Asian Journal of Chemistry Vol. 9, No. 1 (1997), 1–4

A Scenario of Hidden Energy in Garbage

MAN SINGH
Department of Chemistry
Desh Bandhu College (University of Delhi)
New Delhi-110 019, India

In the metropolitan cities[1], for the development of multidimensional schemes, the natural and man-made resources are being utilised to the maximum extent. In return, the machine made management is causing a havoc to the environmental balance and its growth.

The waste products obtained after various processes in the industries, mechanical sectors, nuclear energy development centres and plastic industries, are being dumped at public places. Because of the several types of tonnes of garbage being thrown into the environment[2], serious diseases such as epidemics like cholera, hepatisis are being reported to destroy human life. Due to the limited sources of fossil fuels[3], the scientists of the world are actively engaged in advancement of the non-conventional energy[4] sources for the useful production of electricity. Tonnes of refuse like rice husk, agricultural[5] weeds, paper, dead leaves, plastic waste materials, sugarcane bagasse, pith of coconut and peels of fruits, branches, palm fibres, broken things, wooden materials, eucalyptus, algae etc. are being used for producing electricity and this is like a boon for environmental safety. Data of Tata Energy Research Institute (TERI) and non-conventional energy resources had shown that by burning sugarcane (bagasse) crop about 3500 megawatts of electricity can be generated. Recently a sugar mill in one of the Tehsils of Maharashtra named Shiroli has been set up and (bagasse) producing about 10 megawatts of electricity a day. In Brazil about 13 billions barrels of ethanol is being manufactured from sugarcane which is equivalent to 2 lakhs 20 thousand barrels of oil, and also a power plant of 30 megawatts is being operated with the help of eucalyptus and sugarcane.

In Kenya about 75% of the total energy is being generated from wood, charcoal, agricultural waste[6] products and agro-industrial products. In Japan, sawdust is being utilised for the production of energy. A power plant of about 65 megawatts capcity based on bio-waste products has been set up in British Colombia dependent upon refuses.

Not only the scientists of our country are utilizing the non-conventional energy resources for electricity generation but also countries like Brazil, Canada, America, Japan Ethiopia, Nepal, Tanzania, China, Denmark, Germany, Australia etc. are utilizing non-conventional resources for the production of energy and undertaking various developmental programmes.

But today, the biggest challenge before every country is to make purposeful use of millions of tonnes of garbage and refuse[7]. In our country, Late Prime Minister Mrs Indira Gandhi had instituted an industrial unit for producing compost from garbage and waste at Okhla, New Delhi. The technique prevents

various epidemics in our country and the manure produced from this unit is being made available to peasants at low prices. The collected garbage from fields is passed through various machines in order to produce manure.

In Delhi, there are many mechanized units for producing electricity from garbage and metropolitan refuse. These machines are being operated successfully with the help of bio-material garbage[8] such as slaughter-house wastes, chicken and fish wastes.

Two incinerators and electricity producing units have been set up in 1987 at Timarpur, Delhi of capacity 3.5 megawatts. This plant is based on Denmark's technical knowhow. From this plant about 1 megawatt of electricity is being used for running the plant and 2.5 megawatts is given to DESU (Delhi Electricity Supply Undertaken) grid. In this plant there are two incinerators, two cranes, two furnaces and two rotary kilns. In this unit about 150 tonnes of garbage per incinerator is used. Besides this the hot gases produced from the boiler at 200°C are used by DEDA (Delhi Energy Development Authority) for drying garbage collected from various places in Delhi.

The garbage is used as a fuel in this plant and water boiled by the hot gases is converted into steam which rotates the turbine. This turbine is placed in the vicinity of the steam and the mechanical energy is converted into electricity. The remaining solid mass or clinker left out after burning the garbage is used in road-making and land-filling. For running this plant about 1462 kilocalories of heat per kilogram of garbage is needed.

But now-a-days in the city garbage the percentage of plastic wastes is decreased by ragpickers and the heat capacity per kg of garbage has reduced to 500 kilocalories due to which the plant has been closed. The process of production of energy from sanitary landfill scheme based on Denmark methodology at Timarpur, Delhi is in use since 1986. According to this programme about 10 to 12 years ago the metropolitan refuse used to be dumped in a pit of area about 80 acres and 20 to 25 metres deep. It absorbed rainwater for years together and by anaerobic reaction it decomposed into methane gas; about 55 to 70% of this methane is pumped out of this gas well and is being supplied to Balakram hospital, Delhi and other 45 households of Delhi at a cost of Rs. 40.00 per house by means of 'pipe bore with the help of compressor'. The combustion of this gas does not lead to any harm.

Other plants of the same type are being installed by developing garbage pits at Sanjay Gandhi Nagar, Badli, Haidupur, Gopalpur. A third programme has been set up at sewage disposal[9] treatment plant at Okhla, New Delhi which is based upon liquid metropolitan refuse. In this the garbage of comparatively bigger size is separted by means of machines. The organic as well as inorganic materials which are dissolved in water are supplied to digestors by means of pipes where formation of methane gas takes place by fermentation[10]. The methane which is called biogas is supplied at a cost of Rs. 60.00 per month per five persons to Kalindi Colony, Maharani Bagh, Holy Family Hospital, Don Bosco Technical Institute, Nehru Nagar, Lajpat Nagar, Sunlight Colony and DESU Colony in Delhi.

In the remaining water 2 to 2.5% N, 1 to 1.5% P and 0.5 to 0.75% K are present, which are drained out to Agra Canal for irrigation purposes.

The calorific value of metropolitan refuse like coconut pith, coffee husk, tobacco waste, refuse of textile factories, cigarette refuse and rice and groundnut husk are being enhanced by converting them into solid roll by briquetting them through machines. It can be used as fuel very conveniently for domestic purposes and can be transported easily to any remote area. Its combustion does not lead to any harmful gas or solid production. The calorific value of the briquetted[11] roll was reported to be enhanced from 3500 to 5000 kilocalories per kg. The size of roll is kept to be of 60 to 80 millimetres radius which is easy to use at the domestic level.

At Tata Energy Research Institute (TERI), New Delhi in 1983 a gasified down draft throatless plant was developed which produced electricity from rural wastes and agricultural refuse. The machine could be fitted upon a trolley which can be taken to wherever required. Likewise at Dhandsa village, District Gurgaon in Haryana, a 5 kilowatt unit is functioning since 1989.

In this machine garbage of bigger size is briquetted into rolls of small size in which the cattle dung or molasses are used as binder in the process. Since it is fitted on a trolley, it can be used in the functioning of irrigation pumps, oil extracting machines and flour grinders. In this wood husk, coconut pith, groundnut shells, tobacco waste, waste of maize and wheat, mustard stalks, corn cobe, barley stalk etc. can be used. Presently this machine is being connected to 7.5 kilovolt generator and electricity is being sent to near by temple.

Briquetted biomass can be burnt directly in hearths in place of coal, it can be made into gaseous form known as producer gas which can be used as a fuel in kitchens as well as in irrigation dual feed pumpsets and burners. Briquetted rolls of garbage can be transported easily to remote villages and can be used for the production of gas for energy generation for complete development of these villages. Light too can be produced there and other development programmes can be initiated. The production of energy has affected human culture[12] positively since ancient times. The renowned energy economist Morris Adelmann has shown by means of his experiments and researches that in the 18th century, acute shortage of fuel and the hope of availability of fuels and fire woods for cosier and warmer living were the reasons due to which hordes of people migrated to South America. Hence we must employ all the ways and means for the production of energy form wastes. In order to produce biogas, environmental waste[13] is collected and the dumped into a chamber named as gasifier and resulting biogas is used for the functioning of dual fuel biogas irrigation engines.

Human excreta also produces biogas by connecting sanitary latrines to the biogas plants. This is used as fuel for various purposes like cooking food, lighting of lamps, etc. Various other models like Pragati Deenbandhu, Janata and K.V.I.C. are being used for this purpose.

At the towns situated at seashore, due to the leakage of water from the land to the biogas tank, a balloon type (sheet) plant which is made up of Neoprine is being set up by a German company. This mechanism prevents the leakage of water. At Sangli in Maharashtra, an aquatic garbage named Jalkumbhi (*Eichhornia*) is used for the working of biogas plants. The biogas plant at Maithan village of Mehsana district of South Gujrat has completely transformed this village having population of four thousand. A five kilowatt power generating plant is

working utilizing rice husk and wood dust at the Indian Institute of Sciences, Bangalore, Karnataka.

At Sardar Patel, Renewabls Energy Research Institute, Ballabh Vidya nagar, Gujrat is being producing 20 kilowatt of power based upon wood. The straws of Arhar, as well as cotton, are used as fuel and Lulwana Kamera like agricultural refuse in its gasifiers.

REFERENCES

1. S.J.S. Anand *J. Radioanal. Chem.*, **44**, 101 (1978).
2. K.G. Pillai, in C.K. Varshney (Ed.), Water Pollution and Management, Wiley Eastern Limited, New Delhi (1985).
3. M. James Woodman and E.B. Cowling, *Environ. Sci. & Tech.*, **21**, 120 (1987)
4. D.L. Gunn and J.C.R. Stevens. (Eds.), Pesticides and Human Welfare, Oxford University Press (1976).
5. Paul De Bach (Ed.), Bilogical Control of Insect Pests and Weeds, Reinhold Pubishing Corporation, New York (1964).
6. I.J. Higgins and R.C. Burns, The Chemistry and Microbiology of Pollution, Academic Press, London (1975).
7. Anon, *Env. Sci. & Tech.*, **4**, 811 (1970).
8. G.L. Brady and J.C. Selle, *Int. J. Environ. Studies*, **24**, 217 (1985).
9. L.C. Rai and M. Raizada, *Ecotoxicology and Environmental Safety*, **14**, 12 (1987).
10. W.W. Eckenfelder and J. O'Connor, Biological Waste Treatment, Pergamon Press, New York (1961).
11. J.E. Anderson, *Environment*, **16**, 6 (1974).
12. C.K. Varshney (ed). Water Pollution and Management, Wiley Eastern Limited, New Delhi (1985).
13. M.S. Sethi and S.A. Iqbal, Environmental Pollution: Causes, Effects and Control, Commonwealth Publishers, New Delhi, p. 295.

(*Received*: 4 March 1996; *Accepted*: 1 July 1996) AJC–1143