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EAI's BioMetric

Optimizing the Biomass Value Chain

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EAI BioMetric

Are you using Biomass for heat or power?

Key Benefits

EAI BioMetric is a **specialised consulting team that provides customized benefits on the following aspects along the entire bio-energy value chain:**

Ultimately, EAI's BioMetric can help you cut costs and improve Biomass quality.

Our team has worked with a number of clients who had benefitted from our optimization framework, BioMetric, to optimize their biomass value chain.

In this document, we present two case studies of what we did and the benefits to the client.

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Case Studies of Prominent Assignments Done Under BioMetric

Case Study 1 – A US Specialty Chemicals Manufacturer

In their shift from the use of natural gas to biomass for their drying application, we assisted the client in

- Identifying the right biomass and biomass vendors within 200 Kms, and
- In choosing the right technology & equipment

Background

This company, which makes a specialty chemical product used in toothbrushes and other consumer products, was keen on shifting from the use of natural gas to biomass. The main driver was to conform with the corporate sustainability drive aimed to reducing the overall carbon footprint.

The company has its manufacturing plant in Bharuch, Gujarat.

The company was originally using a furnace in which natural gas was fired and the hot air thus generated was carried to the drier to dry the end product.

Shifting to biomass from natural gas for this company was a fairly intricate process and involved the following:

Understanding the feasibility of biomass supply

Currently, the natural gas was supplied as piped gas on demand. A shift to biomass would however imply a completely different procurement process filled with many uncertainties, the chief among these being the availability of the suitable biomass at acceptable price points and availability of reliable vendors.

Understanding the right technology that would be used

The client was shifting from a gaseous fuel to a solid fuel. Should the biomass be used to generate syngas/ producer gas, the process is still intricate as producer gas has only about 15% of the calorific value of natural gas.

The client needed the hot air to be absolutely clean as the air would be drying products that would be used in foods and other products such as toothbrushes. Biomass based heating from hot air generators would generate hot air with impurities, while steam generation was not feasible as the direct drying could not be done with steam.

As a result of the above, the client needed a heat exchanger to be included as well, as part of the solution.

To satisfy the above needs, EAI's BioMetric team assisted the client on the following aspects

- Identifying biomass vendors who qualified on specific criteria
- Identifying biomass that would be best suited for the clients heating purposes
- Comprehensive analyses of which of the two routes – direct biomass use or biomass gasification based route – for use in the hot air generator
- Interactions with heat exchanger manufacturers to understand what best could be done for the client's high temperature heat exchanger requirement (700 deg C post the heat exchanger)
- Identifying the optimal vendors for both hot air generators and biomass gasifiers.

EAI's Work

The entire assignment took 5 months to complete, and involved

- Extensive secondary research
    - Review of the biomass supply chain in Gujarat and adjoining states – Rajasthan and Maharashtra.
    - Identifying potential biomass briquette suppliers in Gujarat, within 300 Kms from the client's location
- Arriving at a key set of criteria (economic and technical) for evaluating the biomass suppliers
- Interactions with over 25 different biomass briquetting vendors
- Visiting 10 briquetting plants and doing a comprehensive diligence of each of these
- Interactions with boiler makers, hot air generator vendors, heat exchanger vendors and biomass gasifier vendors
- Visiting the engineering facilities of 6 equipment vendors – four of them making hot air generators and two of them making gasifiers – and doing a comprehensive diligence on their facilities and expertise
- Interactions with their current vendors for the furnaces and burners to understand design requirements and constraints
- 6 presentations to their top management located in 5 different countries, in person and over phone
- Final recommendations for the biomass vendors to be chosen, as well as other biomass supply chain strategies to be followed.

Result

Before EAI commenced the assignment, the client did not have a clear idea how the two routes – Gasifier route and solid biomass route stacked against each other. EAI's analyses was able to clarify this

The client also had been able to get in touch with only a few vendors before our team went in. We were able to identify 7 high quality vendors for the client within a distance of 200 Kms.

We were able to do thorough analyses for the client in the Buy-or-Build for biomass briquettes, as the client also wished to know if it would be better if they procured raw biomass and made the briquetting themselves.

It was a challenge to identify vendors who were good at both high quality hot air generators consistent with client requirements, and good also at high temperature heat exchangers, two equipments that were essential for the client. EAI thus thought out of the box and put together a combination of two vendors, one of whom was able to develop high temperature heat exchanger maker and another who was a high quality biomass gasifier maker, and thirdly one who was a high quality hot air generator manufacturer.

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Case Study 2 - A Global Foods and Pharma Major

In their shift from the use of coal to biomass in their boilers used for heating applications, we assisted the client in

- Analysing their existing biomass vendors and suggesting new vendors we identified
- Analysing the current biomass feedstock and suggesting additional feedstock they could try
- Arriving at the optimal processing of the biomass briquettes for use in their current boilers and soon-to-be installed CHP boilers.

Background

The client, a global top 5FMCG company, was already using significant amounts of biomass per day (about 50,000 T per annum in its three plants together), and was planning to further increase its consumption. In addition, it was planning to shift to a CHP boiler.

With this emerging scenario in mind, the client was keen to review and re-evaluate its entire biomass supply chain, in order to arrive at an optimal supply chain strategy. In this context, it approached EAI to conduct a comprehensive biomass supply chain review and optimization.

The objectives of this assignment are:

- ***Determining Optimal Biomass Supply Chain*** – Determine the best mix of biomass feedstock, vendors, and procurement strategy taking into account the client's perspectives and emerging needs of biomass use.
- ***Ensuring Biomass Best Fit for Boiler Technology*** – While reviewing the biomass feedstock, it was important in particular to keep in mind the fact that client would be shifting to a CHPboiler using in order to ensure that the biomass feedstock characteristics lend themselves well to use in the clients' boilers.

Problem Statement

The client has three manufacturing locations in India for its food products. In all these locations, until a few years back, they were using 100% coal for their boilers.

With a mandate to become more sustainable, the company had started the use of biomass instead of coal in their boilers. And it had started to use up to 80% biomass is two of its plants and was looking at going 100% biomass in all its plants within the next few years.

This complete shift to biomass did present its own challenges, with some of the questions and challenges being the following:

- Are the biomass supply vendors reliable and of good quality?
- Are we getting biomass at the best prices possible?
- Are the biomass feedstocks being procured the best for the overall boiler ecosystem?
- How do we sustainably dispose the ash?
- What are the changes we can do to our biomass handling and processing that can make a significant different to the overall plant efficiency?
- How do we plan for the future so that the biomass and the vendors we choose have both higher upstream reliability and better price security?
- As they were also going for a CHP boiler in one of their facilities, they wanted to know the most optimal biomass for the new CHP boiler, which could be different from the optimal feedstock for their current boiler
- In what form are the biomass best utilized? Briquettes, Loose biomass, pellets…

EAI's Work for the Client

- Extensive Secondary research for biomass and vendor availability in all the three locations – two in north India and one in south India
- Extensive interactions with the client top management in charge of procurement to constantly understand their strategic perspectives and including these in the research study
- Meetings with over 30 vendors, about 10 each for each location
- Interactions with the client's engineering team and with the vendor who is building their new boiler to ensure that we are able to come up with the optimal biomass set
- Comprehensive cost breakup analysis of the biomass supply chain, from the farms to the briquetting centers to the factory. We also developed effective financial and logistical modeling and scenario analyses models to arrive at optimal decisions for both biomass feedstock and vendors.
- Did a thorough analysis with the client of all the new biomass feedstock and vendors we had identified.
- Obtained quotations from vendors along with test reports
- Interactions with our own biomass design ex pert partners to explore what could be included in their new and upcoming CHP boiler design
- *Ash Disposal* - We undertook a special research to understand all the avenues available for sustainable ash disposal from the use of biomass and were able to suggest to the client a few more destinations (brick making units) to which the ash produced could be supplied.

Result

We were able to identify new biomass feedstock that could be used in two of the three plants; these new feedstock, in addition to having better calorific value per unit cost, also have the potential to improve the overall efficiency of the boiler operations, thus resulting in a much lower energy cost. In addition, owing to the fact the new set of vendors are far more reliable than the current ones, there are likely to be fewer interruptions in supply, and fewer truckloads with low quality biomass.

Overall, we expect the client's cost of energy to go down by about 16% based on the complete list of improvements arising from the new combination of biomass, vendors and improved biomass logistics and processing. In terms of absolute numbers, the client is expected to have a saving of about Rs 3.4 crores/year from the changes made.

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Other Biomass Related Work & Assets

Our team has extensive acquaintance with the entire biomass value chain and has provided end-to-end services to clients looking for biomass based power production. The EAI team has the expertise of developing and demonstrating successful business models for robust supply chain management for biomass power projects.

Our large network of technical contacts for the biomass industry in India has assisted our clients get easier access to latest technological solutions.

EAI has done biomass projects for globally reputed companies & organizations such as Huber, General Electric, GSK, Bill & Melinda Gates Foundation, Pepsi Co., etc. Some of them are listed below:

Biomass Assignments

S.No	Assignment Name	Client	Country
1.	**Pan India Study on Biomass** GE's bio-energy division was interested in conducting a comprehensive study on the use of biomass gasification, and drivers and constraints for the same. • It was a 2 month study that looked at technical constraints and drivers, as well as operational constraints (predominantly biomass supply chain constraints). • Analysis of types of biomass used in gasification across India • Technical and operational constraints in the use of specific biomass in certain types of gasifiers • Logistical constraints faced in supplying biomass to various power plants • Analysis of revenue models for different biomass, especially because some biomass such as coconut shells can result in much higher quality charcoal as a by-product which can be monetized in the market. • EAI provided a comprehensive report on the state of the biomass supply chain in key regions and the key constraints along this supply chain.	GE (General Electric)	US Co., Assignment for India

2.	**Feasibility study and Project Report on Biomass Gasification Power Plant** A complete feasibility study and detailed project report for a 2 MW biomass gasification power plant. • It was a 3 month study that included both technical evaluation of the gasifier& gas engine they were considering, as well as a thorough analysis of the feedstock availability in Bankura district, West Bengal. • A large part of biomass supply analysis was field study, mainly through visits to and interactions with Forest department, Biomass feedstock suppliers, Gasifier companies and a few biomass gasification based power plants in nearby regions	Green Concretex	West Bengal, India
3.	**Research and Data Support for Biomass availability in Tamil Nadu** EAI has an ongoing relationship with TEDA (Tamil Nadu Energy Development Agency) and we support their bio-energy division on a continuous basis with regard to research and data support for biomass availability in Tamil Nadu.	TEDA	India

Partial List of Clients for Bio-energy Assignments

Following is the partial list of clients for our biomass power, heat and other bio-based assignments.

S.No	Name of the Company	Region for Which Research Undertaken	Domain
1	JM Huber	Gujarat	Biomass for Heat
2	General Electric	Pan India	Biomass Power
3	Glaxo SmithKline (GSK)	AP, Punjab & Haryana	Biomass for Heat
4	Bill & Melinda Gates Foundation	India &USA	Energy from Biomass Waste& Sewage Waste
5	PepsiCo	India &USA	Fruit Waste & Biomass Waste to Value
6	Green Concretex	West Bengal	Gasification-based Biomass Power
7	Reliance Industries	India	Third Generation Biofuels
8	Saudi Aramco	Saudi Arabia	Third Generation Biofuels

9	La Farge	France	Algae Fuels
10	National Algae Association	USA	Algae Fuels
11	Algae Biomass Organization	USA	Algae Fuels
12	Agracast de Mexico	Mexico	Bio-products from Castor Oil
13	BASF	Germany	Bio-products from Castor Oil&Jatropha Oil
14	Bayer	Germany	Bio-products from Castor Oil
15	DSM	India	Bio-products from Castor Oil
16	Eastman Chemical	USA	Bio-products from Castor Oil

Tie-ups and Partnerships

EAI's BioMetric division has an extensive network of biomass stakeholders across the entire country to tap into. This network includes

- Reputed biomass suppliers in over 10 regions in India
- Research experts for emerging biomass feedstock (such as bamboo)
- Biomass boiler and gasifier design experts
- Bio-energy equipment vendors.

These tie-ups can be utilized optimally based on need.

As we also regularly assist some biomass power plant owners, we can also tap into their wisdom to gather best of breed practices or solutions to overcome specific challenges.

Publications

EAI has published perhaps the only professional industry report for Biomass Gasification based power generation – India Biomass Gasification-based Power Generation Report. (http://www.eai.in/ref/reports/biomass_gasification.html)

Our biotech team has also produced some of the globally acclaimed reports in the following sectors

- Algae biofuels
- Algae-based Non-fuel Bioproducts
- Algae-based Wastewater Management & Carbon Sequestration
- Comprehensive Jatropha Report
- Comprehensive Castor Oil Report

Simply put: There are few, if any companies, in India as good as EAI who can provide the specialized, high quality intelligence, market research support and business contacts for the bio-energy market.

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About EAI (Energy Alternatives India)

EAI is a boutique consulting and research firm with a dedicated focus on renewable energy and clean technology. It was started by industry Professionals with educational backgrounds in IITs and IIMs.

- Solar
- Wind
- Biomass
- Emerging Cleantech

We also operate the country's largest renewable energy portal (www.eai.in) and the solar energy portal (www.solarmango.com). In addition, we run a popular renewable energy community the EAI Club(www.eai.in/club) , and India's largest renewable energy newsletter, EAI Daily (www.eai.in/newsletter) .

EAI was founded in 2009 and its team works out of Chennai.

Interested in EAI's BioMetric?

Send a note to consult@eai.in
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