Case Study 05

Sustainability of Sugar Factory in Tamil Nadu, India*

Introduction to Indian Sugar Industry

Sugar is extracted from sugarcane. Sugarcane is a native crop of tropical Indian subcontinent and Southeast Asia. In India, sugarcane is planted thrice a year in October, March and July depending on part of the country it is being harvested. India is not only among the world's largest producer of sugar, but it is also among the largest consumer of sugar. Around 525 mills produced more than 30 million tonnes of sugar in the last crushing season of 2020-21, which lasts from October to April. Around 50 million farmers and millions of more workers are involved in sugarcane farming in India.

According to Indian Sugar Mills Association, the country's sugar mill has produced 268.21 lakh (26,821,000) tonnes of sugar between October 1, 2019, and May 31, 2020. Industry body of Indian Sugar Mills Association (ISMA) reports the country's sugar output rose by 31 per cent to 142.70 lakh tonnes in the first three-and-a-half months of the 2020-21 marketing year that started in October 2020. Uttar Pradesh, Maharashtra and Andhra Pradesh are amongst the largest producer of sugarcane in India, representing around 60% of total cane produced in the country. The variation in production around the country is due to different agronomic conditions and farming practices across the country (Satish Kansal, 1997).

At present the sugar industry is the second largest agro-based industry in India after cotton textile industry. The industry contributes significantly towards the socio-economic development of the country. It has created employability of almost 7.5 percent towards the Indian economy. Sugar Industry is a source of livelihood towards almost 50 million farmers and their families in India. The industry provides more than 5 lakhs employment to the skilled and semi- skilled labours in sugar mills and allied

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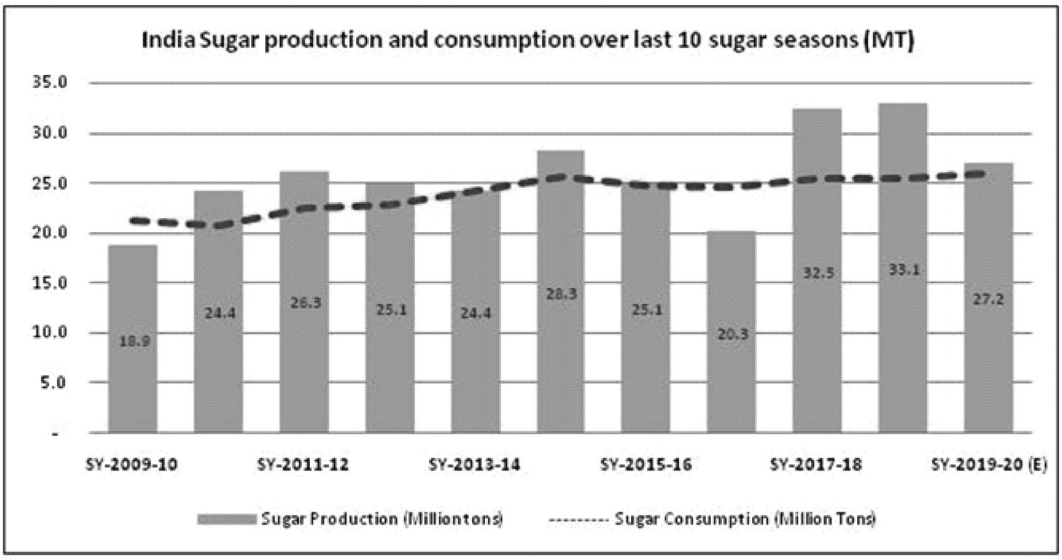
industries across the country. Sugar and its bi-products contribute about 1% to the National GDP of the country. The Indian sugar industry is self-sufficient in its vigor need and produces surplus power through cogeneration.



Data Source: Indian Sugar Mills Association *(ISMA)*

The processing of sugarcane generates bagasse, molasses, and pressmud. Indian sugar industry has been using these by-products to generate bioethanol, electricity, and many other products over the years. The various by products of sugar industry also contributes towards the economic growth of the company.

Government of India supports the sugar industry to ensure remunerative prices as well as marketing of agriculture production through various schemes such as:

a. *Price support system:* The determination of minimum price of the crop which a farmer must receive.

b. *Procurement system:* The Food Grains and Stores, Govt to provide relief to the farmer who otherwise will have to hold an inventory and block his finances.

About the company

The company is one of the pioneer sugar company in South India having vast experience in the field of sugar, power, and alcohol production. The company was established in 1985 and has three sugar plants located in Tamil Nadu, India. The

company is a public limited company listed on National Stock exchange of India and BSE limited. The company has interests across integrated fields such as sugar, distillery, power, and biotechnology. The annual turnover of the company is in between 500-1000 crore. The corporate office is in Coimbatore and Chennai and has three modern sugarcanes based integrated bio-refinery complexes located at Varadaraj Nagar in Theni district, Mundiyampakkam in Villupuram District and Gingee in Villupuram district of Tamil Nadu. The company manufactures and markets white crystal sugar and industrial alcohol with installed capacities of 6000 tpd and 45 KL/day respectively. Industrial alcohol is the rawmaterial for a number of chemicals like acetic acid, acetic anhydride, butanol ethyl acetate, poly vinyl alcohol and vinyl acetate. The company came out with a rights issue in Nov.'92 to part-finance the alcohol project. The company has replaced mill turbines using DC motors which increased crushing rate of sugarcane and hence increased generation of power.

The process adopted in the manufacturing of Sugar is Double Sulphitation Process. Sugar factory of this company consists of the following five main stations:

1. Mill House: Mill House is the cane crushing unit which consists of cane carrier, cane cutter having cane knives, milling tandem, bagasse carrier and conveyor. The mills are driven by DC motors. The residue which comes out of the mill after extraction of juice is called bagasse.
2. Boiler House: Boiler generates steam by burning bagasse. The steam is used in power house, boiling house, curing house.
3. Power house: The high-pressure steam generated by the boiler is utilised for production of power by the turbo-alternators. The power produced is used for captive needs and the surplus power is exported to the government grid.
4. Clarification and Boiling House: The juice extracted by the mills is measured by juice flow system. The measured juice is heated in juice heater in two stages. The juice after evaporation is called as syrup. The syrup is normally of 60% solid of its total weight.
5. Boiling and curing House: Sulphited syrup is taken to plan floor for making sugar crystal. Three massecuites boiling system is normally adopted to bag the sugar.

The company has a cane crushing capacity of 11,000 tonnes of cane crushed per day and 23 lakh tonnes of sugar cane in a year. The company produces crystal white sugar, demerara sugar, white sugar sachet, demerara sugar sachets. The company has implemented various environment protections by adopting innovative technologies,

infrastructure and by meeting the effluent norms set by the Tamil Nadu Pollution Control Board. Following is the list of environmental development initiative taken by the company:

1. Sugar Plant: Sugar plant uses raw water for sugar processing and the surplus condensate as waste to environment. Whereas this company uses condensate generated from the sugarcane to process sugar since the sugar cane itself contains 70% of water.
2. Cogeneration Plant: The emission level at cogeneration is continuously monitored through online monitoring system which is hooked up with the care air centre of Tamil Nadu Pollution Control Board. The emission levels are well with in the norms setup by the Tamil Nadu Pollution Control Board, i.e. <150mg/NM3.
3. Distillery Plant: The company uses a zero-discharge distillery plant and the entire effluent generated from the plant is completely incinerated in the incineration boiler after concentrating in various stages, viz: integrated Evaporation, Flubex and finisher from15 brix to 60 brix.

Sustainability of Sugar factory through Cogeneration Power at the company
Cogeneration involves the use of high-pressure Boilers for producing steam and Turbo generators for generating power. Th ehigh-pressure steam passes through the turbine and generates power. The low-pressure steam from the turbine is used in the processing of sugar. This process of utilization of steam for generating power and for processing of sugar is called cogeneration.

Cogeneration plants in India mostly used water cooled condenser for the turbines. Watercooled condenser uses almost 25 lakh litres of water to cool the sugar processing daily. For sugar processing, ground water cannot be used. For this reason, cleansing of water is required which in turn leaves residual salt. The cleansing of water brings an other problem of salt disposal andother minerals in the area. Water being a scarce resource, use of water poses a threat in many ways to the organisation as well as that to the environment. Installation of water-cooled condenser requires initial investment of Rs.3 crores and surface cost. The whole process leaves tonnes of carbon footprint which in turn has a negative impact on the environment.

The company is one of the environment friendly organisation in Tamil Nadu. And the economy was looking for a change in the industry through green power. The director of the company, Raman believed in using current technology to solve the future problems. He was of the view of not wasting a scarce resource (water) and planned to

act towards the solution. The research and development team proposed installation of air-cooled condenser. But few hurricane tasks lay in front of him in the process:

a. The concept of air-cooled condenser was totally new in the country. The air-cooled condenser has to be engineered and designed by the company itself.

b. The air-cooled condenser would cost around Rs.9 crores which was much costlier than that of the water-cooled condenser.

c. To bring agreement towards the project among the board of directors.

The air-cooled condenser won't have changed the production margin. Even though the air-cooled condensers incur a much higher investment cost than the water-cooled condensers, it is environment friendly, and it totally eliminates the usage of water. This is an important environment feature given the scarcity of water in the region and a positive step towards water conservation. Raman proposed the following ideas to the board of directors to get an acceptance from them:

A. The major problem of cost can be funded partly by the internal accruals, contributions from the promoters and partly by the banks and financial institutions.

B. Water Cooled condenser enforces company an additional of water consumption of 25,00,000 Litres for cooling down the machinery and to continue its operations. Air-cooled condenser would use atmospheric air to cool machines because the cooling will be taking place simultaneously with production of sugar. It would bring down the environmental problem, carbon footprint, caused by the company. It would also help in disking the future water concern of the company, disposal of water and pollution problems in the area.

C. It is Corporate Social Responsibility of the company towards the state and the country, and the company is committed towards holding the highest standard of CSR.

D. The factories were supposed to generate electricity for its own as most of the sugar plants were located in the rural locations and there was no or less transmission of electric lines in these places. The air-cooled condenser will make the company self-sufficient towards the generation of power with additional units that could be sold to state grid and be utilized for state consumption.

The board of directors agreed to the proposal taking into consideration the positive impact ofair-cooled condenser on the environment. A 22 MW Co-generation plant was installed and commissioned on 1st June 2005 at Mundiyampakkam. The company

had taken over the plant from Tamil Sugars Limited in 2002 and started working on the conversion of plant towards air cooled condenser cogeneration plant. It was the first sugar cogeneration plant in India to install air cooled condenser to condense excess steam from the power turbine, which resulted in water conservation. Around 600 m3 per day of raw water was saved by the installation of air-cooled condenser. The plant generates 22 MW of which 6.5 MW is used for the captive consumption and the balance surplus power is exported to the TNEB grid. The Cogeneration Power Plant is the first unit in South India to be registered under CDM Project. The company as adapted clean technologies in its cogeneration plants which have led to reduction in green house gas emissions.

Teaching Note

Synopsis

The case is about an Indian Sugar public limited company which has interest across integrated fields such as sugar, distillery, power, and biotechnology. The case focuses on the concept of sustainability of sugar factory through cogeneration power. The case discusses installation of cogeneration powerhouse which helped the company in reducing usage of water, the pollution and the carbon footprint. The case discusses the managerial decision problems faced during the installation of cogeneration power plant using aircooled condenser and finding solutions to the problems. The case also discusses the corporate social responsibility of the company which must go beyond government regulations.

Target Learning Group

Target Learning Group is BBA and MBA students of B-Schools.

The Learning/Teaching Objectives and Key Issues

The objective of this case is to teach the managerial decision making in a situation when the company is not making any kind of profit out of the decision taken. The case also focusses on concept of corporate social responsibility of the company. The key issue taken in the case is to convince the board of directors to invest in a project which will promote sustainability of the company but will not increase the profit of the company and why organizations must invest in such projects.

Teaching Strategy

The case must be taught in the management course focusing on decision making and corporate social responsibility. Students must understand steps involved in decision making and the importance of corporate social responsibility.

Questions

Following questions can be discussed in the classroom

1. Describe the managerial style of the director of the company.
2. Do you think the company has made the right decision by installing aircooled condensers in the differential priceis very high?
3. What are the immediate challenges for the company post installation of cogeneration plant?

References

1. Sugar Industry of India. Available at https://en.wikipedia.org /wiki/Sugar_ industry_of_India#:~:text=Sugar%20industry%20is% 20a%20big,world's% 20largest%20 producer%2C%20unseating%20Brazil.Retrievedon 29/07/21.

2. Satish Kansal, 1997, Factors Determining Indian Sugar Production and its Comparative Advantage, Fiji/ FAO Asia Pacific Sugar Conference.