

Tenth Governing Board Meeting and the Annual General Meeting of the Advanced Bioresidue Energy Technologies Society at IISc, Bangalore 560 012

Date: 27-09-2005; Time: 11.30 hours; Venue: Director's Office.

Technical Highlights

This year has seen significant research input the technology and also expansion in the field implementation of the technologies developed in the laboratory, namely, (a) Biomass gasification, (b) Producer gas engines, (c) Activated carbon from the gasifier, (d) Precipitated Silica from rice husk ash and (e) Biogas Scrubbing. Progress made in these fields is described below.

a) Gasification Technology

Gasification technology packages in the range of 1 kg/hr to 1100 kg/ hr have been deployed in the field at various locations. Operation as a Independent Power Producer has been achieved. Use of saw dust briquettes, some weeds as biofuel has been a salient feature. The robustness of the design has been proven by the field performances. Currently, continuous operation up to 1500 hours between maintenance has been achieved in the field. Some of the industrial plants which have been reference plants for technologists and decision makers are

- Arashi Hi-tech Bio-power 1 MW power generation
- Hindustan Pencils, Jammu, 2 X 200 kW power generation
- Tanfac, Cuddalore an Aditya Birla group company, 5 MW thermal
- Rubber drying based on gasification systems in Tamil Nadu and Kerala (5 x 250 kW thermal)

Total capacity of gasifiers in the field has reached 6500 kg/hr and replacing about 1500 kg/hr of fossil fuel.

Further, on the gas clean up systems, the technology package has resulted in establishing ultra high purity gas quality which has been never reported in literature. The novel gas cleaning process has resulted in trouble free operation of the gasifiers and gas engines.

During this year gasifiers 1 kg/hr have been exported to Austria. Technology transfer up to a capacity of 50 kW has been executed with Brazil.

Use of gasification technology for Cardamom drying

Food industry like the spices is interested in using driers to remove the moisture from the raw material, instead of drying in sunlight. Cardamom is one such material which is drawing attention by various groups to adapt driers. One of the industrial outfit which was using diesel based drier approached to replace the diesel by biomass as economics with diesel is not very attractive with diesel prices.

Developmental work in this area has resulted in a simple technology to gasify biomass to produce gas, which can be burnt in a special combustion chamber. The challenge in this development was to have precise temperature control within ± 2 C in the drier operating temperature range of 40 to 80 C.

This work has resulted in a technology transfer to the industry for the food sector.

b) Gas Engine Technology

Being one of the important components of the technology package, significant efforts have been made to adopt natural gas engines for producer gas operation. High initiative from the research group has resulted in establishing a working relationship with M/s Cummins. Several technical discussions with the Cummins R & D group in India and the US at the institute has resulted in ensuring M/s Cummins to seriously manufacture engines for producer gas operation. Interactions with M/s Cummins in a partner ship mode, has resulted in establishing over 3 MW of power generation capacity.

At present a 130-kW producer gas based engine has completed about 8000 hours of operation at Mettupalayam. The one-megawatt plant at Arashi High Tech Biopower in Coimbatore, has a bank of five gas engines to deliver a total power of 1.5 MW. For the first time, gas based engines are grid linked and operated as an IPP. The performance of the systems has been found good from the user. Many other gas engines projects are in various stages of installation.

c) Precipitated Silica Technology

Further to the technology transfer to Japanese firm, Ivy Corporation, the pilot plant for about 150 kg/day of precipitated silica is nearly complete. This will be used for the obtaining the scaling parameters for a 5 tons per day plant to be set up in Thailand. After the trials on the 150 kg/day pilot plant, it will also be shifted to a site of the large plant. The entire investment will be made by Ivy Corporation. Significant progress has been made in meeting the precipitated silica quality requirements of the tyre industries. This has resulted in the licensee to establish business relationship with one of the largest tyre manufacturer in the world.

d) Activated Carbon from gasifier operation

It has been shown that activated carbon at an iodine number of more than 500 can be generated from gasifier operation at a rate of 5-10 % of the input biomass feed rate. A processing plant for charcoal generated from gasifier operation is being designed and is planned to be deployed in one of the sites.

e) Hydrogen sulphide removal from biogas

M/s Cummins who are involved in the biogas engines has found that some of the engines are failing due to the presence of H₂S in the gas. M/s Cummins is interested in using the technology developed by IISc in there programs.

Status of Projects

a) Strategic Development of Bioenergy - Progress

Phase I of the SDB project was formally closed in January 2005. A detailed presentation was made to the high power committee on the completion of the project, with Dr. V Ramamurthy, being the chairman of the committee. The committee commended the contribution to the bio-energy sector and the proposal submitted for the Phase II of the the project was favorably considered. The phase II of the project with an outlay of Rs. 168 lakhs for a period of 3 years has been sanctioned and commenced operations from Feb 2005.

b) Advanced Biomass Gasification - Progress

The project was formally closed in September 2004 with all the objectives being met with the completion report has been submitted to the Ministry in this regards.

In continuation of this activity, an industry from Chennai is now interested in replacing naphtha by biomass for the 4 MW gas turbine. Initial discussions in this regard are in progress.

c) National Focal point in NBRAP - Progress

The GIS based electronic atlas for Biomass residue with a modeling for the power potential mapped over the country is nearing completion of its integration. In the past one year a huge set of data derived from Satellite Images has been processed in collaboration with ISRO and additional data from other governmental resources as well as studies based on survey.

First version of the stand alone Atlas is released for limited circulation and feed back from various stake holders. The web based version is in progress and is expected to be completed in about a year.

d) Drinking water project (KPCL)

The projects are funded by Karnataka Power Corporation are completed. The equipments at both the sites are commissioned and were demonstrated to the team from KPCL. Additional work related to improve the load factor is in progress.

e) Gasifiers for urban solid waste

Based on the earlier sanction and unsuccessful efforts to mobilize the state government participation in the project, a fresh proposal has been submitted to MNES, with total funding from MNES as a part of an R & D program. The capacity of the plant has now been reduced to about 200 kW with a total outlay of Rs. 3.0 crores.

f) Gasifiers for bamboo utilization

The initial phase of study project supported by The National Mission on Bamboo Applications (NMBA), a unit of TIFAC, DST, has resulted in implementation of two major projects in North East. Two units of Hindustan Paper Corporation generate significant amount of waste not being used. Using this waste about 250 lts of furnace oil I intended to be replaced in the lime kilns. Further, an industrial plant of 100 kW capacity using bamboo wastes in the advanced stage of finalization.

g) Biomass combustion devices - with KCTU

- Puffed rice making is significant in Karnataka and in being manufactured in clusters. There is a group of 800 puffed rice making units in Davangere. Karnataka Council for Technological Upgradation is a technical wing of Government of Karnataka was to address the environmental conditions in and around the work place. The existing combustion devices are inefficient, environmentally bad and highly unfriendly work place. The system developed has been deployed and is acceptable by the user group. The quality of puffed rice and the fuel efficiency has increased. Technology transfer for the manufacture of these devices has been provided for 5 entrepreneurs from the local industrial base.

- Interaction with British Petroleum has led to develop a domestic combustion device with dual fuel option, biomass and LPG. After carry out various qualifying tests, the device is ready for field testing. BP has shown keen interest in collaborating with ABETS for energy related technologies.

Interaction with International agencies

A one day meeting at CGPL with the delegation including the Chairman, R & D group, M/s Cummins, India and Director Technical from US has resulted in strengthening the relationship between Institute and Cummins.

Based on the available information on the bioenergy technology work, a team lead by US Senator, with representatives from the Sandia labs, Los Alamos National lab visited CGPL to seek any possible co-operation area for collaborative work.

Dr. S Dasappa has the made presentation on the gasification technology in various international gathering, in Austria, the IDB meeting, the GSFC V and with engine manufacturer in Belgium. These have found to be useful in information dissemination and creating awareness on the technology developed at IISc.