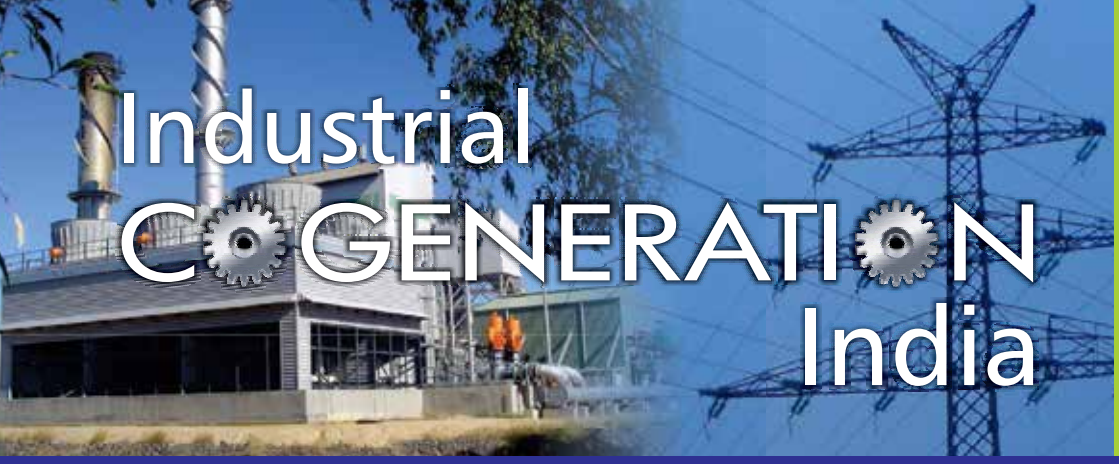

Industrial COGENERATION India

Pune | Vol VII, Issue 4, April to June 2024 (Quarterly) | Price Rs 250/- | Pages: 42

Sanjay Khatal
(Director General)
Cogen India

The cogeneration sector in sugar industry has a historical background, contributing immensely to the country's clean energy scenario as well benefiting the agricultural sector. In this backdrop it was only fitting to laud the achievements of those plants and their personnel who are striving to achieve energy efficiency and overall operations. We, at Cogeneration Association of India (Cogen India), launched the National Cogeneration Awards in 2022. We have been profiling case studies of the winners in each newsletter issue, and this time the second rank winners from 2023 (*refer the Oct 2023 issue for further details*) are included – one from the cooperative sector (Krantiagrani Dr. G.D. Bapu Lad SSK Ltd., Kundal), and two from the private sector (Sar Senapati Santaji Ghorpade Sugar Factory Ltd. and Udagiri Sugar and Power Ltd., Bamani), all from Maharashtra.

India has another opportunity to boost global biofuel deployment as well through the Global Biofuels Alliance (GBA), which it launched in 2023 with leaders from eight other countries. The International Energy Agency (IEA) released "Biofuel Policy in Brazil, India and the United States: Insights for the Global Biofuel Alliance" to support the GBA's development. IEA recommends the GBA focus on developing new and existing markets since over 80% of production is concentrated in four regions: the United States, Brazil, Europe and Indonesia, which account for only half of global transport fuel demand. The agency also recommends accelerating technology deployment and commercialization, and seeking consensus on performance-based sustainability assessments. A brief commentary by IEA talks about India's domestic potential, and what the GBA can do to help accelerate sustainable biofuels use globally.

India's ethanol industry has grown manifold since the government mandated its mandatory blending with automobile fuels. As the 20% target sets in from 2025, ethanol demand is expected to increase to 1,016 crore liters, making the worth of the ethanol industry jump by over 500% from around Rs 9,000 crore to over Rs 50,000 crore, according to the government's projections. In India, ethanol is mostly produced by sugar makers, many of which are listed on stock exchanges. These ethanol stocks offer investors an opportunity to be part of India's ethanol growth story – a review article sheds more light on this within.

Pressmud, a residual by-product in the sugar industry often known as filter cake, has been acknowledged as another valuable resource for green energy production. By utilizing pressmud as a feedstock for biogas production through anaerobic digestion, and subsequent purification to create compressed biogas (CBG), Indian sugar mills can generate extra revenue. Centre for Science and Environment talks about the potential and challenges in this sector, while in parallel, Reliance Industries is in talks with several sugar mills to procure pressmud to produce CBG.

Sugarcane bagasse is divided into two major components – pith (inner part) and rind (outer part). An important

contd on pg 8

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Biogas to Power and Biogas Upgrading Systems

Biogas to Power

Disposal and treatment of biological waste represent a major challenge for the waste industry.

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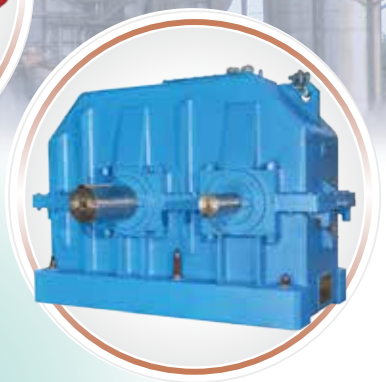

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contd from pg 1... Editorial

usage of pith firing in bagasse-fired boilers has been covered this time. The boiler was commissioned in the crushing season of 2023-24 and has been operated under various combinations of bagasse (up to 30%) and pith (up to 70%) at M/s Bindal Paper Mills Ltd. (Sugar Division) in Uttar Pradesh.

On another aspect, we have also included state-wise data on biomass usage in thermal power plants as of 2023, and the issues involved regarding the supply chain. To accelerate this initiative, a steady supply of biomass to power plants needs to be ensured by developing a reliable supply chain that can transport biomass to plants. This could involve partnering with farmers, forestry companies, or other biomass suppliers to secure a steady supply of biomass. Necessary infrastructure and logistics to transport, store, and process biomass is critical. This could involve building new storage facilities, upgrading transportation networks, or investing in new processing technologies. Finally, the Co-firing Policy needs to be backed by a strong policy and regulatory framework that provides incentives and support for biomass co-firing. This should include developing specialized boilers, burners, and control systems that can handle the unique characteristics of biomass, as well as retrofitting existing equipment to accommodate biomass co-firing.

Indian Renewable Energy Development Agency Ltd.'s (IREDA) Scheme to provide financial assistance for the setting up of a new distillery or expansion of an existing distillery for manufacturing of ethanol, has also been outlined in this issue.

The Cogeneration Association of India (Cogen India) is poised at the right junction to assist industry to achieve their maximum potential. We are proud to announce our latest consultancy offering in the area of solar energy solutions for sugar/cogeneration plants. We have also submitted a proposal to the Government of Maharashtra for cogeneration plant subsidies to offset the impact of lower tariffs.

We look forward to your feedback to make this newsletter more useful to our readers, and hope all stakeholders will join us as members to take this "Green Revolution" forward.

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Ms Anita Khuller, Senior Associate Consultant, Cogen India

Cogeneration Association of India Announces National Cogeneration Awards-2024

After the resounding success in the year 2022 and 2023 to highlight their achievements, we are inviting nominations this year for -

1. **Best Cogeneration Power Plant**
2. **Best Cogeneration Manager**
3. **Best Instrument Manager/In-charge**
4. **Best DM/WTP In-charge/Manager**

Each above category will be have FOUR Awards bifurcated for Co-operative and Private Sector Sugar Mills as well as for Boiler Pressure below & above 80 kg/cm².

Accordingly, there will be total 16 (Sixteen) numbers of Awards.

Deadline for Nominations - 31 May 2024

For details on nomination procedures
please call: 020-25511404, +91 9823004221
or email: cai@cogenindia.org
For more information, please refer:
https://www.cogenawards.com/

ANNOUNCEMENTS

Krantiagrani Dr. G.D. Bapu Lad SSK Ltd., Kundal: Case Study

2nd Rank in "Best Cogeneration Plant in India 2023 Award" for below 87 kg/cm^2 category (Co-operative)

Krantiagrani Dr. G.D. Bapu Lad SSK Ltd., Kundal is located in Sangli district, western Maharashtra. It is one of the leading co-operative sugar mills in India with 7500 TCD cane crushing capacity as well as a 19.70 MW (10 MW exportable) bagasse-based cogeneration power plant and 90 KLPD distillery. The sugar mill's first trial season was during 2002-03, while the cogeneration plant started in 2010 and the distillery in 2017. We have also started erecting a new 150 KLPD ethanol plant, which is due for commissioning in 2025.

The karkhana (factory) management under the guidance of Hon. MLA Arun (Anna) Ganapati Lad and Chairman Shri Sharad Arun Lad has always given importance to proper technical management and excellent technical efficiency, resulting in the factory achieving more than 25+ awards from National Sugar Federation, New Delhi and VSI Pune for Best Technical Efficiency, Best Financial Management, Best Cane Development Activities, Best Environment Activities, Overall Best Sugar Factory, Best Cogeneration Plant, besides individual awards of Best Managing Director, Best Chief Engineer, Best Chief Chemist, Best Chief Accountant, Best Distillery Manager, Best Environment Manager, etc.

The capital cost of installation of the cogeneration plant was Rs. 2.74 crore/MW, which is very less when compared to other sugar cogeneration plants in India. The technical and commercial performance of the cogeneration plant has been consistently good since 2010. Due to this, the Cogeneration Association of India awarded us the 2nd Rank in the "Best Cogeneration Plant in India 2023 Award" for below 87 kg/cm^2 category (Co-operative), which was received from the august hands of Chief Guest Hon. Sharad Chandraji Pawar Saheb (MP) Rajya Sabha at Pune on 16 September 2023 *(refer photo below).*

View of the 19.70 MW cogeneration plant

As per guidelines from Ministry of Environment, Forests, and Climate Change, New Delhi, under our Corporate Social Responsibility (CSR) activity, we have installed 1,500 nos. of 45 Watt LED fittings in 71 villages at a cost of Rs. 65 lakhs[1]. Also, we have planted 70,000 trees in 71 villages at a cost of Rs. 2.18 crores and we are supplying plants free of cost to farmers every year - Neem, Karanj, Jamun, Gulmohar, Mango, Chikku, Coconut, Awala, etc.

Energy Conservation Initiatives in Sugar Mill & Cogeneration Plant

- Almost 60 nos. of Variable Frequency Drives (VFDs) are used for all major equipment in the sugar mill and cogeneration plant.
- Planetary gear boxes are used for major drive units to reduce energy consumption and save power.
- At the time of sugar factory expansion, energy efficient IE2 and IE3 motors were installed.
- For harmonic reduction we have installed 7% harmonic filters for power saving.
- In the sugar and cogeneration plants, all 250 W HPMV lamps have been replaced by LED fittings.
- The old boiler was in manual operation. The boiler is now automated and is operated from the Distributed Control System (DCS), improving boiler efficiency.
- All mill tail bar coupling has been replaced by rope/ rope-less coupling.
- Hydraulic D hooking system with remote operation has been installed for all cane unloaders to reduce power consumption.
- Additional cutting edge provided to leveller and

Notes: 1 crore = 10 million; 1 lakh = 100,000;
IE - International Efficiency;
HPMV - High Pressure Mercury Vapor;
MOL - Milk of Lime

AWARD WINNER

chopper hubs to save power and improve cane preparation.

- Self-lubricator polymer runners are fitted for rake type carriers and hoses in place of steel flat bars, which helped to reduce friction loss, save power, and enable smooth operation of units.

Steam Conservation in Sugar Mill

To reduce steam consumption in the sugar mill, the following measures are being taken:

I) Flash heat recovery system: In this system, condensate water from FFE nos. 1 & 2, Evaporator Body No. 3, and the pans is collected in a closed vessel. Condensate water vapour from this vessel is used in the second and third bodies, leading to a reduction of steam upto 1% on cane.

II) Direct contact juice heater (DCH): In a conventional (tubular) juice heater the temperature approach required is 10 deg C. But in a DCH, the temperature apporach required is only 2 to 3 deg C. Due to this, steam required is low as compared to a tubular juice heater. Also, cleaning the system is not required, so both steam and cleaning cost are saved.

III) Condensate juice heater: Condensate water from the second and third bodies, and the pan condensate is collected in a receiver. The temperature of this condensate water is 98 to 100 deg C. This condensate is used for heating the sulphur burner juice from 70 to 80 deg C. Hence extra steam is not required to heat the juice. This is beneficial in steam saving.

IV) Vapcon system: We are using a vapcon system for the solid sulphur melter. Electrical heaters are used for starting to create 4 to 5 kg/cm^2 pressure steam. This steam is used for melting solid sulphur. After burning the sulphur in the furnace the gas temperature reaches up to 450/500 deg C. This gas passes through after the burner and cools down to 250/300 deg C. Heat recovered in this system is utilized for sulphur melting resulting in 0.5% steam saving.

V) Lime impurity separation system: In this system 3 to 5 micron lime grit is separated from the MOL. Due to separation of fine grit, there is decreased scaling in the evaporator, which increases its efficiency, resulting in reduction in steam % cane.

VI) Falling film evaporator (FFE): FFEs are used for I, II and III effect, of the quintuple set. As it operates on low exhaust pressure and very high heat transfer rate, it is beneficial for steam economy. We have standby bodies for the evaporator, hence stoppages or general cleaning are avoided

VII) Mechanical circulator: We have installed top-mounted mechanical circulators for all batch-type pans and use the third body vapour for them. This third body vapour pressure used for boiling of massecuite gives better exhaustion, fast circulation of massecuite, and also reduction in massecuite boiling time. These result in increased pan capacity and reduced steam consumption.

VIII) Screened dry seed is used for A-massecuite footing: Dry seed from the last deck of the grader through a 26 mesh screen and also from a vibro screen of 40 mesh is used for footing of A-massecuite, resulting in the production of 50% bold grain sugar in minimum steam and time.

IX) Vapour used for melter and molasses conditioner and pan washing: We are using the first body vapour for B and C sugar melting and also for molasses conditioners in place of exhaust and 7 kg/cm^2 steam for steam economy.

X) Plate-type heat exchanger (PHE): Superheated wash water used for the batch-type centrifugal machine is obtained by heating condensate through the PHE by using exhaust steam instead of 7 kg/cm^2 steam.

XI) First vapour steam for air blower: We use first body vapour steam in the hot air blower for the sugar hopper instead of 7 kg/cm^2 steam, which helps in reduction of steam.

XII) Continuous pan for B and C massecuite boiling: We have installed a countinous pan for B and C massecuite boiling, using low vapour pressure. Steam required for the continuous pans is less as compared to batch pans. Due to the above systems, total steam % cane is reduced upto 32% on cane, resulting in more bagasse saving and more power export.

Switchyard at the cogeneration plant

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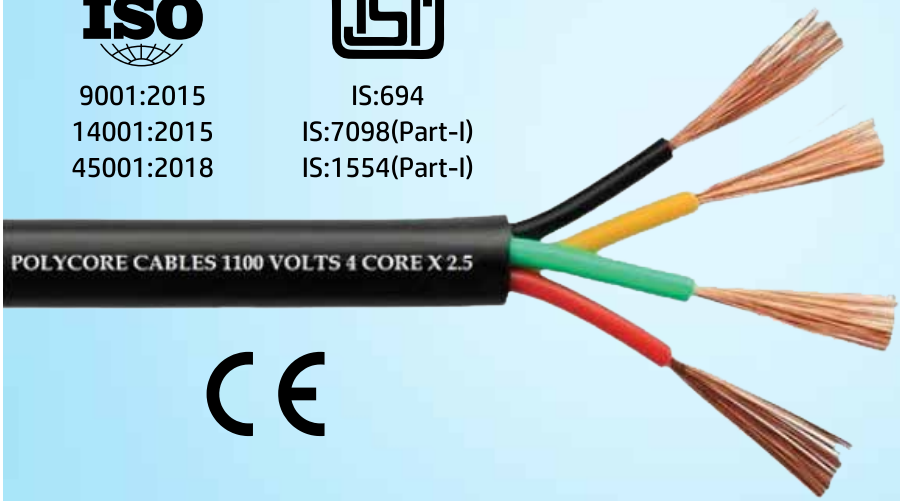

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Overall Performance of 19.70 MW Cogeneration Power Plant (2019-22)

Sr. No.	Description	2019-20	2020-21	2021-22
1	Cane Crushed, MT	798,661	884,004	1,011,087
2	Power Generation, Days	149	212	174
3	Power Generation, kWh	56,179,000	70,225,000	66,165,000
4	In-house + Auxiliary consumption in kWh	22,821,823	25,558,526	28,106,589
5	Power Export to MSEDCL in kWh	33,357,177	44,666,474	38,058,141
6	Power Generation (kWh/ton)	70.34	79.43	65.43
7	In-house + Auxiliary Consumption (kWh/ton)	28.57	28.91	27.79
8	Power Export (kWh/ton)	41.77	50.52	37.64
9	Plant Load Factor	95.85	98.32	93.28
10	Cost of Power Generation in Rs./kWh	2.29	1.20	1.57
11	Steam Consumption (% on Cane)	38.08	36.90	37.40
12	Bagasse Saving (%)	4.17	3.91	4.13
13	Power Export Revenue from MSEDCL, Rs. crores	22.15	29.66	20.13

XIII) Vapour line juice heater (VLJH): We have installed VLJH for B-countinuous pan vapour, for raw juice heating from 30 to 52 deg C. Waste heat is recovered in this system.

Equipment & Machinery in Cogeneration Plant

A) Boiler -

a) Make – Thyssenkrupp Industries India Pvt. Ltd. – 02 nos. (Dumping grate)
Bend tube-type water tube medium pressure boiler
Working pressure – 45 kg/cm^2, Working temp. 445 +/-5^0 C
Heating Surface Area (HSA) – 1,742 m^2, Capacity – 35 TPH

b) Make – Thermax Ltd. – 01 no. (Dumping grate)
Water tube-type medium pressure boiler
Working pressure – 45 kg/cm^2, Working temp. 460 +/-15^0 C
HSA – 1,948 m^2, Capacity – 50 TPH

c) Make – Bajaj Power Equipments Pvt. Ltd. – 1 no. (Traveling grate)
Water tube-type medium pressure boiler
Working pressure – 45 kg/cm^2, Working temp. 450 ±10^0 C
HSA – 3,928 m^2, Capacity – 80 TPH

B) Turbine Generator Set -

a) Make – Siemens Ltd., Vadodara – 1 no.
Type – Back pressure, Capacity – 10.85 MW
Inlet steam pressure – 45 kg/cm^2, Inlet steam temp. – 450^0 C
Alternator – TDPS, 11 kV, 13,562.5 kVA

b) Make – Siemens Ltd., Vadodara – 1 no.
Type – Double extraction cum condensing
Capacity – 8.85 MW
Inlet steam pressure – 45 kg/cm^2, Inlet steam temp. – 450^0 C
Alternator – TDPS, 11 kV, 11,062.5 kVA

C) Cooling Tower -
Make – Paltech Cooling Tower and Equipments Ltd., Haryana – 01 no.
Capacity – 2,500 m^3/hr, No. of cells – 02 nos.

D) DM with RO Plant -
a) Make – Ion Exchange – 35 m^3/hr DM plant – 01 no.
b) Make – WTE Infra Pvt. Ltd. – 50 m^3/hr RO plant – 01 no.
c) Make – Ion Exchange – Water softening plant for cooling tower capacity – 45 m^3/hr – 01 no.

E) Fuel and Ash Handling -
a) Fuel – Make – Saikrupa Industries, Pune
Capacity – 40 TPH – 01 no.
Bajaj Power – 20 TPH – 02 nos.
b) Ash – Make – Bajaj Power and Equipments

F) Eco-friendly Equipment (Electrostatic precipitator or ESP)
Make – Thermax Ltd.
Nos. of fields = 03 nos.

G) Switchyard
Transformer – 11 kV/33 kV
Make – Crompton Greaves, Capacity – 14 MVA
Cooling Oil Natural-Air Natural (ONAN)

Courtesy:
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India's Biofuel Use and Global Deployment

Viewpoint Article by Jeremy Moorhouse & Astha Gupta, International Energy Agency

India has quickly joined the ranks of major biofuel producers and consumers, thanks to a set of coordinated policies, high-level political support, and an abundance of feedstocks. Over the next five years it has the potential to nearly triple consumption and production by removing roadblocks to higher ethanol blends and diversifying biofuel use to replace diesel and jet fuel. However, it will need to keep an eye on costs, feedstock sustainability, and deploy supportive policies to other biofuels beyond ethanol.

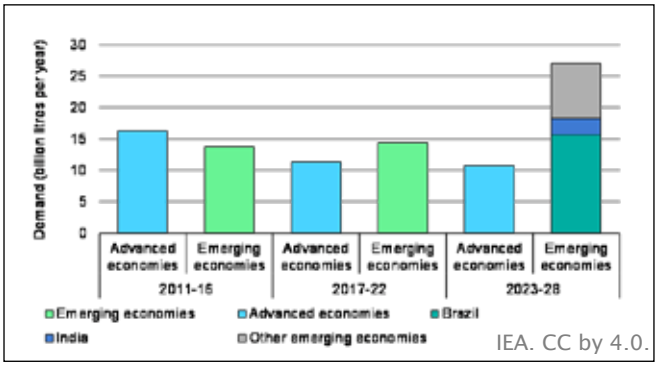
India has another opportunity to boost global biofuel deployment as well through the Global Biofuels Alliance (GBA), which it launched in 2023 with leaders from eight other countries. Last year the International Energy Agency (IEA) released "Biofuel Policy in Brazil, India and the United States: Insights for the Global Biofuel Alliance" to support the GBA's development. In it the IEA recommends the GBA focus on developing new and existing markets since over 80% of production is concentrated in four regions: the United States, Brazil, Europe and Indonesia, which account for only half of global transport fuel demand. We also recommend accelerating technology deployment and commercialization, and seeking consensus on performance-based sustainability assessments.

In this brief commentary we consider the global status of biofuels, India's domestic potential, and what the GBA can do to help accelerate sustainable biofuels use globally.

Biofuel use is accelerating, led by emerging economies

Over the next five years biofuel demand is set to expand to 38 billion liters, a near 30% increase from the last five-year period. In fact, total biofuel demand rises 23% to 200 billion liters by 2028, with renewable diesel and biojet fuel accounting for almost half of this growth, with the remainder coming from ethanol and biodiesel.

Five-year biofuel demand growth, main case, 2011-28



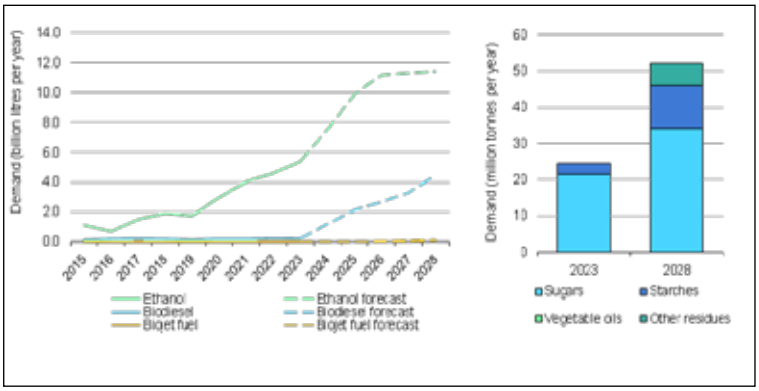
Source: Renewables 2023

Most new biofuel demand comes from emerging economies, especially Brazil, Indonesia, and India. All three countries have robust biofuel policies, rising transport fuel demand, and abundant feedstock potential. Ethanol and biodiesel use expand the most in these regions. Although advanced economies, including the European Union, the United States, Canada and Japan, are also strengthening their transport policies, biofuels growth is constrained by factors such as rising electric vehicle (EV) adoption, vehicle efficiency improvements, technical limitations, and high blending costs in some markets. Renewable diesel and biojet fuel are the primary growth segments in these regions.

India is the third largest global ethanol producer and can build on its rapid growth

India is now the world's third largest producer and consumer of ethanol thanks to nearly tripling production over the past five years. It has potential to expand further with the right policies, keeping costs in check and securing sustainable feedstocks. In 2018 India released its National Policy on Biofuels, which set blending targets for ethanol (20% blending by 2030) and biodiesel (5% by 2030), feedstock requirements for different fuels, and laid out the responsibilities of 11 ministries to coordinate government actions. Beyond blending targets, India established guaranteed pricing, long-term ethanol contracts, and technical standards and codes. Financial support for building new facilities and upgrading existing ones was also provided. Buoyed by its success, the Government moved the 20% volume

Biofuel consumption in the accelerated case (left) and feedstock demand (right) in India, 2015 to 2028



Note: Biofuels consumption is from Renewables 2023, assuming India achieves 20% ethanol blending by 2025/26, is on track for 5% biodiesel blending by 2030, and achieves 2% biojet blending for international flights by 2028.

blending target for ethanol forward by five years to 2025-26, which was enshrined in an updated National Policy on Biofuels in 2022.

Supported by these policies, ethanol for blending in gasoline production and demand nearly tripled between 2018 and 2023, and now stands at near 12% (7% on an energy basis). Sugarcane provides most ethanol production, with the remainder from food grains such as maize and surplus rice stocks determined by the Food Corporation of India. To diversify feedstocks beyond sugarcane, India provides separate pricing for maize-based ethanol, and includes ethanol produced from agricultural residues such as cotton stalks, wheat straw, rice straw, bagasse and bamboo.

Achieving 20% ethanol blending on average across India will require increasing the fleet of vehicles capable of accepting higher ethanol blending levels. India is encouraging flex-fuel vehicles and retrofits are possible for older vehicles, including two wheelers. In addition, a greenhouse gas (GHG) measurement and reporting requirement would help India assure and improve GHG reductions from biofuel use in the transport sector. India will also need to continue to diversify feedstocks to help avoid shortages as it experienced at the end of 2023. New cellulosic ethanol plants, one completed last year, and three others under development, will help.

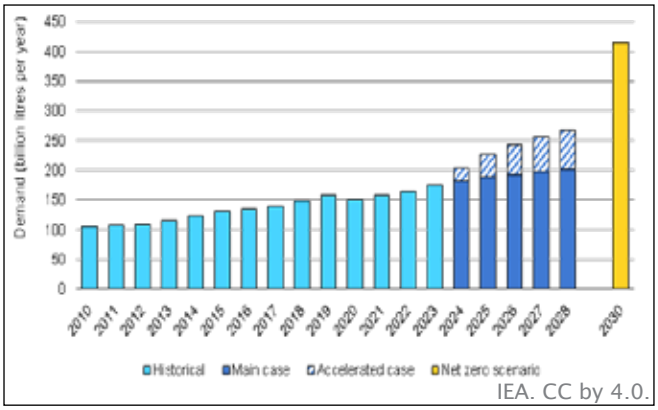
India has other opportunities to expand biodiesel for use in diesel vehicles and biojet fuel as a replacement for jet fuel. The government has already established a 5% biodiesel target by 2030, which would require almost 4.5 billion liters of biodiesel per year according to IEA estimates. Mobilizing production will require a similar mix of policies as provided for ethanol, including production support, guaranteed pricing and feedstock support, especially for mobilizing residue oils like used cooking oil and vegetable oils grown on marginal land.

Biojet fuel is another growth area. On 25 November 2023, the Ministry of Petroleum and Natural Gas announced indicative blending targets of 1% by 2027 and 2% by 2028 for international flights leaving India. We estimate this would require near 100 million liters of biojet fuel per year, likely to come from residue or vegetable oils grown on marginal land. However, future growth could come from other technologies such as alcohol-to-jet, using ethanol and gasification technologies whereby agricultural, forestry and municipal solid waste can be converted into jet fuel.

Biofuel demand must nearly triple on a net zero pathway

World leaders left COP28 this year with clear priorities to triple global renewable capacity, double progress on energy efficiency, drive down methane emissions by 2030, and transition away from fossil fuels – four of the five key priority areas for success indicated by the IEA well before the COP28 gathering. Biofuels are one of the keys to transitioning away from fossil fuels as a complementary measure to EVs and vehicle efficiency improvements. They are also compatible with existing vehicles and over the medium-term play a significant role in reducing emissions from long-distance road, air

Global biofuel demand, main case, accelerated case and net zero scenario, 2010-30



Source: Renewables 2023 and the World Energy Outlook 2023

and maritime transport. In the IEA's net zero emissions (NZE) scenario, biofuels production nearly triples from current levels by 2030, but the world is not on track for this.

In the IEA's accelerated case, strengthening existing policies, establishing new targets and raising biojet fuel volumes, doubles annual historical growth rates to 8% through 2028. Nearly half of this additional growth, 29 billion liters of new demand, results from strengthened policies in existing markets such as the United States, Europe and India (for ethanol), and an additional 21 billion liters comes from new markets (biodiesel in India and ethanol in Indonesia). Biojet fuel offers a third growth avenue, expanding to cover nearly 3.5% of global aviation fuels – up from 1% in the main case.

However, even this level of growth falls short of a net zero scenario. To align with a net zero pathway, biofuels production from new processing technologies to access a large agricultural and forestry residue base, must also quintuple by 2030, necessitating significant developmental support, as most remain pre-commercial. To address GHG emissions intensity, technologies such as Carbon Capture, Usage and Storage (CCUS) applied to biofuel projects can very effectively reduce GHG emissions, with lower feedstock demand. Finally, biofuel production must expand significantly outside of the United States, Brazil, Europe and Indonesia that dominate production and use today. In all cases, predictable long-term policies with clear sustainability requirements are crucial to minimize uncertainty and stimulate investment.

The Global Biofuels Alliance can help expand sustainable biofuels

On the 9 September 2023, India launched the GBA with the leaders of Singapore, Bangladesh, Italy, the United States, Brazil, Argentina, Mauritius and the UAE on the sidelines of the G20 summit. As of January 2024, the GBA now has 22 member countries alongside 12 international organizations. The Alliance is a welcome addition to international and domestic efforts to expand sustainable biofuel supplies in line with a net zero trajectory. Despite the urgent need to increase the production of sustainable biofuels to cut transport emissions and ensure energy security, current growth is lagging to achieve global targets by mid-century, according to the IEA's NZE Scenario. However, with the right policies and practices, rapid sustainable biofuel deployment is achievable. The GBA can help get sustainable biofuels on track by focusing on three main areas:

- **Identify and help develop markets with high potential for biofuels production:** Over 80% of sustainable biofuels production and use is in the United States, Brazil, Europe, and Indonesia. However, total transport fuel demand from these countries accounts for less than half of global transport fuel demand. Expanding sustainable biofuels use will therefore require expansion into new markets and expanded production in existing markets. Augmenting sustainable supplies in each market requires enhancing measurement and monitoring for sustainable supplies, assessing mixed technology deployment pathways and developing regional-specific policy packages, while learning from existing experiences.
- **Accelerate technology deployment to commercialize advanced biofuels:** Advanced biofuels must grow 11 times by 2030 from 2022 levels in the IEA's NZE Scenario, doubling total biofuels production over the same period. However, planned investments to date remain well below this level of growth.
- **Seek consensus on performance-based sustainability assessments and frameworks:** More consistent and internationally recognized sustainability frameworks would help improve measurement and reporting, improve GHG reductions, encourage sustainable biofuels trade, and help new markets incorporate lifecycle GHG accounting into their biofuel policies.

India has already demonstrated how to quickly accelerate biofuel use. It now has an opportunity to extend those lessons learned to other biofuel types. Its leadership with the GBA is a welcome addition to international efforts to accelerate sustainable biofuels demand.

International Energy Agency (IEA)
Website: www.iea.org/about/contact

18 January 2024

Sugarcane Byproduct for India's Compressed Biogas Production

India has assumed a key position in the worldwide sugar economy, emerging as the foremost sugar producer since 2021-22, surpassing Brazil. Additionally, it stands as the second-largest sugar exporter globally. The expansion of the ethanol biofuel sector over the past five years has not only strengthened the sugar industry, but also contributed to the improved financial standing of sugar mills.

Pressmud, a residual byproduct in the sugar industry often known as filter cake or press cake, has been acknowledged as another valuable resource for green energy production. The clarification process separates the sugarcane juice into a clear juice that rises to the top and goes to manufacture sugar, and mud, which collects at the bottom. This pressmud is combustible, and is also used in brick kilns for brick making. When mixed with the spent wash generated by distilleries, the resultant product is enriched organic manure, which is commonly used by farmers to improve their yields. The use of pressmud as a soil conditioner is popular among sugar planters.

Advantages

By utilizing pressmud as a feedstock for biogas production through anaerobic digestion, and subsequent purification to create compressed biogas (CBG), Indian sugar mills can generate extra revenue. Usually, the yield of pressmud falls within the range of 3-4% w/w with the input sugarcane processed in a unit.

The use of pressmud for CBG production offers several advantages. Firstly, it eliminates the complexities associated with feedstock supply chain as found in the case of agricultural residue, where biomass harvesting machinery is required for harvesting and aggregation. Secondly, the feedstock is sourced from one or two producers (sugar mills), as opposed to agricultural residue, which involves multiple producers (farmers) within a narrow window of 45 days per year. Thirdly, pressmud's quality is not a concern, unlike municipal solid waste where the presence of inorganic material can damage anaerobic digesters, leading to lower gas output. Fourthly, it eliminates pretreatment costs as it lacks lignin, unlike agri residue. Lastly, in terms of conversion efficiency, approximately 25 tons of pressmud are needed to produce 1 ton of CBG, compared to cattle dung, which requires 50 tons for the same gas output. Furthermore, its cost (Rs 0.4 – 0.6/kg) makes it more economical than other feedstocks like agricultural residue (Rs 1.5 – 2/kg) and cattle dung (Rs 1 – 2/kg).

Challenges

Nevertheless, pressmud use is faced with specific challenges. While once considered a disposal issue for sugar mills, owners have now recognized its potential for revenue generation. This realization has resulted in a substantial increase in pressmud prices over the last two years, rising from Rs 100 per ton to Rs 500-600 per ton. Pressmud faces competition for use as fertilizer and in bio-composting, contending with spent wash and being used as fuel in brick kilns. The lack of long-term agreements with sugar mills, and the involvement of mediators in procurement, further compound the challenges. Another challenge arises from the need for CBG plants to store feedstock for the entire year, given that sugar mills operate for a specific period. Storing pressmud proves challenging as it undergoes gradual decomposition, resulting in the breakdown of organic compounds. This complicates long-term storage and raises production costs.

Regarding regional production, Uttar Pradesh and Maharashtra contribute to approximately 65% of the total sugarcane cultivation area. Key sugarcane-producing states encompass Uttar Pradesh (225.2 million tons), Maharashtra (123.9 million tons), Karnataka (62.5 million tons), Tamil Nadu (16.9 million tons), and Bihar (12.1 million tons), collectively constituting around 440 million tons out of India's overall sugarcane production, which reached about 495 million tons in the 2022-23 period.

In the 2022-23 timeframe, among 531 operational sugar mills in India, 330 were privately owned, 190 were cooperative, and 11 were public. India's sugar production for the fiscal year 2022-23 amounted to 327.35 lakh[1] tons, accompanied by the production of approximately 114 lakh tons of pressmud. This quantity has the potential to generate 4.6 lakh tons of CBG valued at Rs 2,484 crore, considering the minimum guaranteed price of Rs 54 per kg under the Government's Sustainable Alternative Towards Affordable Transportation (SATAT) scheme.

[1]1 crore = 10 million, 1 lakh = 100,000

However, to fully unlock the potential of this resource, certain interventions are necessary at the earliest. Firstly, states with the highest CBG potential from pressmud should implement bioenergy policies that streamline the approval process for CBG projects, providing a unified solution and a variety of incentives, both monetary and non-monetary. Two examples of states taking progressive steps are Uttar Pradesh and Bihar, which have introduced supportive bioenergy policies for CBG plants.

Secondly, to prevent long-term economic instability in CBG plants resulting from unsustainable feedstock costs, the government should establish a mechanism to control pressmud prices below a specified threshold. Encouraging sugar mills to commit to extended agreements (10-15 years) with CBG plants, featuring an annual rate increase of 5-10%, will ensure economic viability.

Thirdly, comprehensive research is essential to develop technologies for pressmud storage that prevent methane emissions into the environment and minimize gas loss from the feedstock. In addition, state renewable energy nodal agencies, and biogas development and training centers (BDTCs) should conduct periodic training sessions to educate operators on the functioning of CBG plants, handling scientific equipment, and feedstock characterization.

Conclusion

Pressmud is a low-hanging fruit for the CBG industry, and it should be harnessed promptly to address waste management issues in sugar mills, create a sustainable energy source, and supply organic fertilizer to our soils.

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Reliance to Procure Pressmud for Compressed Biogas

As per a press release on 7 December 2023, Reliance Industries Limited (RIL), the owner of the world's largest single-location oil refining complex in Jamnagar, has reached out to companies operating sugar mills in different locations across India to procure thousands of tons of sugarcane pressmud – a crucial component for producing compressed biogas (CBG), on a daily basis for its biogas plants.

RIL chairperson Mukesh Ambani in the company's annual shareholder meeting in August 2023, announced plans to set up 100 CBG plants to convert agri-waste into gas in the coming five years. These plants are expected to consume 5.5 million tons of agri-residue and organic waste, thereby mitigating nearly 2 million tons of carbon emissions, and producing 2.5 million tons of organic manure annually.

RIL currently operates a commercial-scale CBG plant at Barabanki in Uttar Pradesh, which it had commissioned in a record time of just 10 months. It has also set up two CBG demo units at Jamnagar. In future, its CBG facilities will be linked to biogas dispensing stations operated by Reliance Jio BP, significantly contributing to India's bioenergy transformation.

At the Bengal Global Business Summit in Kolkata on 21 November 2023, the chairperson said that the conglomerate has become India's largest bio-energy producer, based on the company's indigenous developed technology. Ambani further informed that RIL would help farmers grow energy plantations on a large scale. "We are planning to set up CBG plants in Bengal that will enable local farmers to increase their incomes by doubling up as *anna daatas* and *urja daatas* — producers of food as well as energy," he said.

RIL has also partnered with DBS Bank India to launch a financing program for CBG plants. The collaboration aims to facilitate the development of an ecosystem for vendor partners to aggregate agricultural residue as inputs for Reliance's CBG production plants across India. The financing program is designed to make the CBG supply chain competitive and achieve enhanced commercial scale.

Sar Senapati Santaji Ghorpade Sugar Factory Ltd., Kolhapur: Case Study

2nd Rank in "Best Cogeneration Plant 2023 Award" for Above 87 kg/cm^2 Category (Private Sector)

Our cogeneration plant is a greenfield plant in Kagal taluka, Kolhapur district, Maharashtra. The sugar mill's capacity is 6,000 TCD and the 23 MW cogeneration plant was erected and commissioned in the 2014-15 season by ISGEC Heavy Engineering Ltd., Noida on a turnkey basis.

Cogeneration Project Details

Gross Power Generation : Capacity - 23 MW
Power export capacity : 14.5 MW/Hr (season)
: 19.5 MW/Hr (offseason)
Year of commissioning : December 2014

Boiler details:

ISGEC make, Capacity - 120 TPH
Working pressure -109 kg/cm^2, Designed pressure - 129 kg/cm^2
Steam temperature - 540 +/- 5 Deg C
Type - Travelling grate/Single drum
Flue gas conditioning system - ESP

Turbine details:

Make - Siemens, Power - 23 MW, Type - Steam turbine SST-300
Double extraction cum condensing, Speed - 6800 rpm, Inlet steam - 105 Ata
Bleed 1 pressure - 9.56 Ata & Temp - 234 Deg C
Bleed 2 pressure - 26.76 Ata & Temp - 365 Deg C
Bleed 3 pressure - 2.75 Ata & Temp - 129 Deg C
Exhaust pressure - 0.076 Ata & Temp - 40 Deg C

Alternator details:

TDPS make, Output - 28,750 kVA, Voltage AC - 11 kV
Current AC - 1509 A, Frequency - 50 Hz, Speed - 1500 RPM

Switchyard details:

Crompton Greaves Ltd. (CGL) make, 25 MVA transformer, 11 kV /220 kV with LA, Isolators, Metering & protection C.T., P.T., V.C.B. Breakers, Main & check meter (Export/ Import/ABT meter)

The plant also has:

- Bagasse conveyors 480 m in length to convey bagasse from the mill to the boiler
- Juice and water pipeline from the mill house to the boiling house, 500 m in length
- Extensive use of steam and power economy devices for maximum cogeneration
- Selection of high pressure cycle, i.e. 110 Ata, 545 Deg C for generating maximum power

More than 6.5 crore units of power were generated in the trial season.

Modifications/Expansion Works

We added two variable frequency drives (VFDs) to the cogeneration plant's cooling tower motors. The saved power was utilized for increased crushing.

The existing old distillery was expanded from 30 KLPD to 45 KLPD in season 2017-18. This led to enhanced production of Ethanol, Rectified Spirit (RS) and Extra Neutral Alcohol (ENA).

Advanced instrumentation & Automation

With several other innovations, and additional machinery and equipment installed, proper instrumentation, offseason maintenance, and advanced automation of the mill, boiler, turbine, and boiling house section, we reduced the average breakdown hours and achieved consistency in crushing from 210 to 250 MT/hr, which improved capacity utilization and plant efficiency, and saved power as well as bagasse.

A) Mill section automation:

In the complete mill section, all equipment is interlocked from the cane carrier to the main bagasse carrier (MBC) and return bagasse carrier (RBC).

Automation in cane preparation: Cane preparation equipment such as kicker, leveller, and fibrizer are interconnected/interlocked with each other. Automation

AWARD WINNER

system is monitored with PLC SCADA. Automation ensures uniform process of cane preparation. Due to all load sensing parameters, we can observe consistent load and a single person can operate the distributed control system (DCS) accordingly. That saved substantial time to operate locally.

VFD-based mill drives: Mill drives are VFD-based where all the mills are interlocked with each other. This automation drives the milling system uniformly and smoothly. As mills are interlocked, the Cascade system and mill RPMs can be varied as per loads. With advanced automation, mill performance is improved.

Advantages of advanced automation:

- Mill performance achieved with maximum extraction with less bagasse pol and moisture
- Efficient and smooth boiler operation
- All mill planetary gearboxes installed, which saved power consumption in all sections
- Constant crushing rate with trouble-free operations
- Minimum mill stoppages
- Convenient for maintenance as well as operation

B) Boiler section automation:

- Boiler operation is fully automated and controlled through PLC SCADA with easy monitoring
- ID/FD/SA[1] fans working with VFDs and pneumatic damper where power consumption reduced
- Bagasse feeding is uniform by giving proper set points/operational range on DCS
- Constant boiler pressure is maintained by auto soot blower system as it's controlled by automation
- Auto de-aeration, C.B.D., and attemperator temperature control system is properly maintained
- Ease in operations with less manpower

C) Boiling house section automation:

- Evaporator, juice heater, pan stations temperatures, pressure and vacuum parameters monitored through PLC-based system
- Auto control PH system is based on both pre-liming and shock liming
- Hydraulically operated cut valves are installed with proper instrumentation with easy operation
- All condenser operations controlled by automation system

Electrical Engineering Power Saving Measures

To save power and stabilize the load, we added VFDs to all sections:

- Mill section: Mill drive motors (4 nos.), Fibrizer motor, Feeder table, Cane carrier, Rake elevator, Strained juice pump installed with VFD drive
- Boiling house: Centrifugal machines (4 nos.), Juice pumps (2 nos.), Sulphited juice pump, Sugar bag conveyor (2 nos.)
- Oliver installed with VFD drive
- Cogeneration section: ID/FD/SA, Feed pumps, Drumfeeders, Cooling tower fan and RBC installed with VFD drives

The saved power is being utilized to increase the crushing rate to 250 TCH.

Water Conservation

In the sugar plant, maximum water is recycled and excess condensate of the evaporator is cooled up to ambient temperature and then recycled and provided all over the plant. The return condensate water is reused in the cooling tower at the cogeneration unit.

For water treatment, the RO plant processes the water, while the conserved water is reused all over the plant for drinking (R.O. water) as well as for industrial use.

Technical Performance Improvement

Sr. No.	Particulars	Season		
		2020-21	2019-20	2018-19
1	Cane Crushing MT	765,937	629,315	681,793
2	Crushing Rate MT including stoppage	5,703.85	6,003	5,814
3	Crushing Rate MT excluding stoppage	6,075.854	6,086	5,951
4	Reduced Mill Extraction (RME)	95.69	96.07	96.04
5	Pol % Bagasse	2.37	2.22	2.16
6	Steam % Cane	33.42	32.11	32.15
7	Moisture % Bagasse	49.83	49.20	49.10
8	Bagasse % Cane	28.64	28.71	28.04
9	Bagasse Production MT	219,399	180,676.04	191,174.75
10	Bagasse Consumption for Sugar Processing	168,976 MT	40,218.48 MT	40,433.45 MT
11	Bagasse Saving % Cane	5.5	5.41	5.86

[1] Induced Draft/Forced Draft/Secondary Air

Problems Faced

As with any operation, some unusual problems were faced during season with regard to machinery and equipment. The measures taken to tackle them and improve efficiency are as follows:

a) Rake elevator modification with addition of flap:

Problem: During cane preparation, sometimes "unwanted" material like M.S. angles, rods, tractor lock pins, rope hooks, etc. pass through the cane carrier along with the cane. When this type of material passes through the fibrizer, an abnormal noise is noted. At times, this material even passes on to the first mill and can damage the mill roller, leading to stoppages, loss of time and mill efficiency.

Modification/Expansion: To overcome this problem, we modified the rake elevator trough by adding a flap to the bottom side of the rake elevator at the center.

Performance: Now when such foreign material reaches the fibrizer, we stop the rake elevator quickly. We open the flap of the rake elevator and restart the rake elevator. When all prepared cane passes through this flap, the rake elevator empties out and we restart cane milling. We located the foreign material offline and dump prepared cane in the cane carrier. This also eliminates the problems at the mill as it is separated out before passing to the mills. This saves substantial time.

b) Cane fibrizer:

Problem: While the fibrizer is running, prepared cane was thrown back towards the cane carrier outlet zone. The bagasse was getting choked in the cane carrier chain and the rollers couldn't move, due to which rollers' wear was observed. Hence, wear and tear of the chain increased.

Modification/expansion: We added a second deflector plate of 25 mm, below the fibrizer swing diameter with 30 degree inclination.

Performance: Due to addition of this second deflector plate, thrown bagasse hits the plate instead of the cane carrier outlet zone. This helped avoid cane carrier roller jamming and chain jamming, and reduced downtime.

Export Power Details

Particulars	Season		
	2020-21	2019-20	2018-19
Cane crushed (MT)	765,937	629,314	681,793
Power export to MSEB in season (kWh)	47,371,500	39,967,500	43,042,500
Power export to MSEB (offseason) from own saved bagasse (kWh)	19,758,885	15,904,742	18,531,569
Power used for distillery (kWh)	3,852,132	3,272,535	3,625,709
Power utilized for sugar mill in offseason (kWh)	326,070	263,123	364,096
TOTAL POWER EXPORT	67,130,385	59,407,900	65,563,874
Export power, kWh/MT of cane	87.64	94.40	96.16
Captive power consumption for sugar mill (kWh/TCH)	22.05	21.83	20.58
Export Power Factor maintained	0.9	0.9	0.9

Note: Average power export achieved was approximately 87.64 kWh/MT

Revenue Received (3 Seasons)

Revenue received from cogeneration power export (Rs.)	453,801,402.6	393,874,377	416,986,238.64
Revenue received in Rs./MT of sugarcane	592	625	611
Maharashtra State Electricity Distribution Company (MSEDCL) EPA rate	6.76	6.63	6.36
Payback period	13 years		

Suggestions for Improvement

To improve the health of sugar industries, the following activities are recommended:

- Downtime should be minimum
- Increase the capacity utilization
- Improve imbibition % cane
- Sugar loss in bagasse as well as boiling house processes should be minimum

The steam consumption % cane only for sugar manufacturing process, excluding steam for the distillery, HP heater, Deaerator, and TG set condenser for the last three seasons are given below:

Particulars	Season		
	2020-21	2019-20	2018-19
Steam for process through turbine (% on cane)	32.20	32.11	32.15
Distillery	-	-	-
HP heater – 1 & 2 (% on cane)	4.31	4.40	5.16
Deaerator (% on cane)	2.46	1.81	1.85
Condenser (% on cane)	11.12	11.0	10.88

Power Consumption Data (kWh/TCH)

Power	Season		
	2020-21	2019-20	2018-19
Units generated	95.28	97.88	95.63
Units exported	61.84	63.50	63.13
Units consumed for sugar mill	21.62	21.83	20.58
Units consumed for auxiliary eqpt.	8.09	7.95	7.94
Units consumed for distillery & incineration boiler	3.71	4.14	3.97

Year-wise Power Generation

Electrical Power Generated (kWh)	Year		
	2020-21	2019-20	2018-19
Season	72,967,200	61,477,040	65,200,220
Offseason using own saved bagasse	23,036,664	18,266,371	21,539,014
TOTAL GENERATION	96,003,864	79,743,411	86,739,234

- Focus on improvements in sugar quality
- Advanced techniques as well as technology should be adopted to enhance overall performance and profits

Awards

- 2nd Rank in "Best Cogeneration Plant 2023 Award" for Above 87 kg/cm^2 Category (Private Sector) from Cogeneration Association of India
- National Award for "Best Overall Performance of Trial Season", from Bharatiya Sugars (2016)
- "Food Safety Management System (FSMS) Certification, as per ISO22000: 2005" (2017)
- National Awards from Indian Federation of Green Energy (IFGE) in category "Outstanding Renewable Energy Generation – Biomass" (Runner-up in 2018 and Winner in 2019)
- State-level Third Prize Award from Maharashtra Energy Development Agency (MEDA), Pune (2018-19)

- Automations in equipment and machinery to be maximized
- Sugar production cost to be minimized
- Maintenance cost to be minimized as much as possible
- Other process losses should be minimized
- Efficient and better utilization of water to be achieved
- Sugar export should be more
- Power consumption should be less
- All other byproduct production should be more such as alcohol, ethanol, spirit, etc.
- Better effluent treatments
- Technical staff and workers' knowledge to be timely upgraded
- Weekly and monthly review meetings to be held with technical staff regarding problems, solutions and future planning
- Better team work and involvement to be encouraged for improved performance

Courtesy:

Mr. B.A. Patil (Manager - Electrical)
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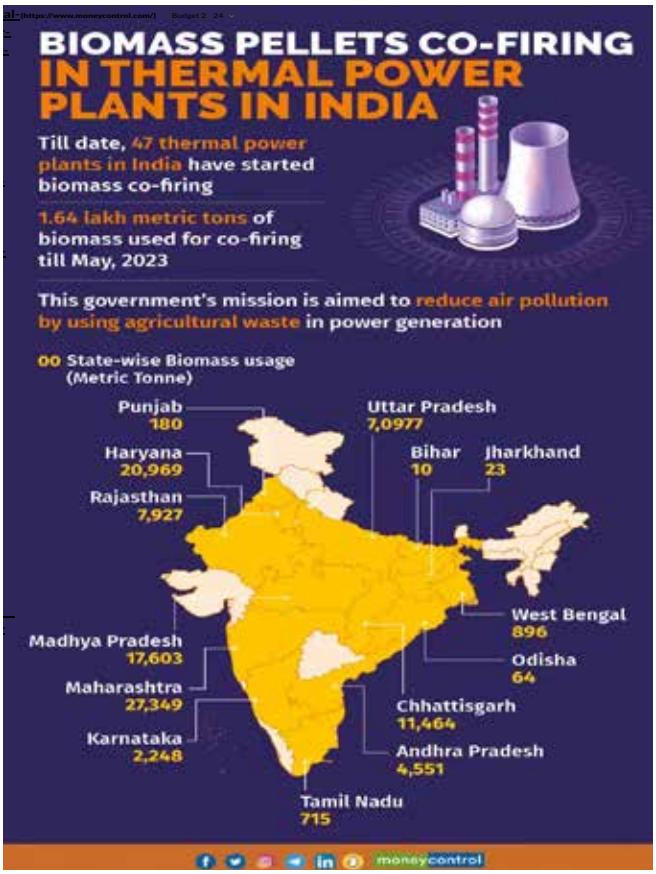
Biomass Co-Firing in Thermal Power Plants: Status

Revised Biomass Policy Mandate from FY 2024-25

As per Press Information Bureau Delhi, the Union Minister for Power and New & Renewable Energy informed in August 2023, that there were 47 thermal power plants (TPPs) that have carried out co-firing of agro residue-based biomass pellets with coal. The Ministry of Power (MoP) issued a modification on 16 June 2023 to revise the biomass policy dated 8 October 2021, which now mandates 5% biomass co-firing in TPPs from FY 2024-25. This obligation will increase to 7% from FY 2025-26.

The Minister informed that the Government has taken many initiatives to ensure the availability and procurement of biomass pellets for co-firing in TPPs like:

- Finance Assistance Schemes by Ministry of New & Renewable Energy (MNRE) and Central Pollution Control Board (CPCB) for biomass pellet manufacturing units,
- Reserve Bank of India (RBI) has approved 'Biomass Pellet Manufacturing' as an eligible activity under Priority Sector Lending (PSL),



- Procurement provision of biomass category has been created on the Government e-Market place (GeM) portal,
- Revised model long-term contract for biomass supply was issued by MoP,
- Vendor database was finalized on the SAMARTH[1] website – https://samarth.powermin.gov.in/,
- Awareness programs and advertisement campaigns were carried out,
- Provision of Udyam Aadhaar[2] on National Single Window System was made to streamline administrative processes for biomass-related projects, and
- Bankable Model Project Report for Biomass Pellet Plants was released, etc.

Further, the MoP, through a Policy Addendum dated 3 May 2023 indicated the various types of various agro residues that could be used, such as stubble/straw/stalk/husk, which are surplus and not being used as animal fodder, for making the biomass pellets. This includes agro residue obtained from crops like paddy, soya, arhar, gwar, cotton, gram, jawar, bajra, moong, mustard, sesame, til, maize, sunflower, jute, coffee, etc., as well as groundnut/coconut/castor seed shells, etc.

In addition, pellets made from the following agro products/crops/waste can also be used for co-firing in TPPs, viz. bamboo and its by-products, horticulture waste such as dry leaves and trimmings obtained from maintenance and pruning of trees and plants, and other biomass such as pine cones/needles, elephant grass, sarkanda, etc.

The Minister informed that approximately 164,976 metric tons of agri-residue-based biomass had been co-fired in 47 coal-based TPPs till May 2023. The state-wise list of TPPs co-firing the above biomass pellets is given on the next page.

The Centre for Science and Environment (CSE) investigated the reasons behind the delay in implementing the mandated 5% co-firing by coal TPPs in the NCR and adjoining areas, as below:

[1] Sustainable Agrarian Mission on use of Agri-Residue in Thermal Power Plants
[2] The Udyam Aadhaar registration process is based on the concept of self-declaration, enabling MSMEs to register themselves for free and obtain the Udyam Aadhaar number.

State-wise Details of Biomass usage in all TPPs in India (till May 2023)

Sl. No.	State	Name of the Plant	Capacity (MW)	Cumulative Biomass usage (metric tons)	State-wise Biomass Usage (metric tons)
1	Uttar Pradesh	National Capital Power Station, Dadri	1,820	20,617	70,977
2		Harduaganj TPS	1,265	7,392	
3		Feroze Gandhi Unchahar TPS	1,550	9,486	
4		Tanda TPS, Ambedkar Nagar	1,760	3,806	
5		Mahan Al. Unit-CPP	900	29,676	
6	Haryana	Yamuna Nagar TPS	600	455	20,969
7		Rajiv Gandhi TPS, Hisar	1,200	95	
8		IGSTPP, Jhajjar	1,500	16,008	
9		Mahatma Gandhi TPS, Jhajjar	1,320	4,411	
10	Punjab	Nabha Power	1,400	30	180
11		Guru Gobind Singh Super Thermal Plant Ropar, Ropar	840	61	
12		Guru Hargobind Thermal Plant, Lehra Mohabbat	920	39	
13		TSPL, Mansa	1,980	50	
14	Maharashtra	Mauda Super TPS, Nagpur	2,320	24,167	27,349
15		Solapur Super TPS, Solapur	1,320	3,060	
16		Dhariwal TPP Chandrapur	600	87	
17		GMR Warora Energy Limited	600	20	
18		JSW Energy - Ratnagiri Maharashtra	1,200	5	
19		Sai Wardha Power Generation Limited	540	10	
20	Karnataka	Kudgi Super TPS, Bijapur	2,400	1,912	2,248
21		JSW Energy - TPP Bellary	860	336	
22	Andhra Pradesh	Simhadri Super TPS	2,000	4,551	4,551
23	Chhattisgarh	LARA Super TPS, Raigarh	1,600	489	11,464
24		Sipat Super TPS, Bilaspur	2,980	3,882	
25		Jindal Super TPP Tamnar	3,400	24	
26		Raipur Energen	1,370	77	
27		Badadarha TPP	1,200	25	
28		Raigarh Energy Generation	600	25	
29		Bharat Aluminum Company	1,740	6,942	
30	Madhya Pradesh	Gadarwara Super TPS	1,600	3,140	17,603
31		Khargone Super TPS	1,320	13,417	
32		Jaypee Nigrie Super TPP	1,320	577	
33		Jaypee Bina TPS	500	425	
34		Sasan Power	3,960	44	
35	Bihar	Kahalgaon Super TPS	2,340	10	10
36	West Bengal	Budge Budge TPS	750	181	896
37		Haldia TPP	600	90	
38		Farakka Super TPP, Murshidabad	2,100	77	
39		Durgapur Steel TPS	1,000	501	
40		Bakreswar TPS	1,050	22	
41		Sagardighi TPS	1,600	25	
42	Rajasthan	Adani Power Rajasthan	1,320	111	7,927
43		Shree Mega Power Bewar (CFBC)	344	7,816	
44	Odisha	Jharsuguda Captive Power	1,215	44	64
45		GMR Kamal Ganga	700	20	
46	Tamil Nadu	OPG Power Generation	420	715	715
47	Jharkhand	Jojobera Power Plant	427.5	23	23
Grand Total			**64,351.5**	**164,976**	**164,976**

Note: As given by the Union Minister for Power and New & Renewable Energy Shri R.K. Singh, in a written reply to a question, in the Rajya Sabha on August 2, 2023.

- The Harduaganj TPP attributed its success in co-firing biomass to a consistent and affordable biomass supply. However, they acknowledge that the supply chain needs further strengthening.
- In contrast, Haryana Power Generation Corporation Limited (HPGCL) faced challenges due to technical limitations and a shortage of torrefied biomass pellet manufacturers.
- Mahatma Gandhi TPP faced technical limitations of only being able to co-fire up to 1.5% biomass pellets instead of 5% as mandated and would need significant investments to increase biomass co-firing to the mandated level, impacting electricity tariffs.
- Talwandi Saboo TPP struggled to find vendors for its plant due to the absence of established technology for manufacturing torrefied biomass pellets.

Efforts to Overcome Supply Challenges

Several plants, like Indira Gandhi TPP, have initiated measures to address the supply challenge by issuing tenders for raw materials to set up in-house pellet manufacturing units and also explored partnerships and in-house manufacturing for biomass pellets.

Challenges in Implementing Biomass Co-Firing for Farm Fire Reduction:

Despite government directives and efforts to enhance pellet manufacturing capacity, the study suggests that biomass co-firing may not significantly reduce farm fires.

Timely planning and a coordinated approach, from tendering by coal TPPs to crop residue procurement by pellet manufacturers, are essential to effectively address stubble burning, which is time-sensitive.

Biomass co-firing is the practice of combusting coal and biomass in high-efficiency coal boilers. For this purpose, the existing coal power plant has to be partly reconstructed and retrofitted. The Indian Government mandated its use to reduce greenhouse gas emissions and costs, while saving precious coal reserves. Co-firing 5 to 7% biomass pellets in TPPs can prevent 38 million tons of carbon dioxide every year, as per the Finance Minister in the 2022 budget speech.

Solutions

To accelerate this initiative, a steady supply of biomass to power plants needs to be ensured by developing a reliable supply chain that can transport biomass to plants. This could involve partnering with farmers, forestry companies, or other biomass suppliers to secure a steady supply of biomass.

To ensure the above, the necessary infrastructure and logistics to transport, store, and process biomass is critical. This could involve building new storage facilities, upgrading transportation networks, or investing in new processing technologies.

Finally, the Co-firing Policy needs to be backed by a strong policy and regulatory framework that provides incentives and support for biomass co-firing. This should include developing specialized boilers, burners, and control systems that can handle the unique characteristics of biomass, as well as retrofitting existing equipment to accommodate biomass co-firing.

Sources: PIB/Delhi and https://www.drishtiias.com/

Udagiri Sugar and Power Ltd., Bamani (Pare): Case Study

2nd Rank in "Best Cogeneration Plant 2023 Award" for below 87 kg/cm^2 Category (Private Sector)

Dr. Shivajirao Kadam Sir established this plant in 2012 on barren land of Bamani, Tal. Khanapur, Dist. Sangli. Due to the absence of water, tankers had to be used for the erection work of the factory, completed in a record period of 8 months, and also over the first two seasons.

The company deals in the manufacture, process, refining, sale, purchase, export and import of white crystal sugar, raw sugar, and byproducts such as bagasse, molasses, and pressmud. We also installed a molasses-based distillery with capacity of 30 KLPD in 2015, to produce Rectified Sprit, Special Denatured Spirit, Extra Neutral Alcohol (ENA), and Ethanol.

Initially, a 2500 MT sugarcane crushing plant was set up with a 14 MW cogeneration plant, using bagasse as fuel. During the first trial season of 2012-13, crushing of 213,425 MT was achieved. Considering the availability of sugarcane, we have expanded our sugar factory capacity to 5000 MT and the distillery capacity to 170 KLPD in the 2023-24 season. All units are running successfully.

We are giving cane payments to farmers in time with one installment. There is no pendency of FRP of cane farmers. Many times, we had paid more than FRP to farmers.

Boiler & Turbine Information

85 TPH Boiler: Make - Hi-Tech Engineering Corp. (I) Pvt. Ltd. Baramati, Working Pressure - 72.5 kg/cm^2, Working Temp.- 515 ± 5 ^{0}C, Total Heating Surface - 4,133.86 m^2

20 TPH Boiler: Make - Hallmark Boilers Pvt. Ltd. Baramati, Total Heating Surface – 1,081.21 m^2

14 MW Turbine: 1 no. 11 kV, 14 MW at Power Factor 0.8 Back Pressure Type. Make - Triveni Turbine Bengaluru, Power Rated – 14,000 kW, Inlet Steam Pr. - 72 Ata, Inlet Steam Temp - 510 ^{0}C, Extraction Steam Pr. - 2.50 Ata

Alternator- AC Generator Output – 17,500 kVA

2.25 MW Turbine for Distillery: One no. 2.25 MW Back Pressure Turbine, Make - Triveni Turbine, Power Rated kW - 1,920, Inlet Steam Pressure kg/cm^2 (g) – 43, Inlet Steam Temperature ^{0}C - 430

Alternator for Distillery - Out Rating - 2812.5 kVA, Power Factor - 0.8, Voltage - 415 V, Make - Nidec Industrial Automation India Pvt. Ltd. Bangalore

Distributed Control System (DCS): CPU - C 300 controller, Software - Plant Cruise 5.20, IOS Capacity - 1500 IOS Modules, Redundant Server - 2 nos., Console Station - 1 no., Operating Station - 3 nos., Make – Honeywell

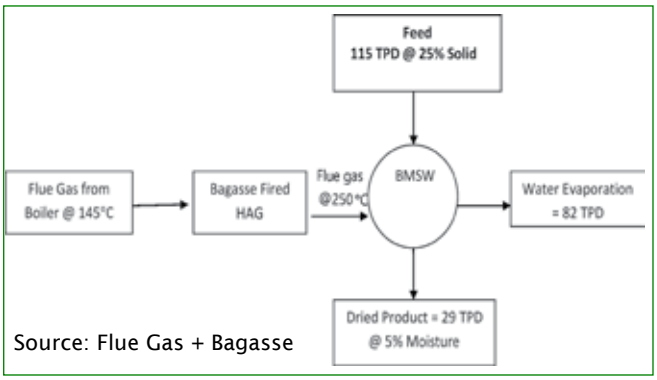
The latest technology adopted in our plant includes:

Rotary Particle Collector (RPC) to collect the boiler ash particles from flue gases instead of the electrostatic precipitator system. This is patented in the US and installed in our plant, the first in Asia. The RPC consists of a rotating fltering cum capturing element called Rotor, inlet and outlet transition gas hoods, top cover, hopper at the bottom, and a unit to clean air jets and the Drive unit. The Rotor, the heart of the system, is designed for fltering the gas and rotates at minimum rpm. The Drive arrangement facilitates speed reduction. The air cleaning unit ensures proper discharge of dust to the hopper. The inlet and outlet transition gas hoods ensure the uniform flow of gas over the Rotor for cleaning and discharging of ash. The Rotor captures the dust that gets dislodged to the bottom hopper. The cleaned part reaches upwards again to the dust capturing zone. This way the Rotor continuously captures dust, dislodges it to the hopper, and limits the emissions in exhaust gas.

Rooftop Solar Panel: We have installed a 200 kW solar panel on our Godown top, from which we generate average 800 to 1,000 units/day, due to which we are saving Rs. 12,000/day in power costs.

AWARD WINNER

Spent Wash Dryer: The spent wash generated from the distillery is fired in the dryer and converted into powder, which contains high volumes of potash – a key source of fertilizer. Due to this we have achieved ZLD, i.e. Zero Liquid Discharge, in the distillery.



Source: Flue Gas + Bagasse

Details: Feed rate – 4,614 kg/hr, Solids in feed – 25%, Output from spray dryer – 12 kg/hr at 5% moisture, Water evaporation – 3,400 kg/hr, Connected load – 380 kW, Consumed load – 304 kW, Fuel required – Flue gas + Bagasse (Flue gas - @ 145°C + 28 TPD Bagasse @ NCV 2200 kCal, Only bagasse – 1,940 kg/hr, @ NCV 2200 kCal, Air pollution control system – Cyclone + Scrubber, Atomization system – Rotary air atomizer

Steam and Power Saving Measures

To improve performance and efficiency over the years, several steam and power saving measures were taken as below:

1) New efficient thermodynamic steam trap installed.
2) All drain-water is sent to the condensate water tank and recycled to the feed water tank.
3) By using distributed control system (DCS) automation, controlled steam was supplied to the sugar and distillery process, leading to savings in steam and power.
4) Use of live steam, i.e. 8 ata steam for sulphur melting, centrifugal machine and pan washing was stopped by using a heat recovery system, where the electric heaters superheated the wash water.

Condensate Polishing Unit (CPU): Capacity - 65 m/Hr. CPUs established in the sugar and distillery plant to collect the condensate water, treat it, and re-use it in the plant. Due to this the raw water consumption has been drastically reduced. Also the excess wastage water going outside the factory has been reduced.

5) Raw juice heating is done by the plate heat exchanger (PHE) in which vapor condensate is used.
6) Steam is being saved by using a direct contact heater (DCH).
7) Circulation of the massecuite in vacuum pans plays a vital role in the steam requirement. After installing a circulator, steam and water is being saved.

Performance of Crushing Season

Season	Date of Starting	Total Days	Sugarcane crushed MT	Sugar production Qtls.	Sugar recovery %	Cogeneration export unit	Distillery production (liters)
2012-13	16-12-12	96	2,13,425	2,50,870	11.81	3,48,750	0
2013-14	01-12-13	142	4,02,363	4,92,070	12.23	2,72,51,000	0
2014-15	12-12-14	169	4,52,518	5,31,380	11.73	2,97,29,500	0
2015-16	08-11-15	143	4,47,843	5,28,100	11.76	2,72,51,000	48,25,000
2016-17	09-11-16	95	3,05,370	3,59,600	11.76	1,85,24,000	37,96,000
2017-18	10-11-17	154	4,73,168	5,62,250	11.87	2,94,97,500	57,07,423
2018-19	29-10-18	140	5,01,381	5,96,650	11.90	2,60,67,750	66,45,001
2019-20	22-11-19	129	5,00,002	6,17,500	12.35	2,70,33,000	58,66,664
2020-21	03-11-20	148	5,77,031	6,92,650	12.37	3,06,85,950	73,73,484
2021-22	21-10-21	186	6,75,902	8,03,000	12.20	3,83,25,750	87,77,777
2022-23	25-10-22	140	5,59,153	6,37,870	12.03	3,12,04,500	62.99.084 34,11,155 (Ethanol)
2023-24	1-11-23	112 (20/2/24)	5,08,605	5,31,900	11.46	1,03,41,750	55,20,264

Revenue from REC Trading

Sr. No.	Particulars	2018-19	2019-20	2020-21	2021-22	2022-23
1	RECs Traded in FY	10,271	10,892	1,996	21,970	4,399
2	REC Sale Amount (Rs.)	1,18,97,000/-	1,74,61,300/-	19,96,000/-	2,20,42,000/-	43,99,000/-

REC = Renewable energy certificate

Outstanding Plant Performance

Sr. No.	Particulars	2018-19	2019-20	2020-21	2021-22	2022-23
1	Power generation (kWh/ton of cane)	84.87	86.34	85.27	90.73	91.99
2	Power export (kWh/ton of cane)	51.99	54.06	53.18	56.78	56.1
3	Plant load factor	93.2	96.87	97.64	95.57	85.51
4	Steam to fuel ratio	2.2	2.19	2.02	2.09	2.10
5	Bagasse saving % on cane	4.32	4.65	1.71	2.73	1.91

8) Previously the condensate extraction pump (CEP) discharge was sent to the feed water tank. Now it is sent directly to the Deaerator.
9) Variable frequency drives (VFDs) have been installed for cane unloading, all carriers, juice/ water/massecuite pumps, all fans, and mill drives. More than 100 VFDs are being used in the plant with proper automation, due to which power is being saved and maintenance has been reduced.
10) Earlier, Helical, worm-type of gear boxes were used. To reduce power consumption, these have been replaced with planetary type gear boxes.
11) An inverter-type, five-star rating air-conditioner has been installed to save power.
12) Conventional lighting has been replaced with LED lamps and photo sensing timers for lighting.
13) Capacitors of proper ratings are installed in 11 kV as well as at the 440 V level to reduce losses and maintain reactive power.
14) All new motors installed have energy efficient ratings.

Remedial Actions Taken in Cogeneration Plant

To improve performance and efficiency over the years, several remedial measures were taken in the cogeneration plant:

1) In the earlier Hi-Tech make boiler, the ID fan capacity limited the boiler loading. So an additional ID fan of suitable capacity was installed, which now operates the boiler on full load.
2) We have provided a biogas connection to the boiler and hot air to the blower fan inlet, and observed increased boiler efficiency with bagasse saving and reduced fluctuations in steam generation.

Social Activities

Under Corporate Social Responsibility (CSR), we carry out several social and public welfare activities in the area. We donate around Rs. 25-30 lakhs every year for education, health, agricultural promotion, environment, natural disaster relief, and infrastructure development.

Awards

Besides the Cogen India award in 2023, our sugar factory has received various State as well as National Awards as below:

- From Vasantdada Sugar Institute (VSI), Pune for Best Technical Efficiency Award in 2016-17, and Overall Best Financial Management Award for season 2019-20 and 2020-21.
- Green Energy India Award from Indian Federation of Green Energy in 2020-21, in the presence of the auspicious hands of Hon'ble Nitinji Gadkari, Central Minister for Road Transport.
- Best Environment Friendly Sugar Mill Awarded by Chini Mandi, New Delhi (2024).
- Maharashtra Mahagaurav Awarded by Maharashtra Digital Media Editor Journalist Association to Chairman & Managing Director (CMD) Dr. Rahul Kadam (2024).
- Youth Icon of Sugar Industries Awarded by Bhartiya Sugars to CMD Dr. Rahul Kadam (2024).

Courtesy:
Uttam V. Patil.
Whole-Time Director
Udagiri Sugar & Power Ltd.,
Bamani-Pare, Tal. Khanapur, Dist. Sangli
Registered Off: 'Savira' S. No. 97, Plot No. 130 Right Bhusari Colony
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Bagasse Pith Firing (Upto 70%) in Travelling Grate Boilers

Sugarcane bagasse, a residue of the sugarcane milling process, consists of natural fibers with high availability. In India, the annual production of sugarcane reaches several billion tons. Nearly 30% of that number will turn into bagasse when it is crushed in a sugar factory. As the stock is abundant, the price of sugarcane bagasse is cheaper than that of other natural fibers. Sugarcane bagasse is also used in paper mills, which have a large amount of waste as sugarcane bagasse pith (SBP).

There have been previous cases of pith firing in boilers limited to 15-20% by the end users; however, they experienced a number of issues, mainly due to combustion, deposition, and high unburnt carbon. Isgec, after considering feedback, designed, erected and commissioned a boiler that can fire SBP up to 70%.

Need of Industry

Biomass is a promising renewable form of energy. Biomass waste is derived from trees, crops and forestry operations; organic wastes; and agro-industrial waste generated by wood conversion and paper industries. Among these, sugarcane bagasse has been identified as a suitable renewable energy. It is the fibrous material that remains after the extraction of sugarcane juice and possesses 30-40 wt% of sugarcane. Bagasse contains approximately (32-45%) cellulose, (20-32%) hemicellulose, (17-32%) lignin, (1-9%) ash, and some extractives. Hemicellulose is an amorphous chain of polysaccharides, which can be converted into fermentable sugars after pretreatment and hydrolysis, and produce bioethanol and biochemicals.

Sugarcane bagasse is divided into two major components – pith (inner part) and rind (outer part). The fiber contents are 10%, 20%, 30%, 40%, and 50% in weight.

Biomass Fuel: Bagasse Pith

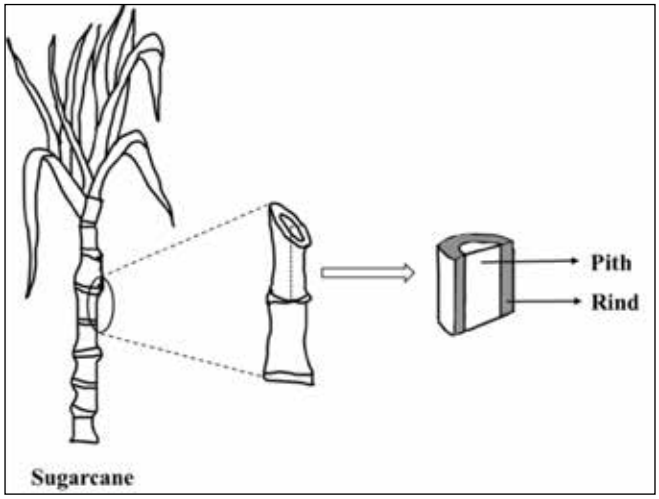
The term pith is also used to refer to the pale, spongy inner layer of the rind. The word comes from the old English word piþa, meaning substance, akin to Middle Dutch pitte (modern Dutch pit), meaning the pit of a fruit.

The stalk of the sugarcane plant includes an outer rind and inner pith. The rind is made up of a hard fibrous substance surrounding a central core of pith, which is softer due to a spongy structured component.

Pith Extractor Plant in Paper Mills

Typical Analysis of Bagasse Pith & Bagasse

Ultimate Analysis	Units	Bagasse	Bagasse pith
Carbon	%	23.50	26.11
Hydrogen	%	3.25	3.58
Nitrogen	%	0.00	0.24
Sulphur	%	0.00	0.03
Ash	%	1.50	2.18
Moisture	%	50.00	45.30
Oxygen	%	21.75	22.56
GCV	kCal/kg	2,272	2,346



Special Design Features of Isgec Supplied Pith-fired Boiler

Some of the specific features that were incorporated in the design of the bagasse and pith-fired boiler supplied at M/s Bindal Paper Mills Ltd. (Sugar Division) for their greenfield project in Bijnor, Uttar Pradesh are:

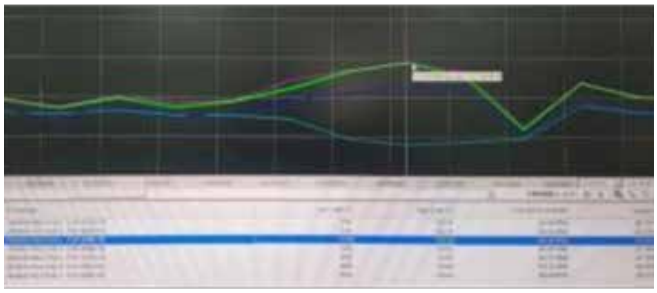
- Taller furnace
- Double goose neck in lower furnace
- Strategically located specially designed over-fired air nozzle
- Optimized distribution of total air flow
- Fuel feeder design to handle low density fuel

70% pith-fired boiler supplied at M/s Bindal Paper Mills Ltd. (Sugar Division) Bijnor by Isgec in year 2023

Log Sheet for Bagasse Pith Firing					
Project Name: M/s Bindal Paper Mills Ltd. (Sugar Division)					
Boiler Details: 100 TPH TG boiler					
Fuel During Test: Bagasse Pith (Readings taken on 4 different operating days)					
Parameters	Units	Days 1-4			
Main steam flow	TPH	82.5	89	78	83
Steam pressure at MSSV outlet	bar	65	65	65	65
Steam temperature at MSSV outlet	Deg C	480	480	475	476
Drum pressure	bar	69	69	69	69
Drum level	%	50	51	52	49
Furnace temperature	Deg C	660	661	670	633
FG temp. at ESP inlet	Deg C	125	126	127	125
Oxygen	%	6.1	6.3	6.2	7
DF no. 1 speed	RPM	450	480	697	732
DF no. 2 speed	RPM	750	924	865	876
DF no. 3 speed	RPM	750	925	866	877
DF no. 4 speed	RPM	400	820	693	825

ESP: Electrostatic precipitator

Furnace flames



Changes in feeder speed

- Optimized flue gas velocity in furnace
- Convective surfaces tube with higher tube pitch
- All auxiliaries sized for worst fuel combinations

Case Study

The boiler was commissioned in the crushing season of 2023-24 and has been operated under various combinations of bagasse (up to 30%) and pith (up to 70%) at M/s Bindal Paper Mills Ltd. (Sugar Division).

Results and Discussion

The case study has demonstrated the practicality of operating pith in travelling grate boilers for extended

periods and with good boiler efficiency being achieved. If the same quality of pith as supplied by Bindal is fired in presently designed boilers, the following long-term effects can be achieved:

- Feeder rpm improved, better fuel control
- Improved boiler efficiency
- Improved combustion flame
- Boiler operates on less excess air

Conclusion

Variation in pith properties are taken care of in the design to have effective combustion ensuring full utilization of the heat from the pith, thereby reducing fuel consumption or improving steam to fuel ratio.

Success of the travelling grate-based pith-fired boilers is now established for paper mills as demonstrated by the case study, and is now proving to be a great contributor to achieving better boiler efficiency.

Specific design features adopted for pith firing produced from paper mills now ensure high availability and good efficiencies of pith-fired travelling grate boilers. Paper mills are now considering continuous and efficient operation using pith in their boilers throughout the year.

Acknowledgement

We are grateful to the management and technical team of M/s Bindal Paper Mills Ltd. (Sugar Division) Bijnor, India for their support and co-operation during the project and operation of the boiler during pith firing. Other references include data from online papers and Isgec's technical library.

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The pith is the internal part of the sugarcane plant with short and variable fiber length. The presence of pith creates process-related issues in papermaking, so it must be removed from the bagasse. Pith has low calorific value, and burning of pith in boilers also creates boiler operational issues as well as environmental pollution and health hazards. The imposition of stringent emission norms by the environmental regulatory bodies is compelling these industries to search for cleaner alternatives to fuels. Pith is generated in huge quantities so its disposal or management will become a major challenge if industries shift to cleaner fuel. Considering these pressing issues and some recent relevant research reported on pith valorization, various studies have been conducted to explore the potential of pith valorization and on alternate routes for the valorization of pith into value-added products. Since pith is also lignocellulosic biomass, therefore, its valorization after pretreatment and as such direct utilization (without pretreatment) has also been explored. Furthermore, various promising pathways have been researched on pith valorization that will make the sugar and associated pulp and paper mill more economically and environmentally sustainable.

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https://www.isosugar.org/event/40/s&p-global---geneva-sugar-conference-2024

Subsidy for Bagasse-Based Cogeneration Projects in Maharashtra

Bagasse-based cogeneration power projects in Maharashtra have been facing financial stress as a result of the tariff fixed under the E-Reverse Competitive Bidding process with ceiling limits, which were both unreasonably low and the bidding process went beyond the legal scope of the MERC (Maharashtra Electricity Regulatory Commission) Regulations of 2015.

In the absence of Electricity Purchase Agreements (EPAs) for grid connectivity, the project proponents had to succumb to the policy of Competitive Bidding to save themselves from the financial risk of CAPEX recovery for the capital availed through the financial institutions. In the absence of power purchase agreements (PPAs), resulting into non-evacuation of power generated, the plants would have been rendered unproductive, resulting into non-performing assets (NPAs) and thereby compounding problems with the leading banks.

The cogeneration power projects set up under Govt. of Maharashtra Policy of 2015, which per-se was devoid of any mention of E-Reverse Competitive Bidding with ceiling methodology, were suddenly made to toe in the new arrangements of bidding, which effectively was coercive. Resultantly 18 projects had to undergo the bidding process route in which the tariff got limited to Rs. 4.75, Rs. 4.97, Rs. 4.98 and Rs. 4.99 per unit.

The Cogeneration Association of India (Cogen India) contested the MERC Order dated 18 August 2018 in Case No. 204 of 2018 challenging the very crux of the competitive bidding. The Appellate Tribunal For Electricity (APTEL) made serious observations in the decision of MERC, mentioning it as a serious error of abandoning its own regulations of 2015, the National Tariff Policy dated 28 January 2016, and Section 62 of the Electricity Act 2003. APTEL held that while consumer interest is important it should have been balanced with legitimate expectation of the generators for reasonable return of the costs of generation.

The State Government subsequently declared its new policy for New and Renewable Energy in 2020 vide Government GR APU-2020/PK 137 dated 31 December 2020. However, for the earmarked target of 1,350 MW of bagasse-based and other biomass cogeneration projects, the policy for tariff was mandated through the MOU route and EPAs were being executed at Rs. 4.75 per unit, similar to those of competitive bidding. The response to this policy did not seem to be evoking much interest from potential investors largely due to the unreasonable tariff and precarious condition of recovery of dues from farmers; in absence of which the tariff paid was at 95%, i.e. Rs. 4.51 per unit. Only 11 projects involving 227.4 MW entered into EPAs, out of which only three were commissioned.

In the mater of projects whose initial EPAs expired post the 13-year validity and were renewed for further 12 years considering plant life span of 25 years, the tariff was restricted to Rs. 4.75, which was further limited to Rs. 4.51 as a result of the recovery condition mandated by MERC.

Cogen India hence requested the State Government to rationally consider the cost of generation for bagasse-based cogeneration plants and provide financial assistance @ Rs. 1.50 per unit to all the above projects, which the Government has approved, subject to the condition that the final price payable should not exceed Rs. 6.0 per unit.

As a result of sustained efforts, submissions, follow-up and high-level discussions/meetings undertaken by Cogen India, the Government of Maharashtra approved a subsidy of Rs. 1.50 per unit for all bagasse-based cogeneration power projects in Maharashtra. This will result in an increase in tariff by Rs. 1.50 per unit and the tariff will now be increased from Rs. 4.75 to Rs. 6.00 per unit.

Cogen India welcomes the decision of the State Government and expresses thanks in assisting the bagasse-based cogeneration sector.

Courtesy:
Cogeneration Association of India
Email: cai@cogenindia.org
Web: www.cogenindia.org
Cell: +91 98230 04221

Overview of Green Ethanol Industry In India 2024

India's ethanol industry has grown manifold since the government mandated its mandatory blending with automobile fuels. From just a 1.5% blending target from 2005-14, it was moved to 10% during 2014-22. As the 20% target sets in from 2025, ethanol demand is expected to increase to 1,016 crore liters, making the worth of the ethanol industry jump by over 500% from around Rs 9,000 crore to over Rs 50,000 crore, according to the government's projections.

Ethanol Stocks

In India, ethanol is mostly produced by sugar makers, many of which are listed on stock exchanges. These ethanol stocks offer investors an opportunity to be part of India's ethanol growth story. Their fortunes closely follow the government's ethanol blending program and sugar prices. Ethanol stocks have seen upswing in their fortunes as oil marketing companies (OMCs) have increased their purchases of the biofuel.

Top 5 Green Ethanol Stocks In India

1. Bajaj Hindusthan Sugar
2. Shree Renuka Sugars
3. Triveni Engineering and Industries
4. Balrampur Chini
5. Dalmia Bharat

Source: https://www.5paisa.com/ - as on Feb 09, 2024

With the target for 20% ethanol blending approaching next year, 2024 seems to be promising year for ethanol stocks. Green ethanol, a renewable and sustainable biofuel, is gaining prominence as a cleaner alternative to traditional fossil fuels. The government is trying to cut its reliance on imported crude oil and ethanol is the best fit for this. These stocks can also become Environmental, Social, and Governance (ESG)-compliant, helping bring foreign funds. The factors to watch out for could be lower production of sugarcane that can force the government to divert more production to sugar.

Factors to Consider Before Investing

While ethanol stocks do present a lucrative investment opportunity, there are several factors to consider before investing in them. These include the following:

Financials: Check the fundamentals of the ethanol company that you plan to invest in carefully. The company's balance sheet and cash flow statement need careful analysis for debt, promoter share pledge, free cash, etc.

Technical: If the valuation of an ethanol company is already very high, then one should be careful about investing in it. One should also look at other factors such as moving averages, support and resistance for each stock, etc., before investment decisions.

Regulatory issues: Sugar is one of the most regulated commodities in India. As most ethanol producers are sugar mills, investors should keep abreast of the changes in regulations regarding sweeteners, sugarcane production, etc.

Feedstock: Analyze the sources of feedstock used for ethanol production. Companies with diversified and sustainable feedstock supply chains are better positioned for stability.

Oil market: The fortunes of ethanol stocks are closely linked to oil markets as the main consumers of ethanol are OMCs.

ESG: Ethanol stocks often appeal to environmentally-conscious investors. Assess the companies' commitment to sustainability and their efforts to reduce carbon emissions and corporate governance.

Competition: The OMCs buy ethanol through auction. Ethanol stocks with good margins will always be able to perform better than peers when it comes to sales.

Advantages of Investment in Ethanol Stocks

Investing in ethanol stocks can offer several advantages, such as:

Renewable energy growth: Focus on lowering carbon emissions has intensified, leading to higher demand for renewable energy sources like ethanol.

ESG: Many funds are now investing in stocks that are compliant with ESG norms. Ethanol stocks tick at least one of the boxes.

Government support: Indian government has been backing increase in ethanol blending in auto fuels to cut reliance on import of crude oil.

Hedge: Since ethanol is an alternative to petroleum-

based fuels, investing in ethanol stocks can serve as a hedge against volatility in the oil market.

Global expansion: Exports are now emerging to be a viable market for Indian ethanol makers as they reduce costs and expand production capacity.

Challenges & Risks in Investing in Ethanol Stocks

Investing in ethanol stocks, while offering potential advantages, also comes with various challenges and risks:

Commodity Price: Ethanol prices are closely linked to the prices of commodities like corn, sugarcane and sugar.

Oil prices: If prices of oil were to fall, the reason to blend biofuels will get blunted.

Regulatory risks: The ethanol industry is heavily influenced by the Indian government policies and regulations, including subsidies and biofuel mandates.

Competitive: More and more sugar companies are getting into ethanol production leading to crowding in the sector.

Investors in ethanol stocks must take these risks into account before investing in ethanol stocks.

Conclusion

Ethanol stocks present a unique opportunity in India due to the government-led demand and the rising stature of the renewable energy sector. While ethanol stocks do offer potential for growth, they also require careful consideration of inherent risks and market dynamics due its close linkage with the sugar sector and highly volatile oil prices.

Note: This article only describes this opportunity and readers are advised to conduct their own due diligence accordingly.

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05-07 June 2024

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International Bio-Energy Conference

3-5 October 2024

India Expo Centre, GREATER NOIDA

Web: https://biogas-india.com/

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Theme: Biofuels as a Sustainable Solution: Reducing Waste, Feeding Energy

October | 21-22 | 2024

Tokyo, Japan

Web: https://crgconferences.com/biofuels
https://biofuelexpo.com/

Email: event@ies-india.com; balram@biofuelexpo.com

Bioenergy	Biodiesel	Production of Biofuels
Biomass Technology	Algae biofuels	Bioeconomy
Bioenergy with carbon capture and storage	Bioenergy Conversion	Biogas
Biofuels cells	Advanced Biofuels	Bioremediation
Biofuels vs Fossil fuels	Green Energy	Biofuel Future and market scope
Bio Hydrogen	MSW Methane gas production upgrading	Bio alcohols and bioethanol
Energy Storage and Conversion	Nanotechnology in Biofuels	Wastewater Management
Advanced Bio refineries	Cyanobacterial Biofuels	Biomass and the Environment
Renewable Energy	Process Technologies for Bio Diesel	Global scenario of Bio economy
Sustainable Energy	Advances in renewable chemicals	Solar energy
Environmental Impacts of Biofuels	Challenges in research on advanced Biofuels and Bioenergy	Biomass as a sustainable alternative resource for livestock feed

FORTHCOMING EVENTS

IREDA Financing Norms & Schemes
(as of 27 Dec 2023)

For setting up New Distilleries/Expansion of Existing Distilleries for Production of Ethanol using Sugarcane Juice/Sugar Syrup/B-Heavy Molasses/C-Heavy Molasses/Damaged Food Grains/Surplus Rice with FCI[1] And Other Feedstock such as Sorghum/Sugar Beet, etc.

Scheme Objective: The main objective of the Scheme is to provide financial assistance for the setting up of a new distillery or expansion of an existing distillery for manufacturing of ethanol, which in turn promotes blending of biofuel in petroleum for reduction in pollution levels and addressing the issues of sugar demand-supply chain.

Projects Eligible for Assistance: All the commercially viable First-Generation ethanol manufacturing plants either in newly set up distilleries (or) expansion (enhancement of capacity) of existing distilleries using 'molasses/sugar syrup/cane juice/damaged food grains/surplus rice with FCI' and other feedstock such as sugar beet/sorghum, etc. as raw material.

Interest Rate: Interest rate may vary time to time as per IREDA policy. However, an additional rate of interest of 0.10% will be charged on the entire loan amount in case the loan amount exceeds 75% of the project cost.

Repayment Period & Moratorium: The repayment period should be maximum of 7 years (including moratorium up to 12 months from COD) depending on the project cash flows and DSCR of the project, and it should be after the implementation period. In case of consortium/ co-financing, terms and conditions can be aligned with the lead FIs/banks/underwriters/syndicators.

Base Case Financial Indicators: The Base case financials should ensure compliance of the following financial indicators: -

Average DSCR > 1.20
Minimum annual DSCR > 1.10
ACR > 1.0
IRR (Post Tax) > Interest rate of project

Promoter Contribution and Quantum of Loan:

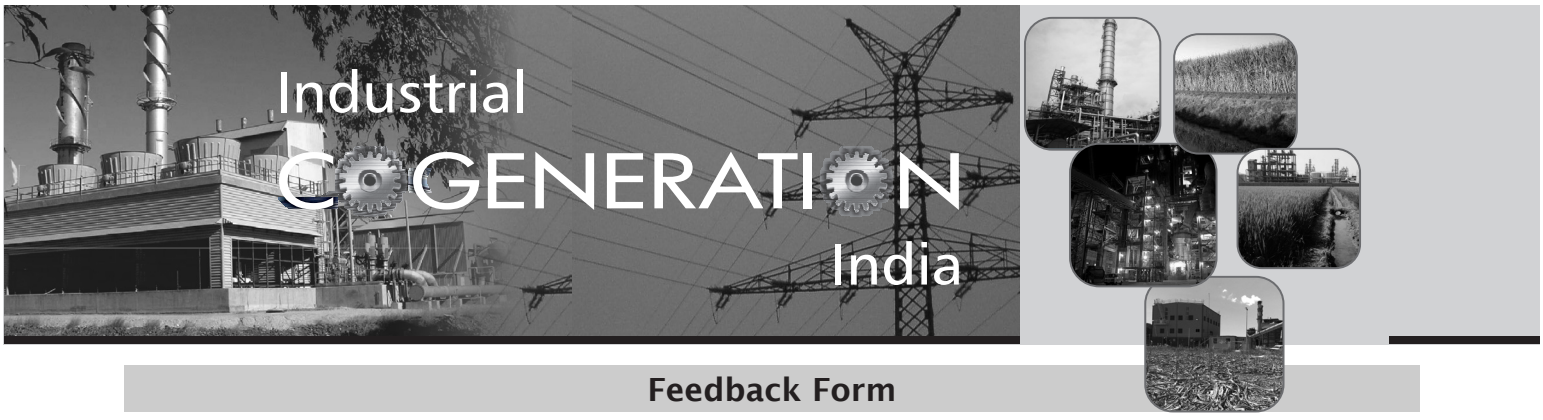
Quantum of loan from IREDA/Minimum Promoters' Contribution should be linked to the eligibility of the project for availing the benefit of Interest Subvention as notified by Govt. of India:

For further details, please contact:
Indian Renewable Energy Development Agency Limited
(A Government of India Enterprise)
Registered Office: 1st Floor, Core-4A, East Court
India Habitat Centre, Lodhi Road
New Delhi - 110003
Tel: 011-24682206-19, Fax: 91-11-24682202
Corporate Office: 3rd Floor, August Kranti Bhawan
Bhikaji Cama Place, New Delhi - 110066
Ph.: 011-26717400-12, Fax: 91-11-26717416
Website: www.ireda.in

Eligibility for Availing Interest Subvention	IREDA Loan Amount (% of Project Cost)	Minimum Promoters' Contribution (%)	Total Term Loan (% of Project Cost)
For Ethanol Projects along with existing sugar mills			
If the Project is eligible	Upto 90%	10%	90%
If the Project is not eligible#	Upto 70%	30%	70%
For Stand-Alone Ethanol Projects			
If the Project is eligible	Upto 85%	15%	85%
If the Project is not eligible#	Upto 70%	30%	70%

#Letter of Intent (LOI) for supply of raw material will be a sanction condition. Firm raw material contracts (to contain atleast clause related to liquidated damage/penalty clause for non-supply of feedstock adequately covering IREDA term loan repayment) for a tenure more than IREDA's loan tenure including moratorium period (door to door) shall be a pre-disbursement condition for stand-alone and dual feed (including sugar) based distilleries.

[1] Food Corporation of India



Feedback Form

Dear Reader,

The Cogeneration Association of India is proud to publish seventy three issues of INDUSTRIAL COGENERATION INDIA. This has been published on a quarterly basis with support from the Ministry of New and Renewable Energy (MNRE) in the past, and in the present from ISGEC Heavy Engineering, Uttam Energy, Danfoss Industries, Paharpur Cooling Towers, Polyvion Cables, Universal Forces Industries, Prumatech Services, Avant-Garde, SS Engineers, Ulka Industries, Clarke Energy, Kirloskar Pneumatic and Paltech Cooling Towers, to promote high-efficiency cogeneration in Indian industry.

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This newsletter is only being sent to subscribers. Therefore, if you wish to continue receiving issues, please take a moment to fill out this form.

*Special offer for hard copies **for sugar mills only**

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4. Please suggest other topics for inclusion in the next issue(s).

.....

5. Would you like to contribute articles? Please mention the topics below.

.....

6. Please indicate your interest in the following:

☐ Energy audit of your plant
☐ Implementation of a cogen/captive power plant
☐ Training of manpower at your plant
☐ Emission reduction trade services for your energy efficiency/renewable energy/cogeneration projects

Other areas where you may require Cogen India's services:.....

.....

7. Do you have a cogeneration/captive power plant? If yes, please send us the following details pertaining to your cogeneration plant:

Installed capacity (MW): ..... Surplus Power (MW): ..... Boiler Temperature/Pressure: .....

8. Would you like to suggest other contacts who should receive this newsletter? .....

.....

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or contact:
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Gurgaon (Cell: 7550397828/9015743610)
Email: cogenindia2017@gmail.com/a.khuller@cogenindia.org (for sponsorships/advertisements or subscriptions)

The Cogeneration Association of India (Cogen India) strives to promote cogeneration and captive power projects in all applicable industrial and commercial sectors, and lobbies for conducive and sustainable policy and regulatory framework. Along with cogeneration, sugar mills in India have also ventured into the production of Ethanol and Rooftop Solar Power Generation, and hold the potential to venture into many new arenas of renewable energy, gradually transferring into Bio-Energy Complexes instead of remaining only a 'Sugar Industry'.

Cogen India thus has plans to extend its wings and provide advisory services on all aspects related to Bio-Power Projects.

Key Action Areas

- Strategies and measures to promote cogeneration projects in all applicable industrial and bio-power commercial sectors in India
- Capacity building and fuel linkage
- Interacting with Central & State Governments, state electricity boards, regulators, national and international bodies for ensuring sustainable policy framework and tariff rates
- Assisting other sugar-producing countries to set up their cogeneration sectors/projects

Activities

- **Inaugural launch of National Cogeneration Awards-2022, followed by National Cogeneration Awards-2023 (www.cogenawards.com)**
- Successful organization of webinars, training programs/ business meets/field visits in sugar, rice, distillery, paper, food processing, bio-power, waste to energy sectors, etc.
- Quarterly (English) newsletter "Industrial Cogeneration India" - A unique forum for distribution of technical and sectoral information i n India/Abroad
- Marathi Bi-monthly newsletter "Nisarg Urja"- Appropriate to the aims and objectives of the association
- Sugar Cogeneration Handbook - 2021: Unique literature useful for stakeholders in the New and Renewable Energy sectors
- Member of the COGEN World Coalition (CWC), established in 2022 as an international non-profit association.
- New Hydrogen India newsletter launched in Sept 2023

For further information on the above or on membership/subscription/advertisement opportunities, refer www.cogenindia.org

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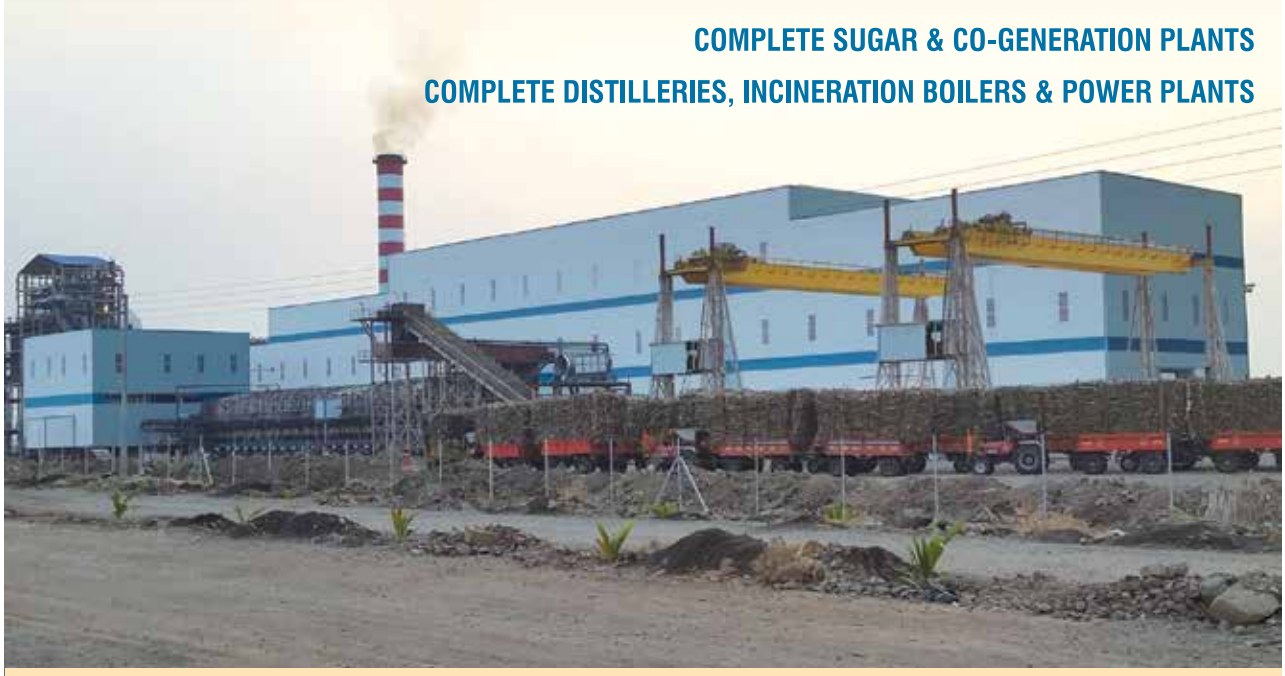

42	43	330+	100+	8
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270+	5	8	60	330+
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