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Biodiesel industry still in infancy

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Biodiesel industry still in infancy

Biofuels are gaining acceptance worldwide as good substitutes for oil in the transportation sector. In India, the demand for diesel is five times higher than the demand for petrol, but the biodiesel industry is still in its infancy.

BioDiesel production is rapidly growing in Europe and the US. Current estimates show production of 2.2 MT/year in Europe, with Germany (1.1 MT per year), France (0.5MT per year) and Italy (0.4MT per year) being the leading producers. The Biodiesel production is about 2,45,000 tons per year in the

US. The European Union mandated that its members derive at least two percent of their fuel consumption from biofuels by 2005 and 5.75 percent by 2010. Recently, the European Council endorsed the policy proposal of the European Commission that there should be at least a 10 percent share of biofuels in all road transport fuel by 2020 in all EU member states.

The Indian government formulated an ambitious National Biodiesel Mission to meet 20 percent of the country's diesel requirements by 2011-2012. India's current biodiesel technology of choice is the transesterification of vegetable oil. Since the demand for edible vegetable oil exceeds supply, the government has decided to use non-edible oil from Jatropha curcas seeds as biodiesel feedstock.

ICRISAT promotes pro-poor biofuels initiative

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is linking the poor and marginal farmers of the drylands of the developing countries with the global biofuels revolution without compromising on food security.

"We call this our pro-poor biofuels initiative for the dryland farmers where food security is not compromised," said Dr William Dar, director general, ICRISAT. "With the fuel prices increasing globally, there is a demand for ethanol from sweet sorghum and biodiesel from pongamia and jatropha. We believe that this provides a wonderful opportunity for dryland farmers to get more money from their farms and wastelands."

The National Biodiesel Mission is being implemented in two stages:

A demonstration project carried out over the period 2003-2007 aimed at cultivating 4 lakh hectares of jatropha to yield about 3.75 tons of oilseed per hectare annually. The project will also demonstrate the viability of other aspects like seed collection and oil extraction. The expected annual biodiesel production from the project is 1.2 tons per hectare per year for a total of 4 lakh tons per annum. In addition, the government will build a transesterification plant with a biodiesel production capacity of 80,000 tons per year as part of the demonstration project.

A commercialization period during 2007-2012 will continue Jatropha cultivation and install more transesterification plants which will position India to meet 20 percent of its diesel needs through biodiesel.

Currently, India has taken the initial steps towards commercial production of biodiesel. The work accomplished so far includes developing high-yielding varieties of jatropha, initiating jatropha nurseries, setting up pilot plants for biodiesel manufacture and testing biodiesel in public transport locomotives and buses. Phase 1 of the National BioDiesel Mission seeks to demonstrate the viability of all aspects of successful biodiesel manufacturing enterprise. The amount of land available for jatropha cultivation is estimated to 13.4

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Ethanol from sweet sorghum

ICRISAT scientists have bred sorghum varieties and hybrids in partnership with national agricultural research partners that yield higher amount of sugar-rich juice. Conventionally ethanol is produced from sugarcane. Sweet sorghum scores over sugarcane as it is a crop of the drylands, and thus its cultivation can benefit the poor and marginal farmers of the drylands.

Even though the ethanol yield per unit weight of feedstock is lower for sweet sorghum, the much lower production cost for this crop more than compensates for this loss, and sweet sorghum has a competitive cost advantage. It costs Rs 12.79 to produce one liter of ethanol from sweet sorghum, while it costs Rs 14.55 to produce ethanol from sugarcane.

"Sweet sorghum's benefit is three-fold," said Dr Belum VS Reddy, ICRISAT's principal sorghum breeder. "It provides the dryland farmer with grain, fodder for the cattle and an additional source of income through bioethanol. Sweet sorghum requires only one seventh of the water that is used up by sugarcane".

Sweet sorghum has advantage over other biofuel crops that it yields grain as well as ethanol. Rather than replacing land grown to food, the cultivation can stimulate increased yield of grain and stalk, and also fodder from bagasse. Normal grain sorghum is already grown on 11.7 million hectares in dryland Asia and 23.4 million hectares in Africa. "From an acre of sweet sorghum, we can get a minimum of 15 tons of cane," says Rami Reddy, a farmer who has planted sweet sorghum. "Rusni buys this from us at Rs 500 per ton. So a farmer makes a good income from his sweet sorghum field, which is in addition to the 200 to 400 kg of grain that he harvests."

ICRISAT has linked the lab, industry, farmer and the market through the public-private partnership initiative of its Agri-Business Incubator. The research to develop improved varieties was linked with the technology package that entrepreneur AR Palaniswamy, managing director, Buni

million hectares, which could potentially yield 15 MT per year of jatropha oil.

Experts suggest that while new infrastructure for seed collection, oil extraction, transesterification, biodiesel storage blending with diesel and marketing are needed in the country, more importantly, large scale cultivation of jatropha must be established before biodiesel production can meet even a five percent blending requirement nationally.

The main problem in getting the biodiesel program rolling has been the difficulty in initiating the large-scale cultivation of jatropha because farmers do not consider jatropha cultivation rewarding enough. The other main issue is the lack of seed collection and oil extraction infrastructure as with the available oil seeds, it is difficult to persuade entrepreneurs to instal transesterification plants.

Commercial biodiesel production

At present, Southern Online Biotechnologies is among the first companies that has commenced the commercial production of biodiesel in the private space with an investment of Rs 21 crore in the project. Its biodiesel manufacturing plant at Samsthan Narayanpur, Nalgonda district, Andhra Pradesh has a production capacity of 30 tons per day or 9,000 tons per year.

Elaborating on the plant, N Satish Kumar, MD, Southern Online, said, "We have been producing biodiesel since the past four months at the capacity of 40,000 litre/day capacity. Our plant is multi-feed stock based and is the first domestic biodiesel unit in India and amongst the first in the Asian region as well."

The project implementation was done by Chemical Construction International Ltd (CCIL), a New Delhi-based engineering and technology company, which has an exclusive technical collaboration with Lurgi Sciences, Germany, a leader in fatty acids, glycerol and biodiesel technologies. And in this way Lurgi's biodiesel technology has come to India via CCIL.

Southern Online conducted trial runs on APSRTC (Andhra Pradesh State Road Transport Corporation) buses jointly in coordination with APSRTC and APPCB (Andhra Pradesh Pollution Control Board) from June 2005 to March 2006. After the trial runs as per the report of the APPCB, the product registered excellent reduction in pollution. With the successful completion of the trial runs, the company again ran a few more APSRTC city buses from June 2006 to September 2006 on biodiesel on various blends, i.e. B5, B10, and B20 (means biodiesel 5, 10 and 20 percent and regular conventional diesel 95, 90 and 80 percent respectively) in coordination with APSRTC to observe mileage of the vehicle with these blends. During the trials, the biodiesel registered higher mileage when compared with regular diesel and a 40 percent reduction in the pollution levels.

Following its first venture, the company has decided to establish one more biodiesel unit as a 100 percent Export Oriented Unit (EOU) in Visakhapatnam for which it is planning to raise around Rs 175 crore through a rights issue and from the overseas market.

Commenting on the recent Budget announcement of full exemption of excise duty, Satish Kumar said, "Biodiesel consists of 89.5 percent vegetable oil and 10.5 percent methanol, thus it comes under the vegetable oil segment by default. In Andhra Pradesh, vegetable oils are already exempt from the excise tax and just attract 4 percent VAT duty. In order to encourage the sector, the government should give concessions like power subsidy, investment subsidy and custom duty exemption for raw material imports in the biodiesel sector." In addition the government should relook into the biodiesel purchase policy by evaluating the present price of the seeds/seed oil, processing expenses and other industry expenditure."

The Ministry of Petroleum and Natural Gas notified a Bio-diesel purchase policy which provided for purchase of biodiesel by oil marketing companies at the rate of Rs 25 per litre (inclusive of taxes/duties/transportation cost) with effect from January 1, 2006 at about 20 purchase centers in 12 states. The industry experts in this segment are of the view that the seed (jatropha, pongamia) procurement price from the farmers is about Rs 6 and the cost of extracted oil (jatropha, pongamia) is itself about Rs 25-26 and when



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managing director, Rusni Distilleries, has developed.

"By partnering with ICRISAT through its Agri-Business Incubator, our distillery at Mohammed Shahpur village, Medak district of Andhra Pradesh, has become the world's first plant to commercially produce ethanol from sweet sorghum," said Palaniswamy. "We have linked with farmers, to whom we are supplying seeds of sweet sorghum varieties, and buying back their produce."

According to calculations made by Rusni Distilleries, a 40 kiloliter-per-day ethanol from sweet sorghum plant in India can benefit 5,000 farmers and provide 40,000 man-days of labor per year. By planting sweet sorghum instead of grain sorghum, dryland farmers can get an additional income of Rs 1,763 per hectare per crop. This is the benefit they get in addition to the existing benefit from the grain.

In addition to the Rusni project in India, ICRISAT has signed agreements with five private companies in the Philippines to form a sweet sorghum for ethanol consortium. Further, ICRISAT and Rusni are in the initial stages of exploring such consortia in Uganda, Nigeria, Mozambique and South Africa.

Biofuel from pongamia and jatropha

ICRISAT's initiative to produce biofuels is not limited to bioethanol alone. ICRISAT is promoting the cultivation of pongamia and jatropha crops from which biodiesel can be extracted.

"We have partnered with the Andhra Pradesh Government to permit poor villagers, especially women's groups, to grow pongamia and jatropha on wastelands and collect the fruits," said Dr SP Wani, regional theme leader on watershed development, ICRISAT.

In partnership with GTZ, the German development cooperation organization, ICRISAT is working with Southern Online Biotechnologies, which has already established a 40 kiloliter-per-day biodiesel plant in Nalgonda district of Andhra Pradesh.

Biodiesel yields even greater

the cost of technology conversion to biodiesel is added to it, the price becomes Rs 33-34. So it is not feasible to sell biodiesel at the price of Rs 25 in the country. In comparison, the EOUs are selling biodiesel to international buyers at the rate of Rs 37.50.

"The biodiesel industry needs active government support to flourish in the country. Even though we are currently producing biodiesel commercially, there are not many takers for it within the government sector. So, at present, we are selling it to domestic direct customers like the private transport fleet owners, truck and bus owners, who are happy with the performance of our biodiesel," said Satish Kumar. "We have also opened our retail shop on the national highway and our next expansion step will be setting of an EOU. At the same time, with the help of ICRISAT we are also encouraging farmers to plant jatropha on wastelands and have assured them a buyback price of Rs 6 for the seeds."

Another company on the verge of commercial production of biodiesel is Naturoil Bioenergy Ltd, which is again based in Andhra Pradesh. Their biodiesel plant is based in the port town of Kakinada, which is a 100 percent export oriented unit. The envisaged capacity of the plant is 100,000 tons per year.

In 2006, Naturoil Bioenergy inked a strategic technology partnership with De Smet Ballestra Group of Belgium for implementing its Rs 140 crore integrated biodiesel plant at Kakinada. Jaganath, CFO, Naturoil Bioenergy, stated, "The commercial production from the plant will start by June this year and the plant is more than 80 percent ready. Right now we are in the advanced stage of tapping the European and US markets and signing contracts with some companies in the US and the Europe."

Naturoil's bio-diesel plant designed on multiple feedstock ranging from palm oil and jatropha to soya bean, will produce 300 tons per day of biodiesel and employ 200 workers. The project, claimed to be one of its kind in Asia, had a debt to equity ratio of 1.5:1. APIDC Venture Capital, which was the first to support the project from the concept stage, helped it raise further funds from other equity investors such as UTI Venture Funds and SIDBI Venture Capital. Under the project, about 1.20 lakh acre of dry wastelands can be taken up for cultivation based on vegetable oil seed plantations.

In addition, Naturoil is planning to set up additional biodiesel plants at Visakhapatnam in Andhra Pradesh and in various South Asian countries. It had already initiated discussions with potential partners in Thailand, Indonesia and Sri Lanka and for the next three years the company has planned production on imported feedstock from Malaysia. It expects to get jatropha from 1.5 lakh acres in Andhra Pradesh to supplement its stock.

The company has also been talking to various tissue culture laboratories in India to enable multiplication of the right germplasm, which would be provided to the participating farmers to meet the escalating demand for jatropha seedlings. "The biggest challenge for the industry is the availability of raw material in the country, as India is a large importer of vegetable oil. In the absence of the availability of raw material within the country (the thrust on jatropha plantation has been on since the past few years and so the required volume of seeds will be available only after 2-3 years) the companies will have to import it from abroad initially," said Jaganath.

Concurring with the demands of the other industry leaders for government support, he opined, "The industry is still awaiting the National Biodiesel policy from the government, which will hopefully support the sector." Welcoming the recent Budget announcements, he said that this is a nascent industry and requires all possible support.

"Currently in India the appetite for usage of biodiesel is still not very visible. So the market is not large. This has to change and parallelly the biodiesel industry has to also develop so as to cater to their needs," he added.

reductions in air pollution than ethanol, since fossil fuel diesel is polluting considering the popularly used diesel technologies in the developing countries. Compared to fossil fuel-derived diesel, biodiesel reduces unburnt hydrocarbons by 30 percent, carbon monoxide by 20 percent and particulate matter by 25 percent.

The planting of biodiesel crops also helps sequester atmospheric carbon into tree biomass. The World Bank bought 147 tons of carbon credit from Powerguda village to neutralize the emissions of air travel by participants of an international conference held in Washington DC, USA, in October 2003.

TNT India starts biofuel efforts

Environmental concern is a top global priority for TNT Express, one of the world's leading business-to-business express delivery company. And "Driving Clean" is a global initiative for TNT in addressing the environmental concern by using alternatives like biofuels. As part of this initiative, kick-started after a senior managers' meeting in January 2007 in the Netherlands, TNT India too has launched a pilot biofuel project in early March this year. Abhik Mitra, managing director, TNT India Pvt Ltd, informed, "The Driving Clean initiative is a global action plan to improve the environmental performance of our fleet. We

have started the pilot on three trucks on the Pune-Nasik-Bangalore route. We will test the biofuel and ecodriving performance." TNT runs over 1,000 trucks every day and the success of this pilot project would decide its future course of action. Though it was too early for Mitra to comment on the transit time, cost economics, sourcing of fuels etc., TNT is hopeful that it can take the biofuels up to 20 percent levels in diesel in the future and expand this project to its entire fleet. Each of the biodiesel truck covers about 45,000 km per month and the project aims to reduce carbon emissions by up to 337 tons per year per vehicle. TNT is one of the first express organizations in India to contribute to the biofuels strategy and is optimistic about the future of clean driving.

Other Trial Runs using 5% biodiesel blends

- Railways used biodiesel on some regularly scheduled train journeys
- Tractors tested by Mahindra & Mahindra
- Mercedes cars tested by Daimler Chrysler
- Public transport buses tested by Haryana Roadways, Bombay Electric Supply and Transport, among others
- In addition trials marketing of 5 percent diesel blends through some retail outlets have been conducted by the oil company Bharat petroleum Corporation Limited (BPCL)

National Biodiesel Mission

Key aspects of Phase I Demonstration Project (2003-2007)

- Plantation area coverage

- Nurseries development
- Seed collection and oil extraction centres
- Blending and marketing and
- Financial requirement

Phase II (2007-2012)

Aim: Produce sufficient vegetable oil-based biodiesel to achieve 20 percent blending

Strategy: Accelerate the momentum achieved in the demonstration project

Convert plantation into a mass movement all over the country

Duration: Will begin in 2007 and completed during the XI plan (2007-2012)

The success of the demonstration project is expected to galvanize all the stakeholders and participants to mobilize resources with the government as the facilitator.

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