BIOENERGY

Ethanol as biofuel

The inevitable decline in petroleum reserves and its impact on gasoline prices, combined with climate change concerns, have contributed to current interest in bioenergy fuels. Bioethanol is the most successful renewable transport fuel with corn and sugarcane ethanol currently in wide use as blend-in fuels in the United States, Brazil, and a few other countries. However, there are a number of major drawbacks in these 1st generation biofuels, such as their effect on food prices, net energy balance, and poor greenhouse gas mitigation.

Ethanol is a comparative cleaner burning fuel with high octane. It reduces the carbon monoxide emission from vehicles. The use of petrol blended with 20–24% ethanol is a standard practice in countries like Brazil. Therefore, it is highly desirable for the India to use ethanol–petrol blend as transportation fuel to save valuable foreign exchange in importing crude oil as well as in reducing the environmental pollution caused by the vehicular emission. Besides a substantial consumption for potable purposes, nearly 50% of total ethanol production is also used as a feedstock for the chemical industry in India. The market size of the alcohol based chemical industry in India is about US$1.2 billion. Growth in world ethanol production crucially depends on the development of the fuel-alcohol market. Requirement of ethanol in the first phase of the programs on 5% blending in petrol in India, was 3.45 billion liters a year, which could have gone up to 5.00 billion liters had the program been introduced throughout the country. Due to non-availability of enough molasses in India, it is not possible to meet the requirements. So there is need to switch over to other biomass sources for ethanol production. Few varieties of biomass are not available throughout the year, thereby affecting the consistent availability of biomass.

Bio-methanation

Biomethanation is among the most suitable technologies to solve the energy problems in rural India. Anaerobic digestion is a natural two-step process. In the first step organic matter reduces to organic acids which converts into methane and carbon dioxide in the second step. The two groups of microflora acidogens and methanogens involved in these two phases differ in their biochemical functions, nutritional requirement, pH and temperature. Since the survival of methanogens is dependent on that of the acid formers, a strict balance between the two is essential to the success of the system. In addition to supplying energy the biogas plants give enriched manure which is a good fertilizer.

The most familiar biogas plants installed in India are based on cattle dung and the gas is used mainly for domestic purposes. Besides cattle dung, rural areas produce large quantities of agricultural residues viz. banana stem, water hyacinth, eucalyptus leaves and composite agricultural residues which can generate biogas and manure. The biogas so generated can be used to run a dual fuel engine pumpset for irrigation and manure can be utilized as crop fertilizer. The effluent discharged by industries such as distilleries, tanneries etc. is one of the most polluting and environmentally unacceptable organic waste. Discharging of these effluents without proper treatment in to rivers or lakes leads to loss of aquatic life. It also creates foul odours and pollutes the surrounding atmosphere. Biomethanation is gaining more and more importance because of its potential for simultaneous production of Biogas and reduction of pollution.

The different bioreactors used for anaerobic digestion include Upflow Anaerobic Packed Bed Reactor (UAPBR), Anaerobic Rotating Biological Contactor (ARBC), Anaerobic Fluidized Bed (AFB) etc. The choice of reactor depends on characteristics of the effluent. For this the complete analysis of the waste water is conducted for pH, COD, BOD, total solids, suspended solids total volatile solids, suspended solids total nitrogen, total phosphorous, any toxic substance etc.

Way forward

Bioethanol can be produced from abundant lignocellulose biomass. The most critical element for the success of bioethanol technology is the availability of cellulases at a nominal cost. For this focused Research & Development would be needed to produce cellulase with high yield and productivity indigenously. Major effort would also be required for producing bioethanol from nonfood feedstocks other than molasses viz. cellulosic and lingo cellulosic material. The performance of the Biomethanation process increases through the recirculation of effluent. The overall yield of the Biogas further improves with time as the culture matures and well adopts to the process. The two phase anaerobic digestion process allows operation at higher loading rates and shorter retention time.

The policy initiatives viz developing and implementing laws to encourage technology transfer, promoting interactions between Government and private sector entities by pooling resources and sharing technical information under applicable laws, introducing criteria to protect intellectual property, patents, and

licenses for Government funded research and development projects may be useful for expansion of Bioenergy in the country.