

Promoting Greener World Through Biogas Production (A Case of SASK Energy, Muktsar)

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Abstract

We had an opportunity to meet Mr. Gandhi, the COO of Centre for Entrepreneurship & Industries Development (CEID), who deals with the production and bottling of Biogas from animal (mainly Cow/ Buffalo) waste, Sewage Waste, Poultry Waste, Press-Mud (Sugarcane factory/sugar mills waste etc). Mr. Gandhi, COO & Mr. Deepak Prajapati, CTO asked a very honest question from us "today we are the only biogas bottling plant manufacturer in Punjab, do you think our company would be able to eradicate the problem of abundance of agriculture/cattle waste from India and specifically from Punjab. Will we be able to generate such amounts of biogas so as to address the energy shortage of the country?"

We were completely surprised by the magnificent outlook that these persons had... we said nothing as we believed that our answer may not match with the levels of their enthusiasm.

WASTE AND ENERGY SHORTAGE PROBLEM

The Indian State of Punjab, in the arid of North West of the country, was a dry, semi-desert region four decades ago. Due to the heavy investments in agricultural technology, development of infrastructure, extension services, elaborative research work in inputs at farm have resulted in the state becoming India's largest producer of agricultural products. India has become a food-sufficient country from being a food-deficient country, largely because of the agricultural transformation in Punjab. No doubt, Punjab today is quoted as the "Breadbasket" of India.

In spite of the fact that Punjab creates wealth and food for the country,

yet the enormous amounts of agricultural and cattle waste is an issue that the farmers of Punjab are much worried about. If the waste is not managed properly, it may lead to several complications. To overcome this problem and to deal effectively with the surplus waste, government is making efforts by providing financial assistance to various entrepreneurs. The problem is further aggravated by the power crisis in Punjab which is looming large, as demand for electricity has reached near 2,300 lakh units against supply of 1,990 lakh units. The sharp increase in demand has particularly been in domestic sector for cooling and agriculture sector for paddy plantation and irrigation of other kharif crops. (Indian Express, 29 April, 2013)

CENTRE FOR ENTREPRENEURSHIP & INDUSTRIES DEVELOPMENT (CEID)

In the fast growing economies, people are looking for the safe opportunity of their investment. CEID in this way is synonymous with lasting quality, fast service and unparalleled expertise for project development. Consultancy provided by CEID has been pivotal in shaping modern biogas project in India along with agri-business, solar and petrochemical. The experienced CEID team guarantees the smooth implementation of the whole project. CEID is headed by Mr. Madan Lal Gandhi, Managing Director & Mr. Deepak Prajapati, Chief Technical Officer, who are the Founders & of Centre for Entrepreneurship & Industries Development (CEID). They combined having a vast experience of 40 years as project Head in various industries. In 2000 he started his own company to provide Technical & Management support at the local and national level to the new & young entrepreneurs. Mr. Gandhi is responsible for all operations, financial and marketing aspects. Mr. Gandhi & Mr. Deepak Prajapati are having rich experience of establishment of more than 100 industrial units in different sectors like Agro Ind., petrochemical, renewable etc. They have also established Punjab's 1st Guar Gum Mfg. industries (Food Processing industry) in the name of M/s Superfine Agro at Vill- Burj Muhar, Abohar, Punjab. CEID also established region's first biggest Kinnow Waxing & Grading Plant in the name of M/s Balaji Agro Exports at Vill. Sayidawali, Tehsil Abohar. CEID is also having experience to establish more than 40 Kinnow waxing & grading plants in & around Abohar.

Huge quantity of dropping Kinnows gave us the idea to use Kinnow waste to generate the Biogas. Along with it CEID also established Punjab's first and only Guar Gum production unit at Abohar. Mr. Gandhi is currently responsible for all Technical & Management activities. Dr. J.L Kakkar works as a senior scientist and has over 30 years of experience in the field of dairy department. He is responsible for testing, optimizing the raw material for Biogas Bottling projects and organic

fertilizer activities of the projects. Er. Dipak Prajapati works as Chief Technical Executive and is responsible for all the technical and operating activities. Er. Amit Kadian, Mr. Sahil Sethi and Mr. Gurmit Singh, Er. Madan Mohan, are the Project Managers who are responsible for evaluation of the projects according to technical and economic criteria, project implementation, liaison with pollution control authorities of State/ Central board and local authorities for environment protection for all the Industrial Projects. Er. Bipin Kumar, Er. Rajiv Kumar & Er Sumit Kumar work as Plant Operator-Heads.

CEID recently commissioned on 13/07/2015 on trial basis India's & Punjab's biggest Biogas Bottling Plant having capacity 5000 cum/day at M/s Arc Bio Fuel Pvt. Ltd., at Vill. Khote Saran, Mansa Road, Barnala (Punjab) with Atomisation (PLC/SCADA) having largest double membrane roof on the top of Digester with Dia- 30 mtrs. × 8.0 mtrs., storage capacity 2600cum of Raw Biogas. It is also the biggest double membrane roof in India (Dia-29.6 mtrs). Project promoters are Mr. Sahil Singla, Contact: - +91-9501380320 & Mr. Rahul Singla. The compressed Biogas successfully trial at M/s Deepak Dhabha at Dhanula, Distt-Barnala (Region famous Dhabha). M/s Deepak dhabha is consuming 250- 300 kg our biogas per day.

M/s Arc Bio Fuel Pvt Ltd (ABFPL) is feeding Cowdung, poultry litter as well as agro industrial waste from "Trident Mills", Barnala (MNC Group) also for generation of raw biogas.

PROJECTS INSTALLED BY CEID & RUNNING SUCCESSFULLY

S. No.	Projects Name & Address	Plant Capacity (Raw Biogas in Cum/day)	Ministry of New & Renewable Energy (MNRE) Sanction Date	Present Status
1.	M/S Anand Energy Village Kala Tibba, Tehsil- Abohar, District -Fazilka (Punjab)	600	16.06.2009	Commissioned on dated 17.11.2011
2.	M/S SASK Energy Village Najabt Kukrian, P.O Lubaniawali, Tehsil & District- Sri Muksar Sahib (Punjab)	1000	29.04.2010	Commissioned on dated 15.03.2012

3.	M/S Shashi Energy Village Tohana, Near Green Valley Public School, Ratiya Road, Tehsil-Tohana, District Fatehabad (Haryana)	600	10.02.2011	Commissioned on dated 11.09.2012
4.	M/S Singla Bio Energy Village Siaghawali, Tehsil Sadulshar, District Sri Ganganagar (Rajasthan)	1000	29.04.2010	Commissioned on dated 30.09.2012
5.	M/S Amit & Sumit Dairy Farm Village Jahajgarh, Tehsil Beri, District Jhajjar (Haryana)	700	26.09.2011	Commissioned on dated 03.12.2013
6.	M/S Sanjh deep Gas Energy Village/P.O Mehma Sarjan, Tehsil & District Bathinda (Punjab)	5000	26.09.2011	Commissioned on dated 13.11.2013
7.	M/s Bathinda Ceramix Pvt. Ltd. Village Jodhpur Romana Dabwali Road, Bathinda (Punjab) India's first biogas plant using biogas in Klin as captive use.	5000	16.06.2011	Commissioned on Dated 10.04.2013
8.	M/S MGN Green Pvt.Ltd., Hissar (Haryana)	1500	Still to claim subsidy, already applied to MNRE	Commissioned on Dated 13.12.2013
9.	M/s Braj Dham Power Pvt.Ltd (Sewage Treatment Plant), Jaipur (Rajasthan) Supplied and successfully installed India's first biogas holders (3 no's)	8000	Still to claim subsidy, already applied to MNRE	Commissioned on Dated 13.01.2014
10.	M/s Milestone Infrastructure Biogas Bottling & Bio-Compost Division (Based on Press mud) Baroda, Gujrat	2000	Still to claim subsidy, already applied to MNRE	Commissioned on Dated 13.02.2014

11.	M/s Arc Bio-fuel Pvt Ltd Barnala, Punjab	5000	Still to claim subsidy, already applied to MNRE	Commissioned on Dated 13/07/2015
12.	M/s Swaraj Farms & Stores, Ambala, (Haryana)	1500	Still to claim subsidy, already applied to MNRE	Commissioned on Dated 13/02/2015
13.	M/s Sarovar Agro Farms & Biogas Pvt. Ltd, Ambala, (Haryana)	1500	Still to claim subsidy, already applied to MNRE	Trial Commissioning is going on
14.	M/s Dayoday Urja Evam Jaivik Khaad Pvt. Ltd, Bhopal (Madhya Pradesh)	3000	Subsidy from MNRE already sanctioned	Trial Commissioning is going on
15.	M/s Panchkula Farms Pvt Ltd, Ambala (Haryana)	4000	Still to claim subsidy, already applied to MNRE	Trial Commissioning is going on
16.	M/s Rockstone Infrastructure Pvt Ltd, Ahmedabad (Gujarat) India's biggest biogas bottling plant on Sewage waste	20,000	Still to claim subsidy, already applied to to MNRE	Trial Commissioning is going on

SASK ENERGY, MUKTSAR

In line with the various problems faced by the farmers regarding the disposal of cattle and agricultural waste, SASK Energy was established on June 29th, 2009. The firm was set-up as a partnership firm in village Najabt Kukrian; in Sri Muktsar Sahib district of Punjab state under the technical & management consultancy of CEID, headquartered at MARKFED Building, Opp. PNB Main Branch, Vir Haqiqat Rai Chowk, Abohar Distt. Fazilka (Punjab) Pin - 152116 / Office : 01634 500005, Fax : 500006, 09803339824, 09023369888, Emails : dipak_791@yahoo.co.in, ceidbiogas@gmail.com, info@ceidconsultants.com, Website : www.ceidconsultants.com which is a vibrant project development company focused on identifying, prospecting and promoting Biogas-based green technologies to meet the growing demand for energy in India. SASK Energy is a Biogas Bottling

plant, 1000cum/day (which is the first project of its own kind in Punjab) which generates biogas from agricultural and cattle waste. The project has location advantage as Punjab is famous for agricultural activity and hence number of cattle holding activity is also well-developed. As per the survey report which was held one year before, Muktsar cattle population was about 2 to 2.5 lakh cattle and the dairy activity in Muktsar area is famous because of availability of green & dry fodder at cheaper rates.

The Biogas generation capacity of the SASK Energy plant is 1000cum/day and is set on an area of 3000 sq feet approximately. The cost of setting up the plant and machinery was 170-180 lacs. The input requirements of the plant per day to feed the digester is 24 tons of raw material (approx), which includes the raw material in the form of animal manure, kitchen waste, fruit and vegetable waste, food processing waste and other biodegradable waste. The process results in 370 kgs of Methane (sold @ Rs. 71/kg) along with 21 tons of Biofertilizer per day (sold @ Rs.0.25/liters). The total running cost / product manufacturing cost comes out to be Rs. 13,300 per day, whereas the revenue generated per day is Rs. 31,520. ($370 \text{ kg} \times \text{Rs.}71/\text{kg} + 21\text{tons} \times \text{Rs.} 0.25/\text{l}$)

TECHNICAL COMPONENTS

1. Biogas Generation

Biogas production is a microbial process. All microbes involved in biogas production grow in absence of air (Oxygen) The process involves the combined action of four bacteria, in four stages. Groups of bacteria involved in the process are (1) Hydrolytic bacteria, (2) Fermentative bacteria, (3) Acetogenic bacteria, (4) Methanogenic bacteria. The first and second stage is degradation of high molecular weight substances like cellulose, starch, proteins, fats, etc present in organic materials, into small molecular weight compounds like fatty acids, amino acids, carbon dioxide and hydrogen by acetogens. In the third and fourth stage organisms known as homoacetogens convert hydrogen and simple carbon compounds produced in the first and second stages into acetate and some other simple compounds like format, carbon dioxide and hydrogen into methane.

2. Biogas Storage

Almost 400 cubic meter biogas is being stored in a separate neoprene balloon (2 no's). The balloon is kept under a proper shed with wall fencing to minimize the weather impact on it. A moisture trap is installed to minimize the moisture in balloon. The balloon has got the expected life period of around 10 years. A guide rail is attached to balloon to estimate the gas content in it.

3. Biogas Up-gradation/ Enrichment Technology

- (i) Water scrubbing : Using Low Pressure (Capacity 50 M3/Hr)
- (ii) Quality of upgraded gas : 97.00% (CH₄)
- (iii) Availability of technology: Indian

4. Biogas Utilization

Compressed Biogas (CBG) filled in high pressure cylinders upto 150 bar & CBG is being sold to the consumers (Industries/Hotels etc).

5. Digested Slurry Utilization

The digested slurry is directly being sold in a liquid form. A proper awareness campaign was carried out to explain the utility of such digested slurry. Even gardening was done in the plant campus for the demonstration purpose with such slurry. Proper awareness and marketing campaign resulted in expected response from market.

6. Utility Requirement

An electricity Connection of 55 KW from Punjab State Power Corporation Limited (PSPCL) is used and requirement of water is being fulfilled from own tube well.

7. Biogas Distribution

Biogas is distributed through six cascades (each cascade having 9 cylinders & water capacity 675 litres each)

8. Operation and Maintenance

It is being done by CEID with AMC for 10 year. The required training had been already given to the staff.

SUPPLY CHAIN / INTEGRATED VALUE CHAIN

Supply chain includes entire network of entities, which are directly or indirectly interlinked and interdependent in serving the consumers.

It comprises vendors that supply raw material, producers who convert the raw material into products, warehouses that store, distribution centers that deliver to the retailers, and retailers who bring the product to the ultimate user. Supply chains underlie value-chains because, without them, no producer has the ability to give customers what they want, when and where they want, at the price they want. Producers compete with each other only through their supply chains, and no degree of improvement at the producer's end can make up for the deficiencies in a supply chain which reduce the producer's ability to

compete. The entire supply chain of SASK Energy is explained along with the value added by each participant.

Suppliers of Raw Material

The raw material used by SASK Energy to produce Biogas is primarily poultry waste, cow dung, kinnow waste along with sugar mill waste, fruit/vegetable waste and kitchen waste. The agricultural and animal waste is supplied directly by the dairy farmers and the consolidators who have direct contract with the dairy farms. The contractor charges Rs.50 per trolley and the farmers till date provides the waste free to cost to the plant.

The Process Followed in Generation of Biogas

• Raw Material Unloading Platform

Dung or any other organic waste is brought to the loading platform and after required quantity determination it is fed to slurry preparation tank.

• Slurry Preparation

The dung or/and Biomass are mixed with water in the slurry preparation tank. The ratio of the mixing of water and waste depends upon type of material. The mixture is then mechanically mixed to have homogeneous slurry. In certain cases the wastes are subjected to crushing or pulverizing for getting the optimum gas production.

• Digester

The mixed slurry is then fed to the anaerobic digester to create an anaerobic condition to generate methane gas by methanogenic bacteria. The retention time depends on the type of digester but in this case it is 20 Days. The slurry coming out of the digester can be used for vermi-composting.

• Biogas Storage

The raw biogas is stored in balloons (2 no's) before sending it to scrubber (for purification). The balloons are protected with protection wall. And can store up to 400 cubic meter of gas.

• Gas Enrichment System

Gas is passed through scrubber using compressor. The process removes impurities (like CO₂ & other gases) and enriches the gas with Methane concentration more than 97%. The system also removes H₂S from the gas.

• Gas Distribution System

Biogas is distributed through Six Cascades having total approximate capacity of 600 Kg (each cascade having capacity 100kg).

• **Slurry Production**

The digested slurry comes out of the digester through pipe and directly sold to the farmers in the same form.

FINAL CONSUMER

SASK Energy caters to the demands of mass market, i.e. all the commercial users of LPG are its potential consumers. The buyers of Compresses Biogas include Industries, Government Canteens, Restaurants, Hotels, Hostels, Sweet shops and Domestic use. The Biogas fertilizer is purchased by farmer as the liquid slurry is rich in micro and macro nutrients along with NPK and can be directly applied in farms. The major end-users of the compressed Biogas are M/s Vishal Plastic Industries, Kotakpura, Punjab, (Plastic tank manufacturer) Contact: - 09888103113 & nearby hotels/dhabha's.

FUTURE PLANS

M/S SASK Energy has expanded the capacity almost double in the month of August, 2013 and they are also establishing 5000 cum/day Biogas fertilizer plant at Bathinda, which have already been sanctioned to CEID by the Ministry of New & Renewable Energy (MNRE), Govt. of India, New Delhi and the plant is successfully commissioned and running successfully.

DISCUSSIONS

Will the plant be able to meet the vision of Mr. Prince Gandhi?

ANNEXURES

Biogas Bottling Plant Cost Comparison

1.	Capacity of plant (Raw Biogas)	1500 cum/day	1000 cum/day
2.	Area required	1 Acre	1 Acre
3.	Covered Area required	3000 sq feet (approx)	3000 sq feet (approx)
4.	Cost of Plant & Machinery*	200-210 lacs (approx)	170-180 lacs (approx)
5.	Bank Loan	Available	Available
INPUT REQUIREMENTS			
6.	Raw material required per day (Dung)	38 tons (approx)	24 tons (approx)

7.	Types of Raw material can be used/feed in to the Digester NOTE : Production of the Biogas is subjected to the type of raw material available and its Quantity.	ANIMAL MANNURE (DUNG), KITCHEN WASTE VEGITABLE & FRUIT MARKET WASTE AGRO & FARM WASTE FOOD PROCESSING WASTE & OTHER BIO DEGRADABLE WASTE	
OUTPUT**			
8.	Methane	570 kg per day	370 kg per day
9.	Biogas fertilizer (Liquid Slurry)	35 ton per day	21 ton per day
BUYERS			
10.	Compressed Biogas (CBG)	Industries, government canteens, restaurant, hotels, hostels, sweet shop & domestic use, etc.	
11.	Biogas fertilizer (Liquid Slurry)	Farmer (Liquid slurry is rich in micro & macro nutrients along with NPK and can be directly applied in fields).	
PRODUCT MANUFACTURING/RUNNING COST PER DAY (in Rs.)			
12.	Raw material (Cost of Dung Rs.300 per Ton)	11400.00	7200.00
13.	Staff	2200.00	2200.00
14.	Electricity	2000.00	1700.00
15.	Others	2600.00	2200.00
16.	TOTAL Running cost (in Rs.)	18200.00	13300.00
REVENUE GENERATION PER DAY (in Rs.)			
17.	Compressed Biogas (CBG)	45600.00 (calculated at Rs 71/Kg × 570 Kg)	29600.00 (calculated at Rs 71/Kg × 370 Kg)
18.	Biogas fertilizer (at Rs. 0.25/lt)	8750.00	5250.00
19.	Total Revenue generated per day (In Rs.)	49220.00	31520.00

**Payback on Biogas Bottling Plant Without
Central Financial Assistance (CFA) from MNRE**

S. No.	Particulars	1500 cum/day	1000 Cum/day
1.	Total Revenue generated per day (In Rs.)	49220.00	31520.00
2.	Total running cost per day (In Rs.)	18200.00	13300.00
3.	Gross Income per day (at 100% capacity)	31020.00	18220.00
4.	Total Gross Income at 80% capacity per day (In Rs.)	24816.00	14576.00
5.	Gross Income per Year (i.e. 350 days) (In Lakh)	86.55	51.01
6.	Payback without Central Financial Assistance (CFA) (approx)	2 Years and 1month	3 Years

With Central Financial Assistance (CFA), payback time will reduce by 8-9 months

All above highlighted data/calculation is based on standard conditions like Project Site location, availability of raw material on standard cost (@ Rs 200/- to Rs 250/- per ton), standard soil bearing capacity & internal heating system (SS make). Cost may vary according to project site.

