, canna, nutgrass), non-edible seeds (e.g. Leucaena, Sesbania, tamarind,mango kernels, spoilt grain), oilcake of nonedible oilseeds (Pongamia, Madhuka, castor), or leftover food. Its reaction time is just a fewhours. It produces just a couple of litres of watery effluent that is easy to dispose of. Yours sincerelyDr.A.D. Karve, President,Appropriate Rural Technology InstitutePune, India.

.

- Next message: New Member and Member Database
- **Messages sorted by:** [date] [thread] [subject] [author]

More information about the Digestion mailing list