

## Profits from Cogeneration

### Sugar Industry puts bagasse to good use

The sugar industry is amongst the most highly regulated industries in the country and is severely debt ridden. The level of regulation in price, supply and other aspects sometimes defies logic. Today, administered prices and release quotas determined by the government have resulted in a large stock build-up of about 8 million tonnes (mt) in addition to about 2 mt of imported stock to fulfil perceived shortages. This has left to artificially high free market prices. In contrast, prices in 2001-02 were close to or even lower than those paid to the farmer. While such fluctuations have benefited political lobbies and a few producers, they have mostly been detrimental to farmers, manufacturers and consumers.

India is the largest consumer of sugar in the world. This industry is amongst the largest agricultural industries in the country with about 570 sugar mills, mostly concentrated in the sugarcane-producing states of Maharashtra, Uttar Pradesh, Tamil Nadu, Karnataka, Andhra Pradesh, Bihar, Gujrat, Punjab and Haryana. The majority of them are co-operatives. However, the big producers belong to the private sector and include Bajaj Hinduathan, Dhampur Sugar, Balrampur Chini Mills, Ugar Sugar Works and Bannari Amman. Soft drink manufacturers and confectionaries are the bulk purchasers of sugar in addition to retail and other commercial users.

A seasonal, sugarcane has two harvesting seasons. Depending on the harvest, India's position varies from year to year as the largest producer to the largest importer in the world. Today, it is the third largest producer of sugar after Brazil and the European Union. The current production capacity is about 18 mt. In 2002-03, production hit an all-time high of 20.1 mt, but then declined in the next two years to about 13 mt.

As a result of controlled prices and quotas, the industry suffered poor price realizations until the beginning of 2005. The price increased from about Rs. 11 per Kg. in mid-2003 to about Rs. 19 in January 2005, and is now at about Rs. 17-18 per kg.

The union government fixes the minimum support price of sugarcane to be paid to the farmers. The state governments normally stipulate an additional charge over this fixed price. In addition, 10 % of sugar produced is procured by the state governments at predetermined prices for the public distribution system. The remaining 90 % can be sold at the free market price, albeit within the monthly release quota prescribed by the state. Vagaries of monsoon, fluctuations caused by controls, and uncertain profitability have prompted the sugar industry to look for additional revenue sources such as power and ethanol.

While the country still has a number of small capacity producers that came up because of the now redundant limitation on cane-crushing capacities, it is the large producers that are expanding. Sugar production is expected to grow in the coming three to four seasons. Producers are encouraged by better monsoon prospects, new incentives for bagasse-based power generation and use of molasses for ethanol, a large potential market for ethanol, and expected relaxation of quotas for a free market. Some of the large producers who are expanding capacities include DCM Shriram Consolidated, Trivani Engineering and Industries and Balrampur Chini Mills.

Power and ethanol have contributed significantly to this motivation for expansion. Over the last two to three years, some of the large sugar manufacturers have started producing ethanol that can be mixed with petrol for running automobiles. The recently negotiated price for selling ethanol to oil marketing companies is about Rs18 per litre.

Bagasse-based cogeneration of power using steam turbines has also become popular. At least 40 per cent of sugar manufacturers already have captive cogeneration plants and contribute about 7 per cent to the total captive capacity in the country. High pressure steam is used for sugar production process as well as electricity generation. The generated power is used not only to meet their power requirements, but also to sell to the state grid. This saves costs as bagasse is a waste product in the sugar production process and hence, if the entire power requirement can be met from the cogeneration plant, it is almost free. Since, power is not a major cost component in sugar production, almost 40-70 per cent of the power generated can be sold to the grid. However, in the non-crushing season, bagasse may not be available and an alternative fuel may be required for power generation.

<b>Sugar Industry's captive power capacity (by state)</b>	
<b>State</b>	<b>MW</b>
Andhra Pradesh	192
Assam	-
Bihar	53
Chhattisgarh	6
Delhi	-
Gujarat	97
Haryana	37
Himachal Pradesh	-
Jharkhand	-
Karnataka	308
Kerala	-
Madhya Pradesh	40
Maharashtra	51
Meghalaya	-
Orissa	23
Punjab	114
Rajasthan	2
Tamil Nadu	331
Utter Pradesh	243
Uttaranchal	-
West Bengal	-
<b>Total</b>	<b>1,498</b>

Notably, when a sugar mill does not produce enough bagasse to meet its power requirements and has to source it from elsewhere, the cost is still usually less than Re 1 per unit. In comparison, if the plant has to use diesel, the unit cost could be higher than Rs 2.75 and Rs 3.20 per unit depending on the state. Most cogeneration plants have the flexibility to switch between two or more fuels. In the peak season sugar mills may generate more than 90 per cent of their power using bagasse. While excess bagasse is usually stored for use in the lean season, alternative fuels such as lignite may be used for over 60 per cent of generation during this season.

The ministry of Non-conventional Energy sources (MNES) recognizes the potential of this environment-friendly, non-conventional fuel and actively promotes its use. MNES's policy guidelines for faster promotion of bagasse-based cogeneration include attractive purchase prices for generated electricity, prompt payments for electricity purchased, honoring signed power purchase agreements, expeditious statutory permissions, and guaranteed long-term stability of declared policies. According to the ministry, the estimated potential of saleable power from bagasse-based cogeneration in sugar mills is about 3,500 MW.

Taking advantage of the MNES incentives, a number of large sugar mills have announced plants to either set up new cogeneration plants, or to increase capacity of their existing captive units. Our sample survey indicates that almost all of them intend to sell surplus power to the grid. Although the capital cost of about Rs 10-Rs 15 million per MW for setting up a bagasse-based cogeneration plant is much lower than that of other plants, power from cogeneration may not be all that feasible for small sugar producers in a bad season because of the high cost of alternative fuels like diesel and lack of access to cheaper fuels such as coal or lignite. However, with an assured supply of bagasse or a cheaper alternative, cogeneration could not only bring in much required revenues in the non-crushing season, but also save processing costs.

<b>Sugar Industry's captive power capacity (by fuel)</b>		
<b>Fuel</b>	<b>MW</b>	<b>% share</b>
Steam/Bagasse	1,102	73.6
Biomass	88	5.9
Diesel	233	15.6
Steam/Diesel	72	4.8
Gas/Naphtha	-	-
Hydel	-	-
Wind	2	0.1
Unclassified	-	-
<b>Total</b>	<b>1,498</b>	<b>100.0</b>

<b>Sugar Industry's captive power capacity (by size)</b>		
<b>Size range (MW)</b>	<b>Total MW</b>	<b>% share</b>
1-5	415	27.7
5.1-10	393	26.2
10.1-25	471	31.4
25.1-50	168	11.2
50.1-100	51	3.4
100+	-	-
<b>Total</b>	<b>1,498</b>	<b>100.0</b>

Apart from saving costs using cogeneration, sugar manufacturers have also taken steps to conserve energy. Some energy conservation measures include recirculating fly ash which contains unburnt carbon in the boiler to release more heat energy; installing star-delta-star unit for motors running with less than 50 per cent load, energy-efficient cooling towers for cooling water, and hydraulic drives by replacing gear boxes; providing variable frequency drives for weighed juice pumps and cane carriers; replacing conventional gear trains in the mills with a planetary gear box; mixing the excess condensate of vapour with cold water in the evaporator instead of using just cold water; installing a spray pond system for condenser water cooling; installing auto transformers for factory lighting; optimizing the cooling tower pump; using low-loss chokes and high-output lamps; installing energy-efficient motors; and installing falling film evaporators .

As the industry looks forward to the possibilities of freeing itself from some of the regulations that undermine its profitability, reducing interest costs through the government's debt-restructuring options, and finding relief from seasonal vagaries that bring uncertainties to the revenue potential, power from bagasse-based cogeneration and ethanol for automobiles will prove to be a bonus for sugar manufacturers . Depending on the crushing capacity, sugar plants have either already set up or are planning to set up cogeneration and ethanol plants.

While the MNES and the states are promoting bagasse-based cogeneration by offering a number of incentives, running the plant in the non-crushing season poses problems (inadequate bagasse and higher cost of alternative fuels). Even then, as the cost of setting up a cogeneration unit is much lower than other power plants, the possibility of selling excess power to the state grid has opened up an additional revenue source.

**Reference book:**

Power Line  
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