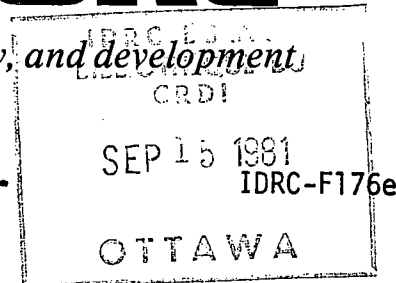


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CHINA SWITCHING TO BIOGAS ENERGY

by Song Ming

As one of the outcomes of energy development in China, some 7.1 million peasant households -- five percent of the 800 million rural people -- now use biogas for cooking and lighting.

Over the next 10 years, it is planned to convert half the country's rural dwellings to this organic methane gas for cooking and lighting, and to provide the same energy source to some 50 percent of the rural population for generating electricity and driving irrigation pumps and rice mills.

Biogas generating units are now mushrooming in rural China along with small hydro-power stations. Research institutes have been set up to teach the necessary technology.

Mianyang, a town in Sichuan province, in southwest China, was one of the first places to introduce biogas on a large scale and its experience has been heavily drawn on as the countryside gradually converts to this new energy source. In Mianyang home made cooking stoves are built of cement-coated brick or clay, with a ring containing six or seven tiny holes. Leading from the stove, a plastic tube connects to an underground methane pit in the courtyard. The whole system is switch-operated.

In the nearby town of Deyang, a state farm that produces oranges, milk spices has a concrete aqueduct that leads cattle-dung slurry from a big animal shed on the hilltop to large biogas digesters under concrete covers. Emptying

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the outlet chamber, the users need only lift a small sluice gate for the residues and liquid effluent to flow along another aqueduct to fields and orchards at the foot of the hill.

The farm has eight biogas units with a total capacity of 1560 cubic metres. There are also three biogas-fuelled generators, with a combined output of 118 hp, driving the wheels that pump water to a pond on the hill-top and irrigate the fruit trees at the foot of the hill.

The raw material for methane production is organic matter such as human and animal manure, weeds, plant stalks and leaves, all of which are inexhaustible in both urban and rural areas.

"The use of plant stalks and leaves is cyclical," explains physicist Qian Xuesen, Vice-Chairman of the China Association for Science and Technology. "First, they are used as animal feed. Second, together with animal dung, for conversion into biogas. And in the final phase, the waste products from biogas generation can be turned back into manure and re-applied in the fields."

After the biogas has been extracted, the residue makes an effective organic fertilizer containing nitrogen, phosphate, and potash. Applied to rice, wheat, cotton, and maize crops, it increases yields by some 10 percent more than ordinary farm manure.

In addition to providing energy and manure, biogas can also help lighten women's household tasks and reduce the incidence of disease in villages where there are no sewage treatment plants.

Biogas units built in China have three salient features. The digestion tank and gas holder are combined in one pit, instead of the two pits common in other countries. They are built two-and-a-half metres underground to save space and create the right temperature conditions for fermentation. And, to

reduce costs, locally available building materials are used to construct units that vary in style depending on the locality. In Huolu county, in north China's Hebei province, for example, it costs little more than 20 yuan (around US\$10.) to build a 10-cubic metre methane pit and gas stove for a household.

The biogas units have capacities ranging from 6 to 12 cubic metres. Viewed in cross-section, a unit looks rather like a teapot with its spout as the charging hole, and its handle as the tapping hole for removing the decomposed material no longer able to produce gas. Gas pressure inside the fixed dome digester is very high, up to about 1000 kg/m².

The design of household biogas plants varies according to the soil type, the water table, and the building materials available. Four types of structure are most common in China. One is the lime-clay biogas unit. A traditional building material in China, the mixture contains lime and clay in the proportion about 1:10. This type of unit should be built in a pit above groundwater level.

The lime-concrete mixture is also traditional and contains lime, sand, and gravel in a proportion of 1:3:6 by volume. This type of unit is suitable for pits above or below groundwater level, but in no case should the groundwater level exceed half the height of the digester wall.

For the cut-in-place tank, the masonry tanks are dug out directly from suitable soils -- hard clay and soft stone -- with the minimum of structural work. Finally, bricks, stones, rocks, slate, and prefabricated concrete components are used for the construction of biogas digesters, determined by local availability.

For all these types of units, the walls, dome, and base should be built of materials mixed with cement and sand in a proportion of 1:3. They must be wind and watertight and leak-proof. This is the key to the successful construction of a biogas unit.

The usual formula for generating biogas is to combine 10 percent nightsoil, 40 percent animal excreta, grass, and plant stalks and leaves, and 50 percent water. This mixture is then kept at between 10 and 55 degrees C, the temperature range at which the methane-producing bacteria are most active.

The plant stalks -- chopped into small pieces -- and other ingredients are mixed and fill 90 percent of the capacity of a tank at first. More is then added to ensure normal gas production all year-round.

The International Development Research Centre (Canada) has published Compost, fertilizer, and biogas production for human and farm wastes in the People's Republic of China. To obtain this publication, write: Communications Division, IDRC, Box 8500, Ottawa, Canada, K1G 3H9.

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