

## **DETAILED PROJECT REPORT**

6 TPD Compressed Biogas Plant (14,400 *m3*/ day Biogas) in Village Harsana (Rehda)Tehsil UN, District Shamli 247776 Uttar Pradesh

9<sup>th</sup> March 2024

### To,

### M/s. Superior Agro Ventures Pvt. Ltd.

# E/2479, Amba Vihar, Saharanpur Bypass Road, Gangoh, Tehsil – Nakur, District – Saharanpur 247341 Uttar Pradesh.

### Prepared by:

### M/s. Natfrenz Technologies Pvt. Ltd.

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Superior Agro Bio-CNG Project in Tehsil – Un, District Shamli, UP



**Natfrenz Technologies Pvt. Ltd** helps you make confident technology decisions & ensure bio gas plant is agile, effective & equipped to cut through the buzz of latest trends to create enduring result.

We are pioneers turnkey sustainable waste management solutions to manage urban waste with cities increasingly having trouble in the management of their wet and dry waste. We offer dependable, tried and tested solutions for scientific treatment and disposal of waste.

We provide solutions in waste treatment plant construction, independent projects and management of various holdings across the globe. We are also committed to absolute integrity, transparency, superiority and customer satisfaction. Passion and planning for results, completely aligning with our clients for their success. Commitment to highest quality, professionalism & ethical standards in everything we do.

Manufacturing domestic Biogas, Bio-CnG plant, Bio thermal plant. We offer Technical consultancy for Feasibility study, Project report, Design & PMC in Biogas Plant, Dairy farm, Goshala, Solar plant, Bio Composting plant, Renewable Energy and Marketing tie-ups for sale of Organic fertilizer.

We highly appreciate your interest towards waste management and zero discharge projects. We are glad to join hands with you in contributing our part to save our planet earth! Please use one of the following options to contact us. One of our highly experienced and qualified members will revert to you. Don't worry, your details are safe with us and we do not spam you with unnecessary calls or emails

We offer collection of organic and recycled waste at source. Ensure organic waste is treated scientifically at approved, state-of-the-art facilities. Collection and segregation of inorganic waste.



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### **INTRODUCTION**

Customer Profile: Superior Agro Ventures Pvt. Ltd.

Parameters	Details	
Name	Superior Agro Ventures Pvt. Ltd.	
Constitution	Private Limited Co.	
CIN No.	U15490PB2022PTC056613	
Line of Activity	Manufacturing of Agro Products	
MSME Registration No.	UDYAM-MP-21-0006430	
Existing Banker	HDFC	
PAN No	ABJCS1276P	
GSTIN	09ABJCS1276P1ZK	
Pagistarad Address	Backside Old Grain Market, Railway RD, Kapurthala,	
Registered Address	Punjab 144601	
Proposed Linit Address	Village – Harsana, Tehsil UN, District Shamli, Uttar	
Toposed Onit Address	Pradesh 247778	
	S.No. E/2479, Amba Vihar, Saharanpur Bypass Road,	
Local Office	Gangoh, Tehsil – Nakur, District – Saharanpur 247341	
	Uttar Pradesh	
Email-Id	superioragro1@gmail.com	
Partner/ Director/ party	Constitution	
details		
Jaivil Rana	Director	
Mini Panwar	Director	

### **INTRODUCTION:**

### **Project Facility:**

- M/s. Superior Agro Ventures Pvt. Ltd. has planned to set up 14,400 CuM/day (6 TPD) Bio-CNG & Bio-Fertilizer Plant
- 4 The Project Cost: 42.65 CR
- ♣ Production capacity 6 TPD (14,400 CuM)
- Grganic Granulated Bio-Fertilizer 20 Ton / Day
- Land Availability – 5 Acres of Land for Plant is available
- Also need 15 Acres of Land from Govt. for storage of Raw Materials under the provisions of UP Bio Energy Policy 2022

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The Units are proposed to be established under Sustainable Alternative towards Affordable Transport (SATAT) / GOBARDHAN scheme launched by Government of India.

### **GOBARDHAN SCHEME**

Gobardhan scheme is being pursued as a national programme priority under Swachh Bharat Mission Grameen-Phase II. Gobardhan aims to support villages in effectively managing their cattle and biodegradable waste. Department of Drinking Water and Sanitation is working with Ministry of New and Renewable Energy, Ministry of Petroleum and Natural Gas, Department of Animal Husbandry and Dairying, Department of Agriculture, Cooperation and Farmers Welfare, Department of Agricultural Research and Education, Department of Rural Development, state governments, public and private sector institutions and village communities to give this a shape of "Jan Andolan" so that community collective action on Gobardhan is achieved. It is expected to promote community awareness and ownership, and help villages manage cattle, agro residues and other biodegradable waste.

### SATAT SCHEME

SATAT initiative was launched on 2<sup>nd</sup> Oct 2018 by Ministry of Petroleum and Natural Gas & Skill Development and Entrepreneurship, with PSU Oil Marketing Companies (OMCs) like Indian Oil Corporation Ltd., Bharat Petroleum Corporation Ltd., Hindustan Petroleum Corporation Ltd., and GAIL Limited by inviting Expression of Interest (Eol), from potential entrepreneurs to set up Compressed Bio-Gas (CBG) production plants and make available CBG in the market for use in automotive fuels.

### The main objectives of SATAT scheme is to

- ✓ Utilise more than 62 million MT of waste generated every year in India.
- ✓ Developmental effort to benefit vehicle-users as well as farmers and entrepreneurs
- Reducing vehicular emissions and pollution from burning of Agricultural residues /Organic wastes.
- ✓ Efficient tackling of urban air pollution due to farm stubble / Agriculture Waste burning and carbon emissions.
- ✓ Promotion of organic farming by using Fermented Organic Manure (FOM) produced from CBG plants
- ✓ Reduce dependency on crude oil & Natural Gas imports and realise PM's vision of enhancing farmers' income, rural employment and entrepreneurship



✓ Buffer against Crude oil/ Gas price fluctuations.

## NATIONAL CLEAN ENERGY & ENVIRONMENT FUND (NCEEF)

Through Finance Bill 2010-11 a corpus called National Clean Energy Fund (NCEF) was created out of cess on coal produced / imported ("polluter pays" principle) for the purposes of financing and promoting clean energy initiatives, funding research in the area of clean energy or for any other purpose relating thereto. Subsequently, the scope of the fund has been expanded to include clean environment initiatives also. An Inter-Ministerial Group (IMG) chaired by Finance Secretary approves the projects/schemes eligible for financing under the NCEF. These projects include innovative schemes like Green Energy Corridor for boosting up the transmission sector, Namami Gange, Green India Mission, Jawaharlal Nehru National Solar Mission (JNNSM)'s installation of solar photovoltaic (SPV) lights and small capacity lights, installation of SPV water pumping systems, SPV Power Plants, Grid Connected Rooftop SPV Power Plants, pilot project to assess wind power potential etc.

Till date IMG has recommended 55 projects have been recommended with total VGF of Rs. 34811.19 crore spread over years. For BE 2017-18, Rs.8703 crore have been provided for in the Budget for NCEF projects. The coal cess was collected at Rs. 50.00 per tonne of coal since June 22, 2010 which was extended in Budget 2014-15 to Rs. 100.00 per tonne of coal w.e.f. 11.07.2014. The same was increased to Rs. 200.00 per tonne w.e.f. 01.03.2015 in the 2015-16 Budget. Further, the coal cess has been increased to Rs. 400 per tonne in the Union budget 2016-17 and the same has been renamed as "Clean Environment Cess". Accordingly, the name of NCEF has been changed to National Clean Energy and Environment Fund (NCEEF).

### **CREATING A SUSTAINABLE WORLD**

India ranks 3rd in renewable energy country attractive index in 2021.

The country has set an ambitious target to achieve a capacity of 175 GW worth of renewable energy by the end of 2022, which expands to 500 GW by 2030. This is the world's largest expansion plan is in renewable energy.

India's installed renewable energy capacity has increased 286% in the last 7.5 years and stands at more than 151.4 Giga Watts (including large Hydro), which is about 39 per cent of the country's total capacity (as on 31st December 2021). The installed solar energy capacity has increased by 17 times in the last 7 years, and stands at 49.5 GW. The installed Renewable energy capacity (including large hydro) has increased from 76.37 GW in March 2014 to 151.4 GW in December 2021, i.e. an increase of around 98%.

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India has achieved its NDC target with total non-fossil based installed energy capacity of 158.17 GW, which is 40.2% of the total installed electricity capacity.

*Up to 100% FDI is allowed under the automatic route for renewable energy generation and distribution projects subject to provisions of The Electricity Act, 2003.* 

### BACKGROUND:

- M/s. Superior Agro Ventures Pvt. Ltd. is a private limited Company and formed by the parent firm (M/s. Golden Global Agrotech) as SPV, for setting up of Bio Energy and Agro processing unites
- Proposed project is to be established in Tehsil UN of District Shamli 247776 Uttar Pradesh
- **GMC** (Indian Oil Corporation) has given Letter of Intent No. IndianOil/SATAT/01/3589 dated 03.11.2023 to Superior Agro Ventures Pvt. Ltd. for supply of CBG for 6 TPD of CBG / day.
- **GMC** (Indian Oil Corporation) has revised the CBG Procurement Rate (82.50% of Retails Selling Rate at Retails Outlet) under their Notification Ref. No. CO/AE&SD/01 dated 20.05.2022.

For Example – The Current Retails Price of CNG at Karnal, HR Retail Outlet is Rs. 83/ kg including GST, The IOCL Procurement rate will be **Rs. 68 per Kg including GST** & Transport cost for delivery at IOCL's Retails outlet in Karnal, Haryana / Shamli / Saharanpur, Uttar Pradesh.

M/s Superior Agro Ventures Pvt. Ltd. has entered into tie-up agreement with Natfrenz Technology (Technical Consultant & PMC) and M/s. Vimal Organics Ltd. (EPC Contractor) of proposed upcoming 14,400 CuM capacity Biogas (6 TPD CBG / day) Plant.

### **Proposed Project Rationale**

- MoPNG launched an initiative on 02<sup>nd</sup> Oct 2018, under SATAT scheme with Oil Marketing Companies (OMCs) inviting Expression of Interest (EOI) from potential entrepreneurs to setup Compressed Biogas Plants.
- OMC has floated EOI with Reference number CBG32(1) dated 01.04.2022 to various Entrepreneurs, Proprietors, Partnership firms, Companies, Cooperative societies and Technology providers for supply of CBG under SATAT scheme.



### Project Owner's Firm's Background:

- Promoters of M/s. Superior Agro Ventures Pvt. Ltd. Involved in Renewable Energy Projects.
- Head and the second sec
  - To carry on the business in India and outside India as manufacturers, producers, processors, job workers, traders, commission agents, dealers in CNG, Bio-Gas, Power Gases, PNG, LNG, oils, minerals, Crude Oil, Bio-Fertilisers, Biomass Pellets, Bio-Energy Storage & Transportation, Trading, Bio & Chemical Fertilisers, Pesticides, Insecticides, Agro-waste, Domestic Waste, Municipal Waste, Industrial Waste including the by-products & derivatives of these products.
  - To act as a consultant on turnkey basis and/or part thereof for development projects connected with the dealing in alternate sources of energy, energy efficiency, pollution control, resource recovery, waste minimisation, waste avoidance, carbon dioxide, emissions abatement, all kind of fertilisers, fuel switching mechanism and sustainable power and other related areas.
  - To carry on the business of manufacturers, producers, importers, exporters, buyers, sellers, dealers, stockists, suppliers, wholesalers, distributors, retailers and jobbers of Biogas, Bio-Fertilizers & solid fuel briquettes, etc.

### GIST of OMC's LOI:

- LOI was issued to M/s. Superior Agro Ventures Pvt. Ltd. by OMC via Ref No IndianOil/SATAT/01/3589 dated 03.11.2023 for 24 months from the date of issuance.
- Company is responsible for planning, preparation, engineering and execution of the CBG plant, including the storage of raw material, operation and maintenance of the CBG plant, maintaining final product output quantity and quality, managing the byproducts and wastes from the CBG Plant as per existing Central/ State Government norms and providing performance guarantee for the CBG Plant.
- Company is responsible for setting up and commissioning of the CBG Plant and its continuous operation including arranging the entire land and finance.
- Company should ensure that the CBG delivered should be of automotive grade and cooking grade compressed at desired Bar as required by OMC.



CBG shall meet IS 16087:2016 specifications of BIS or its recent version and /or any other prevailing standards on CBG.

a. Delivered at Retail Outlets in Cascades: Price framing for CBG delivered at OMC existing or new Retail outlets/ standalone selling point through Cascades are fixed as,

Particulars	Unit	Pumped in OMC Pipeline compressed at 5 -30 Bar	Delivered at Retail Outlet in Cascades. Compressed at 250 Bar
Basic Price of CBG meeting IS 16087: 2016 standard.	(Rs /Kg)	41.00	46.00
GST as per actual (presently 5%)	(Rs /Kg)	2.05	2.30
Total supply price (incl. GST)	(Rs /Kg)	43.05	48.30
<b>GMC</b> (Indian Oil Corporation) has revised the CBG Procurement Rate (82.50% of Retails Selling Rate at Retails Outlet) under their Notification Ref. No. CO/AE&SD/01 dated 20.05.2022.			
Basic Price of CBG meeting IS 16087: 2016 standard.	(Rs /Kg)	68.00	The Current Retails Price of CNG at Karnal, HR / Shamli / Saharanpur Retail Outlet is Rs. 84/ kg including GST

- **b.** Company to get all the required Licences/approvals/ permissions from the statutory authorities which are mandatory/necessary for the operation and transportation of CBG.
- **c.** Before commencing of CBG Plant, a "Commercial Agreement" will be signed between OMC and M/s Superior Agro Ventures Pvt. Ltd. for supply and Marketing of CBG. Validity of the agreement is 15 years and will be further extended on mutual consent.

### II. Organization Involved in the Project & Key Technical Persons:

- Technical Consultant Natfrenz Technologies Pvt. Ltd. Virender Sharma
- EPC Contractor Vimal Organics Ltd. Arun Agarwal
- Equipment Plant Supplier Obial India Pvt. Ltd. Ashwini Kumar



### BRIEF - TECHNICAL CONSULTANT - M/S. NATFRENZ TECHNOLOGIES PVT. LTD.

Established in the year of 2018, Natfrenz Technologies Private Limited is the leading wholesale trader and service provider of an exclusive range of Cattle Shed, Biogas Plant, Organic Fertilizers and much more. The offered products are manufactured using supreme quality material and latest technology under the strict supervision of our skilled professionals.

## Some of our reputed clients of *M*/s. Natfrenz Technologies Pvt. Ltd. for Biogas Enrichment Systems for Production of CBG

<ul> <li>Singla Bio Energy, Ganganagar 100 M3/hr</li> </ul>	-	Bio CNG Plant
<ul> <li>Amit Sumit Dairy Farm, Jhajjar 100 M3/hr</li> </ul>	-	Bio CNG Plant
<ul> <li>Anand Energy Abohar 30 M3/hr</li> </ul>	-	Bio gas Dryer
<ul> <li>Sask Energy, Ferozepur 30 M3/day</li> </ul>	-	Bio gas Dryer
<ul> <li>21st Century Enviro Pvt. Ltd, Sirsa 100 M3/hr</li> </ul>	-	Bio gas Dryer
<ul> <li>Excellent Renewables P Ltd., Baroda 30 M3/hr</li> </ul>	-	Bio CNG Plant
• Scalene Greenergy Limited, Bangalore 30 M3/hr.	-	Bio CNG Plant
• Scalene Greenergy Limited, Bangalore 20 M3/hr	-	Bio CNG Plant
<ul> <li>Haldiram Snacks Pvt. Ltd, Noida 50 M3/hr</li> </ul>	-	Bio CNG Plant
<ul> <li>Mailhem Equipment Pune. 50 M3/hr</li> </ul>	-	Bio CNG Plant
<ul> <li>Scalene Green energy Systems 400 M3/hr</li> </ul>	-	Bio CNG Plan

### COMPLETE BIOGAS PLANTS ON TURNKEY EPC BASIS

 MGN Energy Pvt. Ltd. EPC 2000 M3/day **Bio-CNG Plant on** - Sanjh Deep Gas Energy EPC 5000 M3/day **Bio-CNG Plant on**  Project in Barnala Punjab 5000 M3/day **Bio-CNG Plant on EPC** - NRB Bio Energy Rajasthan 2500 M3/ day **Bio-CNG Plant on EPC** -**Bio-CNG Plant on EPC** • Samagra Agro Kanpur 5000 M3/day - Wadala Energies 5000 M3/day **Bio-CNG Plant on EPC**  Hargobind Bio Energy 6000 M3/day Biogas to Power Plant on EPC - Aggarwal Bio Energy 2500 M3/day **Bio-CNG Plant on EPC** - Biogreen Cycle Sri Lanka 4 MW Power project based on MSW - Biogreen Cycle Sri Lanka 6 MW Power project based on MSW - Amar Builders Moradabad 100 M3/day **Bio Gas Power Plant on EPC** -**Bio Gas Power Plant on EPC**  Shri Sai Construction Meerut 50 M3/ day -



- Gunjan Contractor and Suppliers 50 M3/day -
- Studio Eleven Architects Delhi 10 M3/day
- UPES Dehradun 100 M3/day
- Air Force Jipur 1 M3/day
- Kurukshetra University 10 M3/day

- Bio Gas Plant on EPC

### PROJECTS CURRENTLY UNDER EXECUTION - UNDER SATAT SCHEME (NATFRENZ ON EPC TERMS)

-

<ul> <li>Jaglan Contractor and Security Pvt. Ltd 6000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Sharp Renewal Energy Pvt. Ltd. 12000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Shiv Gora Natural Product Pvt. Ltd. 6000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Grass2gas Biofules LLP 6000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Dhanraj Dharnia Treading Co. 6000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Shiv Ganga Stone Crusher 6000 M3/day</li> </ul>	-	Bio-CNG Plant
<ul> <li>Shivarda Bio Gas Pvt. Ltd. 6000 M3/day</li> </ul>	-	Bio-CNG Plant
• Bhadauria Natural Gas & Products P. Ltd. 6000 M3/day	-	Bio-CNG Plant
<ul> <li>Aerostar Bioenergy Pvt. Ltd. 6000 M3/day</li> </ul>	-	Bio-CNG Plant
• Sevozone Energies & Fertilizers Pvt. Ltd. 14500 M3/day	-	Bio-CNG Plant
(Not under SATAT)		

• Iskcon Vrindaranyam Campus 150 M3/day	-	BIO Gas Plant
<ul> <li>Nuclear Power Corporation of India 4 M3/day</li> </ul>	-	Bio Gas Plant

## BRIEF - EPC CONTRACTOR: (M/S. VIMAL ORGANICS LTD.)

Vimal Organics was set up in 1984 for Activated Bleaching Earth plant. This Unit was called an import Substitution Substitution unit. VOL were considered experts in refining of tough oils like RBO, SBO, SEMO and few others. Memberships of top associations like Oil Technologists Association of India, Solvent Association of India, AOCS.

### VOL created several firsts in this industry:

□ Using Sulphuric Acid, earlier it was Hydrochloric Acid.

□ Using Spent Sulphuric Acid (70-75%)

□ Using fresh PP bags with LDPE liner in 1987, earlier it was either gunny bags or laminated HDPE Bags.

□ First to export ABE outside India to many countries

□ Government of India awarded VOL Star Export House status



VOL have a lagoon for waste Water to recover the Abe before the water goes to ETP. The Design of lagoon was very special so that some part will not have any movement of water.

□ To have revenue from Effluent Mitigation by recovering any of Gypsum, Alum or Glaubers' salt

Using Bio Mass Gasification, instead of Fossil Fuels

## A. PROJECTS DONE BY M/S. VIMAL ORGANICS LTD.

## - SULPHURIC ACID -

- Shriram Food and Fertilizers Ltd., Delhi 300 TPD
- Khetawat Chemicals & Fertilizers Ltd., Haldia 150 TPD
- Mahadev Fertilizers Ltd., Fatehpur 140 TPD
- Bhilai Steel Plant, Bhilai 140 TPD
- Bokaro Steel Plant, Bokaro 150 TPD
- Aminex Chemical Ltd., Pune 165 TPD
- Khaitan Chemicals and Fertilizes Ltd., Indore 200 TPD
- Hindustan Copper Ltd., Khetri from smelter gases 400 TPD
- Advance Det Chem Ltd., Silvasa 60 TPD Later Expanded to 110 TPD
- Jai Ram Phosphate Ltd., Rajnandgaon (Chhatisgarh) 150 TPD
- M/s Kiri Dyes & Chemical Ltd. 500 TPD
- Ankur Fertilisers P Ltd 100 TPD
- Rourkela Steel Plant, SAIL 125 TPD

## - SINGLE SUPER PHOSPAHTE/ GRANULATED & NPK-

- Ram Ganga Fertilizer 200 TPD
- Jai Shree Chemicals and Fertilizers Ltd., Pataudi 200 TPD
- Mahadev Fertilizers Ltd., Fatehpur 300 TPD
- Khaitan Chemicals and Fertilizer Ltd., Indore 400 TPD
- Mahadev Fertilizers Granulation Plant 150 TPD
- Granulation Plant for Shriram Food & Fertilizers Ltd. 600 TPD
- Jairam phosphate LTD. Rajnand Gaon Chatisgarh 200 TPD
- Natraj Organics Ltd. Muzaffarnagar 400 TPD
- Renuka Fertiliser, Ananthpur 250 TPD



### -MULTI SULPHATES-

- IFFCO 100 TPD
- Chakradhar Chemicals P Ltd 35 TPD
- Salt Refining , lodisation and Packing City Salt Ltd Dhaka Bangladesh 20 TPH
- City Salt Ltd, Dhaka, Bangladesh 20 TPH
- United Salt Industries Ltd, Dhaka, Bangladesh 20 TPH

### -LIME CALCINATION-

- Giad Steel, Sudan 60 TPD
- Omrak Corporation, Chotaadujpur, Gujarat 100 TPD
- KINC Ltd, Chotaadujpur, Gujarat 100 TPD

### -COMPRESSED BIOGAS-

• Sevozone Energies, Saharanpur, UP - 6 TPD CBG Plant

### Orders in Hand at Various Stages of Implementation

 $\hfill\square$  Fertiliser and Chemical Complex in Zimbabawe

□ Lime Calcination Unit for El Shihab Industries Lime Calcination Unit for El Shihab Industries, Sudan

□ Caustic Soda Plant with Stable Bleaching Plant and Power unit for Shaaba Group, Ghana

□ Sulphuric Acid Plant for Majestic Chemicals, Oman

### ABOUT OMC: INDIAN OIL CORPORATION LIMITED (IOCL)

Indian Oil, is an Indian government corporation. It is under the ownership of Ministry of Petroleum and Natural Gas, Government of India headquartered in New Delhi. The government corporation is ranked 212th on the Fortune Global 500 list of the world's biggest corporations as of 2021. It is the largest government owned Oil Corporation in the country, with a net profit of \$6.1 billion for the financial year 2020-21. As of 31 March 2021, Indian Oil's employee strength is 31,648, out of which 17,762 are executives and 13,876 non-executives. Also, total 2,775 women employees comprising 8.77% of the total workforce.



Indian Oil's business interests overlap the entire hydrocarbon value-chain, including refining, pipeline transportation, marketing of petroleum products, exploration and production of crude oil, natural gas and petrochemicals. Indian Oil has ventured into alternative energy and globalisation of downstream operations. It has subsidiaries in Sri Lanka (Lanka IOC), Mauritius (Indian Oil (Mauritius) Ltd) and the Middle East (IOC Middle East FZE).

## Bank Dealings of the Promoter Company: HDFC Bank, Kapurthela, Punjab

The Company is new and does not have any Outstanding with us/ any other banks/FIs.

NAME	CIBIL	Particulars
M/s. Superior Agro Ventures Pvt. Ltd.	No delinquency reported	Company

### **Business Model of the Company:**



### A. Flow Chart depicting the Business Model of the CBG Unit



### **Objectives of Biogas Plants in Rural India**

- To support villages effectively manage their cattle waste, agricultural waste/residue and all other organic waste.
- To support communities to convert their organic waste to wealth through generation of manure and energy out of waste.
- To promote environmental sanitation and curb vector-borne diseases through effective disposal of waste in rural areas.
- To create livelihood opportunities in rural areas and enhance the income of farmers and other rural people by supporting them to convert their waste to wealth.
- To promote rural entrepreneurship by involving entrepreneurs, Farmers' Cooperatives, SHGs and Youth Groups in the setting up and operation and management of biogas plants.

### **Project Approach & Objects**

The project is a classic example of true integration of related activities and effective convergence of various programmers. Farmers working with dairy animals, poultry farming, and organic vegetable cultivation will be directly or indirectly benefited by the project. Biogas units produce a nutrient rich fertilizer, called 'biogas-slurry'. This is a safe and organic fertilizer that is good for crop growth and soil fertility. It is estimated that usage of slurry on land boosts crop yield by 15-20% as compared to the usage of chemical fertilizers. Slurry can be enriched by the addition of poultry excreta. A substantial saving on money is expected when a farmer switches from the use of chemical fertilizer to slurry. Additionally, this also has environmental benefits and enhances soil health. A main objective of biogas industry is **the reduction of fossil fuel consumption**, with the final goal of mitigating global warming. **Biogas production is carbon-neutral and does not add to greenhouse gas emissions**. It is independent of sun, wind or water.

Biogas production can reduce the pollution potential in wastewater by converting oxygen demanding organic matter that could cause low oxygen levels in surface waters. Biogas is **a clean fuel with good calorific value**. It will be used as replacement of chemical fertilizers in crop production.

### **Organic Fertilizer**

In view of the increasing and indiscriminate use of synthetic fertilizers and pesticides and deteriorating soil health and productivity, the concept of organic farming is gaining importance world-over. The present-day intensive agriculture practices have resulted into soil fatigue, and gradual deterioration of soil health. To overcome these growing problems emphasis is being given to restore soil health by reducing the use of chemical inputs and increasing the use of biological and organic inputs. Nutrient mobilization and plant protection



through natural and biological route should be the first option followed by chemical option to fill the gap.

There is a need in the country to augment the infrastructure for production of quality organic and biological inputs. Accordingly, under National Project on Organic Farming a Capital Investment Subsidy Scheme for Commercial Production Units for Organic/ biological Inputs has been introduced. The scheme is being implemented by the Department of Agriculture & Cooperation through National Centre of Organic Farming (NCOF) in collaboration with NABARD or NCDC.

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## CHAPTER 2 AN OVERVIEW OF THE COUNTRY COMPRESSED BIOGAS (CBG) FERMENTED ORGANIC MANURE

### Biogas

Biogas is an energy-rich gas produced by anaerobic decomposition of biomass. It is produced from waste / bio-mass sources like agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc.

Biogas, a renewable fuel, constitutes mainly of methane (~60%), carbon dioxide (~40%), and traces of hydrogen sulphide. It can be burned directly as a fuel or purified & upgraded by removing carbon dioxide (CO2), hydrogen sulfide (H2S) and compressed to make Compressed Bio-Gas (CBG). The CBG has methane content of more than 90%, which is similar to the commercially available natural gas in composition and energy potential.



### Compressed Biogas (CBG / Bio-CNG):-

The gases methane, hydrogen, and carbon monoxide (CO) can be combusted or oxidized with oxygen. This energy release allows biogas to be used as a fuel; it can be used for any heating purpose, such as cooking. It can also be used in a gas engine to convert the energy in the gas into electricity and heat.

The Ministry of Petroleum & Natural Gas, Govt. of India in association with Public Sector Undertaking (PSU) Oil Marketing Companies (OMC) viz. *Indian Oil Corporation Ltd.*, Bharat Petroleum Corporation Ltd. and Hindustan Petroleum Corporation Ltd. `launched SATAT Programme in October 2018 for setting up of 5000 Bio CNG Plants in India



India is the second largest producer of fruits and vegetables. However, post-harvest losses in India stand at 40%, which is very high primarily because of low shelf life and poor cold chain infrastructure. On a whole, more than 600 million metric tonnes (MMT) of agricultural wastes are generated every year in the country, most of which goes as waste. On the other hand, India relies more than 80% on imports to meet its energy demand. A solution that can address these twin problems of organic waste and high energy import to provide alternate source of the clean fuel is therefore highly desirable.

### **Commercial Model of Biogas**

Under this model, large biogas/ Compressed Biogas (CBG) plants can be set up by Entrepreneurs/ Cooperatives/Gaushalas/Dairies, etc., for generation of CBG on a commercial scale. The CBG can be sold to industries/Oil Marketing Companies (OMCs) or directly through fuel dispensing units etc. Slurry from the plant will be converted to solid and liquid bio-fertilizers/organic manure.

- State and Districts will promote the construction of commercial units as part of the GOBARDHAN scheme to promote the use of biogas for multiple needs. In this regard, they would:
- Create enabling policy provisions for entrepreneurs and businesses to set up commercial units
- Support entrepreneurs and businesses to avail loans/financial assistance being provided under the schemes of various departments/institutions.
- Create awareness of the business potential of commercial plants so that more such plants are set up.
- Promote uptake of slurry by Government Departments and other allied organisations.
- Provide land on lease for the project, wherever needed

### Funding source

Large CBG plants are to be set up through self-financing. However, financing/assistance can be availed from other sources such as:

- I. Commercial loans Loans to entrepreneurs for setting up CBG plants have been included under Priority Sector Lending. SBI and Bank of Baroda, PNB, IREDA have introduced loan products for CBG plants under Sustainable Alternative Towards Affordable Transportation (SATAT) of MoPNG
- II. Waste to Energy programme of MNRE\*: a. Central Financial Assistance for Bio-CNG generation (including setting up of biogas plant): Rs 4.0 Crore per 4800 kg/day. For further details, please visit the website https://biourja.mnre.gov.in/
- III. Compressed Biogas Plants: Rs. 75 Lacs / ton upto max Rs. 20 CR subsidy under UP Bio Energy Policy 2022.

- IV. Agriculture Infrastructure Fund (AIF): AIF provides financial support for investment in viable projects relating to post-harvest management infrastructure and community farming assets. All loans under this financing facility will have an interest subvention of 3 percent per annum up to a limit of loan amount of Rs. 2 crores. This subvention will be available for a maximum period of 7 years. CBG plants have been included as eligible project of AIF. For further details of the scheme please visit the website https://agriinfra.dac.gov.in/
- V. CSR and other sources
- VI. Swachh Bharat Kosh: For disbursement of fund under SBK, the operational guidelines of Swachh Bharat Kosh will be followed. For more information visit: http://sbkosh.gov.in/
- VII. Other support: MoPNG provides support for CBG projects under SATAT in the form of assured off take of CBG for 15 Years.
- VIII. Under the innovative incentive mechanism for the restoration, nourishment, and betterment of the mother earth. Market Development Assistance (MDA) scheme in the form of Rs 1500 per MT to support marketing of organic fertilizers, viz., Fermented Organic Manures (FOM)/Liquid FOM/Phosphate Rich Organic Manures (PROM) produced as by-product from Bio- gas Plants/Compressed Biogas (CBG) Plants set up under GOI umbrella of Gobardhan initiative.

### Background:

Bio-gas is produced naturally through a process of anaerobic decomposition from waste / bio-mass sources like agriculture residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc. After purification, it is compressed and called CBG, which has pure methane content of over 95%. Compressed Biogas is exactly similar to the commercially available natural gas in its composition and energy potential. With calorific value (~52,000 KJ/kg) and other properties similar to CNG, Compressed Bio-Gas can be used as an alternative, renewable automotive fuel. Given the abundance of biomass in the country, Compressed Bio-Gas has the potential to replace CNG in automotive, industrial and commercial uses in the coming years.

### POTENTIAL APPLICATIONS

The analysis estimates that the biogas potential ranges from **310 to 655 billion m3/year** in the year 2040 depending upon availability of different resources. The estimated biogas potential in the year 2040 is around 36% of India's current (2015) total primary energy supply in the high availability scenario.

The potential for Compressed Bio-Gas production from various sources in India is estimated at about 62 million tonnes per annum. Thermal Application: Biogas Plants could be used for any heating, melting, burning, drying process where an operating temperature is up to 1250



degree centigrade is required. Thermal application is done either by filling the compressed biogas in cylinders and then taking those cylinders to the application site.

### Bio-waste to Biogas in India

- Cow Dung, poultry litter, horse dung, etc.
- Agricultural residues as rice straw, wheat straw banana stem, maize stalks
- Industrial by product-Sugar mill press mud, Distilleries spent wash, Sago plant effluent
- Municipal Solid Waste, Slaughter-House waste, vegetable market waste, kitchen waste

# Other than use as an automotive fuel, some of the other potential applications of Biogas are as under:

- Heat treatment furnaces/Lime kiln and other industrial kilns Ceramic Kiln
- Institutional Cooking/Hotels / Restaurants/Food Processing/Bakeries/Tea / Coffee processing
- Steel re-rolling mills and forgings/Charcoal production/Textile Dyeing
- Melting & Heating of Non-ferrous metals/Annealing & heat treatment/Lube oil refineries
- Namkeen and Sweet Industries
- Boilers/Thermal Fluid heaters/Galvanizing furnaces
- Plywood Industries/ Candy Manufacturers/ Rubber & Footwear industries/ Silk dyeing and carpet units.

## **BENEFITS OF BIOGAS PLANT**

There are multiple benefits from converting agricultural residue, cattle dung, municipal solid waste, Mundi Waste and Poultry Litters into CBG on a commercial scale:

- Boost to entrepreneurship, rural economy and employment
- Biogas plants will help in managing a major portion of solid waste in villages i.e cattle dung and agricultural waste and promotes environmental sanitation.
- Promotes household income and saving as the use of biogas reduces the expenditure on LPG
- Promotes employment and income generation opportunities for SHGs/ farmers groups
- Substantially reduces vector-borne diseases and promotes public health
- Use of CBG reduces the expenditure & dependency on the Fuel
- Helps in reducing greenhouse gas emission and promotes environmental sustainability
- Helps in generating organic manure which enhances agriculture and farm productivity
- Helps to save foreign exchange by reducing the need for the import of natural gas



- Responsible waste management, reduction in carbon emissions and pollution
- Additional revenue source for farmers
- Support to national commitments in achieving climate change goals
- Buffer against crude oil/gas price fluctuations
- Helps in reducing carbon emission and promotes environmental sustainability

A non-polluting and renewable source of energy is created in biogas plants. Under the process organic waste is converted to useful fuel. It is an excellent way of energy conversion. Compressed biogas or electrical power can be used in Industries, Canteens, Restaurant, Hotels, Hostels, Sweet shop, Dhabas, etc.

### **Future Potential**

Compressed Biogas can be produced from various bio-mass/waste sources, including agricultural residue, municipal solid waste, sugarcane press mud, distillery spent wash, cattle dung and sewage treatment plant waste. The other waste stream that is rotten potatoes from cold storages, rotten vegetables, dairy plants, chicken/poultry litter, food waste, horticulture waste, forestry residues and treated organic waste from industrial effluent treatment plants (ETPs) can be used to generate biogas.

Going forward, Compressed Bio-Gas networks can be integrated with city gas distribution (CGD) networks to boost supplies to domestic and retail users in existing and upcoming markets. Besides retailing from OMC fuel stations, Compressed Bio-Gas can at a later date be injected into CGD pipelines too for efficient distribution and optimized access of a cleaner and more affordable fuel.

## Benefits of Fermented Organic Manure (Bio-Fertilizer) Plant

- To prevent pollution and environment degradation by proper conversion and utilization of organic / agricultural waste.
- To convert the organic waste in to plant nutrient resources
- boost both nutrient efficiency and **organic** matter content in the soil;
- nurture the soil with organic matter that reduces dependency on chemical inputs;
- restore and maintain soil fertility to nurture plant growth;

## AN OVERVIEW OF THE COUNTRY – BIO-FERTILIZER

India is the second largest producer of fruits and vegetables. However, post-harvest losses in India stand at 40%, which is very high primarily because of low shelf life and poor cold chain infrastructure. On a whole, more than 600 million metric tonnes (MMT) of agricultural wastes are generated every year in the country, most of which goes as waste. On the other hand, India relies more than 80% on imports to meet its energy demand.



The underlying objective of the project is to bring about lifestyle improvements and enhance the standard of living through financial-cum-technical support. The project aims at helping villagers have access to use of biogas. On-farm biogas plants collect cow dung from adapted cattle sheds, Goshalas, Farmers, mix it with water and channel it into fermentation pits. The resulting biogas is environmentally friendly as it curbs the decomposition of open cow dung producing methane, a gas that significantly contributes to global warming.

## Fermented Organic Manure (Bio-Fertilizer): -

The soil fertility and nutrient availability are limiting factors for growth and plant development. Fermented compost and nitrogen (N)-fertilizer are useful as sources of nutrients to support the growth of plant and microorganisms in soils. The combination of biological fertilizer and chemical fertilizer can support the concept of sustainable and integrated agriculture and minimize the adverse effects of chemical fertilizers.

Manures are plant and animal wastes that are used as sources of plant nutrients. They release nutrients after their decomposition. The art of collecting and using wastes from animal, human and vegetable sources for improving crop productivity is as old as agriculture. Manures are the organic materials derived from animal, human and plant residues which contain plant nutrients in complex organic forms. Major sources of manures are:

- 1. Cattle shed wastes-dung, urine and slurry from biogas plants
- 2. Human habitation wastes-night soil, human urine, town refuse, sewage, sludge and sullage
- 3. Poultry Jitter, droppings of sheep and goat
- 4. Slaughterhouse wastes-bone meal, meat meal, blood meal, horn and hoof meal, Fish wastes
- 5. By-products of agro industries-oil cakes, bagasse and press mud, fruit and vegetable processing wastes etc
- 6. Crop wastes-sugarcane trash, stubbles and other related material
- 7. Water hyacinth, weeds and tank silt, and
- 8. Green manure crops and green leaf manuring material

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- To convert the organic waste in to plant nutrient resources
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### Implementation, Production & Marketing Plan

It is planned to roll out 5,000 Compressed Bio-Gas plants across India in a phased manner, with 250 plants by the year 2020, 1,000 plants by 2022 and 5,000 plants by 2025. These plants are expected to produce 15 million tonnes of CBG per annum, which is about 40% of current CNG consumption of 44 million tonnes per annum in the country. At an investment of approx. Rs. 1.7 lakh crore, this initiative is expected to generate direct employment for 75,000 people and produce 50 million tonnes of bio-manure for crops.

Superior Agro are in negotiations with Gram Panchayat / Direct Marketing Sale Network and using the IOCL Rural Fuel Stations and Kisan Seva Kendra and Punjab Agri Export Corporation for sale of Bio-Fertilizers in coming time.

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### CHAPTER 3 POTENTIAL OF COMPRESSED BIOGAS (BIO-CNG) & ORGANIC GRANULATED FERTILIZER

### India's gas consumption to jump more than 3 times by 2030: GAIL Director

India's natural gas consumption is projected to rise to as much as 550 million standard cubic meters per day by the end of the decade from about 174 mmscmd now as the user base expands with the inclusion of newer industries such as steel, <u>GAIL</u> (India) marketing director E S Ranganathan said on Thursday (25 Nov. 2021). Speaking at the **ET Energy world Gas Conclave** virtual event, he said the revolutionary move to commit to a net-zero carbon emission by 2070 has strongly showcased the Indian economy's reorientation towards a cleaner and lower emission economy.

"We now have a definitive policy direction towards phasing down of coal from primary energy mix with our targets carefully calibrated to account for India's energy needs. Against this background, gas along with derived products such as blue hydrogen and ammonia will have a greater role to play in starting down the slope from peak emissions to net-zero emission," he said.

While the government is targeting to increase the share of natural gas in the primary energy basket to 15 per cent by 2030 from the current 6.2 per cent, the share of the environment-friendly fuel in the total energy demand is only 2 per cent.

"So the sector will undoubtedly see a strong demand," he said adding the city gas networks that retail CNG to automobiles and piped gas to the household kitchen, have seen consumption exceed pre-Covid levels and will see aggressive growth going forward.

Gas consumption presently is around 174 mmscmd, largely by fertilizer plants, city gas networks and power units. Of this, 49 per cent is met by domestic production and the rest through imports in form of liquefied natural gas (LNG).

"On the supply side, we estimate that the country will reach around 380 mmscmd by 2029-30 with the indigenous production and import of LNG plus biogas also contributing significantly," he said.

LNG, he said, will continue to play a leading role in meeting India's gas requirements in spite of a strong and welcome upswing in domestic production.

The indigenous production has already jumped around 19-20 mmscmd in the last quarter, he said adding LNG import capacity will rise to 40 million tonnes per annum.

Gas demand will be "380 mmscmd on the conservative side and 550 mmscmd on the optimistic side by the end of this decade," he said. "We also estimate the growth of renewable will be an opportunity for gas to grow. Gas being the lowest carbon-emitting alternative to



that, so wherever renewable is not there, gas can pitch in so we can have a low carbonemitting mechanism in place."

India needs Rs 1.6 lakh crore in investments over the next 5-8 years to expand the use of natural gas, including building terminals and laying of pipelines, he said adding major gas demand is expected to come from industries using blast furnaces such as steel, oil refineries, long-haul transport, and heating and cooling requirement.

Demand from city gas is likely to rise to 140 mmscmd in 8 years from 35 mmscmd now while gas use in refineries is expected at 58 mmscmd from about 14 mmscmd now.

On pricing, Ranganathan said there is a need for a long-term "stable and healthy" price of LNG for gas demand to grow.

### Compressed Bio Gas (CBG) in India

India is among the fastest growing economy in the world and its energy consumption is slated to increase rapidly. According to the Ministry of Petroleum and Natural Gas (MoP & NG) estimates, India has a total reserve of 763 Million Metric Ton (MMT) of crude oil and 1,488 Billion Cubic Meter (BCM) of natural gas.

The country currently imports nearly 77% of its crude oil requirements and about 50% of natural gas requirement, leading the Government of India to set a target of reducing this import by at least 10% by 2022. Further, it has set a target of increasing the contribution of gas in India's energy mix from existing 6.5% (global average is 23.5%) to 15% by 2022.

### **Agricultural Productivity**

Currently, India produces 106.19 million tonnes of rice a year from 44 million hectares of land. That's a yield rate of 2.4 tonnes per hectare, placing India at 27th place out of 47 countries. China and Brazil have yield rates of 4.7 t/ha and 3.6 t/ha, respectively. As the graph shows, if Indian agricultural productivity was at these rates, we could produce 205.52 million tonnes and 160.01 million tonnes of rice, respectively.

India's yield rates for rice and wheat —tonnes produced per hectare—is drastically lower than even Brics counterparts. If India's yield rates for the two crops were at China's levels, we could almost double our yields or halve the land used for the purpose.

### Potential of Bio-CNG in India

- High potential industries for Biogas:
- Primary: Distillery, Sugar, and Starch (75% Biogas)
- Secondary: Pulp and paper, Milk processing, Slaughter house, and Poultry



As per a recent study sponsored by MNRE, the current availability of biomass in India is estimated at about 750 million metric tonnes per year. The Study indicated estimated surplus biomass availability at about 230 million metric tonnes per annum covering agricultural residues corresponding to a potential of about **28 GW**. This apart, about 14 GW additional power could be generated through bagasse-based cogeneration in the country's 550 Sugar mills, if these sugar mills were to adopt technically and economically optimal levels of cogeneration for extracting power from the bagasse produced by them.

### CBG SALES TIE-UP FOR 15 YEARS WITH IOCL UNDER SATAT PROGRAMME

Indian Oil Corporation Ltd (IOCL) is India's flagship national oil company with business interests straddling the entire hydrocarbon value chain - from refining pipeline transportation and marketing of petroleum products to exploration & production of crude oil & gas marketing of natural gas and petrochemicals. The company is the leading Indian corporate in the Fortune 'Global 500' listing ranked at the 168th position for the year 2017. IOCL is a public sector undertaking. Government of India held 56.98% stake in IOCL as on 31 December 2017.The company's operations include refineries pipelines and marketing.

Superior Agro in process to sign a 15 years Bio-CNG Sales agreement with IOCL.

### Implementation, Production & Marketing Plan

Hon'ble Prime Minister has given the following four pillars of vision of India's energy future – energy access, energy efficiency, energy sustainability and energy security. The Government of India has also set a target of – 'Doubling Farmers Income by 2022'Government of India has released the National Policy on Bio-Fuels 2018 vide gazette notification no. 33004/99 dated 8.6.2018. The policy emphasizes on promotion of advanced Bio-fuels including CBG.

### Liquid Fermented Organic Manure (Organic Fertilizer) Market Report

Liquid fertilizers provide higher uniformity than granular fertilizers, offering more clear coating to the crops so that all plants receive the same nutrients regardless of the place. This advantage is expected to increase the Liquid Fermented Organic Manure (Organic Fertilizer) Market size.

### Sales Network of Fermented Organic Manure

- Plan to sell the Organic Manure through Punjab Agro (Govt. of Punjab Undertaking) / Punjab Agri Export Corporation.
- Bio-fertilizers act as a supplement to the chemical fertilizers in meeting the nutrient requirement of the crops. Fortified Granulated Bio-fertilizers application results in the increased uptake of water, development of roots, vegetative growth, increased minerals and increased fixation of nitrogen.



- Bio-fertilizers restore normal fertility to the soil and make it biologically alive. They boost the amount of organic matter and improve soil texture and structure. The enhanced soil holds water better than before.
- Bio-fertilizers add valuable nutrients to the soil, especially nitrogen, proteins and vitamins.
- They also helps in reducing dependence upon expensive petroleum sources of chemical fertilizers.

## Scope of Organic Fertilizer in India

Growing information about synthetic fertilizers' adverse effects is one of the primary reasons driving the Organic Fertilizer Market size. Synthetic fertilizers are generated mainly from chemicals and non-renewable sources that harm the environment, such as polluting soil and affect the soil quality.

The global Organic Fertilizer market size is projected to reach USD 13.8 Billion by 2026, from USD 6.9 Billion in 2019, at a CAGR of 10.4% during 2021-2026.

### Trends Influencing Fermented Organic Manure (Organic Fertilizer) & Market Size

It is expected that increased implementation of environmental policies to minimize the use of non-biodegradable goods would, in turn, fuel the growth of organic fertilizer market size during the forecast period.

The growing trend of using liquid organic fertilizers is expected to accelerate market growth over the forecast period, as they are less labour-intensive and are also easy to use.

### **Organic Fertilizer Market Share**

In 2016, the largest revenue contributor was the animal-based supply for organic fertilizer. The animal-based organic fertilizers act as an optimal supply of nitrogen content and offer other essential nutrients provided by the crops. Additionally, these fertilizers increase the soil's ability to retain water.

Based on the region, the Asia Pacific is projected to witness the highest CAGR during the forecast period. This rapid growth of the region is attributed to the increase in per capita income and the growing demand for organic food.

### Liquid Fermented Organic Manure (Organic Fertilizer) Market Report

Liquid fertilizers provide higher uniformity than granular fertilizers, offering more clear coating to the crops so that all plants receive the same nutrients regardless of the place. This advantage is expected to increase the Liquid Fermented Organic Manure (Organic Fertilizer) Market size.



This study focuses on the liquid Fermented Organic Manure (organic fertilizer) volume and value at the national, regional, and business levels. From a global viewpoint, this study reflects the total market size of Liquid Organic Fertilizer by evaluating historical evidence and forecasts for the future. This study focuses on many main regions in the region: North America, Europe, Japan, China, South East Asia, India, and so on.

- To sell the dry Bio-fertilizer is to be sold at approx. Rs. 8.0/kg through Punjab Agri Export Corp. / Company Sales Network / Using Indian Oil Rural Fuel Stations Network.
- Bio-fertilizers act as a supplement to the chemical fertilizers in meeting the nutrient requirement of the crops. Fortified Granulated Bio-fertilizers application results in the increased uptake of water, development of roots, vegetative growth, increased minerals and increased fixation of nitrogen
- Bio-fertilizers restore normal fertility to the soil and make it biologically alive. They boost the amount of organic matter and improve soil texture and structure. The enhanced soil holds water better than before.
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## CHAPTER 4 PLANT DESIGN & TECHNOLOGY

### **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 for bacteria, in four stage, Groups of bacteria involved in the process are (1) Acid forming bacteria, (2) Aceto-genic bacteria, (3) Aceto-clastic bacteria, (4) Hydrogen Utilizing methane bacteria. The First and second stage involve degradation of high molecular weight substances cellulose, starch, protein, fats, etc., present in organic material into small molecular weight compounds like fatty acids amino acids carbon dioxide & hydrogen by acetogen. The third stage involved in which organism knows as homo-acetogens converted hydrogen and simple carbon compound produced in the first and second stage into acetate and some other simple compound like format, carbon dioxide & hydrogen and methane.

### CBG Production Technology - Continuously stirred tank reactor (CSTR) digester:

In a CSTR digester, organic material is constantly or regularly fed into the digester. The material moves through the digester either mechanically or by the force of the new feed pushing out digested material. Continuous digesters produce biogas without the interruption of loading material and unloading effluent. They are better suited for large-scale operations. Proper design, operation, and maintenance of continuous digesters produce a steady and predictable supply of usable biogas.

CSTR – The CSTR (Continuous-Flow Stirred Tank Reactor) is a technological solution that requires a continuous flow of fresh biomass. The biomass fed into the reactor is constantly mixed to ensure a perfect homogenization. In the CSTR, the anaerobic digestion process takes place at controlled temperatures and for dry matter contents below 10 percent. The retention time is variable and depends on the types of biomasses used to feed the plant.

### How does CSTR Technology Works

Solid and liquid biomasses are loaded through a pre-tank or loader into the digesters, circular tanks made of concrete or steel.

The digesters are equipped with slow and fast mixers, whose operation is optimized to ensure a perfect homogenization of the digestant in the tank and prevent crust and sediment formation.

A sailing or gasometer cover is installed to cover the digesters, which ensures the storage of a sufficient volume of produced biogas.



### **Technology Advantage**

From an engineering and process engineering point of view, the reactor has numerous advantages. In addition to being a flexible technology, it allows technical measures to be implemented in order to maximise energy production:

- It is suitable for feeding the plant with **BIOMASS WITH A COMPLEX DIGESTION**;
- Provides the possibility to implement **CO-DIGESTION** with a varied recipe;
- It has EHIGH BUFFERING CAPACITY for pH variation.

CBG or Compressed Bio Gas consists of mainly methane (more than 90%) and other gases like carbon dioxide (less than 4%), etc. CBG is produced by anaerobic digestion of biomass and waste sources like agricultural residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc. This Biogas can be purified to remove hydrogen sulphide (H2S), carbon dioxide (CO2), water vapor and when this purified biogas (methane content more than 90%) is compressed to maximum 250 bar and filled up in cascades (group of high pressure cylindrical vessels), it is called Compressed Bio Gas or CBG.

- Hydrolysis reaction decomposes organic molecule such as carbohydrates, proteins and fats into glucose, amino acids and fatty acids, respectively.
- Acidogenesis converts those generated small organic molecules to volatile organic acids with help from bacteria.
- During the Acetogenesis process, bacteria in the acetic group digests volatile organic acids and releases acetic acid.
- Lastly, anaerobic bacteria in the methanogenic producing bacteria group will complete the Methanogenesis process by converting acetic acid to methane gas and other gases like carbon dioxide and hydrogen sulfide.

Hydrogen sulfide is a corrosive gas. Presence of carbon-dioxide in the bio-gas reduces its calorific value. Hence the biogas needs to be purified. Various technologies are used for removal of hydrogen sulfide, such as Biological Fixation, Iron chloride dosing, Water scrubbing, Activated carbon, Iron Hydroxide or Oxide and Sodium Hydroxide etc.

## Anaerobic Digestion technology:

An Anaerobic Digester is a device for optimizing the anaerobic digestion of biomass and to produce biogas for energy production. Anaerobic digesters are made out of concrete, steel, brick, or plastic. They are shaped like silos, troughs, basins or ponds, and may be placed underground or on the surface. All designs incorporate the same basic components: a pre-



mixing area or tank, a digester vessel(s), a system for using the biogas, and a system for distributing or spreading the effluent (the remaining digested material).



### Advantages:

- Efficient digestion
- Can digest different levels of dry matter content
- May digest energy crops
- Good mixing
- Good solids degradation

### **Disadvantages:**

- Complex digestion process
- High capital cost
- Requires more skilled workers

### Biogas purification technologies:

In order to improve the calorific value and energy content, methane concentration shall be increased and in turn CO2 & hydrogen sulphide (H2S) shall be removed. Some of the available technologies for removal of H2S are Iron chloride dosing, Water scrubbing, Activated Carbon and Amine Process. For removal of carbon dioxide, the following technologies are prevalent:



### Pressure Swing Adsorption (PSA)



This technology is prevalent for large bio-gas systems in India. With this technique, carbon dioxide is separated from the biogas by adsorption on a surface under elevated pressure. The adsorbing material, usually activated carbon or zeolites, is regenerated by a sequential decrease in pressure before the column is reloaded again, hence the name of the technique. Hydrogen sulphide and water needs to be removed before the PSA-column.

### Plant Design and Operation of Biogas Plant

Flawless design is the key to smooth and efficient operation of the plant. A small design error can lead to high loss of efficiency or even complete failure of the plant. This plant being a large-scale biogas plant further emphasizes the need for accurate design.

### **Biogas Production Unit:**

Cow dung / press mud / rice straw will be mixed in the mixer and fed to the digester. Waste will be fed in the digester after homogenizing with water in ration of 1:1.5-2.0. Composition of raw biogas:

Methane:	55-60%
Carbon dioxide:	35-40%
Hydrogen Supplied:	~ 500 ppm
Nitrogen:	2-3%



The entire plant and machinery is easily available from many different suppliers from India and abroad. The know-how is also available from very reliable sources from abroad. The plant for 350 days per year, using sophisticated and proven CSTR (Continually stirred tank reactor) technology. Anaerobic digestion is a renewable energy generation process in which microorganisms break down biodegradable material in the absence of oxygen. Anaerobic digestion technology was developed long back and commercialized in Europe and is technically considered a low-risk, high-output technology.

### CBG Production Technology (VPSA Systems)

It's a specially designed gas separation system that uses adsorbent to separate the gas. Adsorbents are like molecular sieves, with a tiny pore on their surface that allows them to selectively adsorb molecules like Co2 and N2 under a certain pressure.

CBG or Compressed Bio Gas consists of mainly methane (more than 90%) and other gases like carbon dioxide (less than 4%), etc. CBG is produced by anaerobic digestion of biomass and waste sources like agricultural residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc. This Biogas can be purified to remove hydrogen supplied (H2S), carbon dioxide (CO2), water vapor and when this purified biogas (methane content more than 90%) is compressed to maximum 250 bar and filled up in cascades (group of high pressure cylindrical vessels), it is called Compressed Bio Gas or CBG.

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### Biogas enrichment / Carbon di oxide removal – Anaerobic

Bio-Methane Production involves the removal of undesired & corrosive components of Biogas and compression of pure gas in CNG cylinders. BIS norms (IS 16087: 2013) for the composition of Bio-Methane are as follows—

S. No.	Particulars	Composition
1	Methane	90%
2	Moisture	16 mg/M <sup>3</sup> (max)
3	Hydrogen Supplied	30.3 mg/M <sup>3</sup> (max)
4	CO2 + N2 + O2	10% (max)

Biogas Purification Plant will reduce the level of impurities up to the desired level and increases the percentage of Methane as per the requirement. Working principle involves the variation of solubility of gases with pressure and solubility difference of Methane, Carbon dioxide & Hydrogen Sulphide in Water and moisture adsorption properties of ZMS & Alumina.

### Purification

Production of biogas could be a continuous process. The utilization of biogas as an efficient energy source depends strongly on its methane concentration. Therefore, biogas purification is essential in order to have more energy per unit volume of compressed biogas and to get rid of the corrosive effect of H2S. Biogas purification process increases the methane concentration and decreases the carbon dioxide concentration in biogas, which in turn would result in higher calorific value. The purified biogas is compressed as CBG with methane content of more than 90%, and the CBG shall be complied to IS 16087:2016 specifications of BIS.

Some of the technologies which are prevalent in removal of carbon dioxide are Pressure Swing Adsorption (PSA), Vacuum Swing Adsorption (VSA), Water scrubbing, Membrane Separation and Chemical scrubbing – Mono ethylamine (MEA) system.



### Compression

The purified biogas with more than 90% of methane will be compressed at 250 bar and transported in gas cylinders (cascades) for the end use.

Bio-CNG plant will be commissioned after obtaining required license for filling and storage of compressed biogas in CNG cylinders from Petroleum & Explosives Safety Organization (PESO), State Pollution Control Board (PCB) etc.

Calorific Value of Bio-Methane with ~93% of Methane is about 45 MJ/Kg while the calorific value of LPG is about 46 MJ/Kg. Therefore, it is a good, sustainable & renewable replacement of LPG in all thermal applications of LPG. Furthermore, the emissions of Bio-Methane are better than LPG due to the higher number of Hydrogen atoms per Carbon atom. Again, any kind of modification is not required in the receptacle (Burner etc.) of LPG.



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### Cascade storage & transportation:

The compressed biogas will be filled and transported through cascades which is a group of high pressure cylindrical vessel. For delivery of CBG, 3000 litres metal cascades or cascades of higher capacity shall be used. Steel cylinder cascades and composite cascades may be used for transportation of CBG. For steel cylinder cascades, IS 7285 shall be applicable. If type-3 or type-4 composite cascades are used, respective BIS specifications like IS 15935 or relevant specifications shall be applicable.

# After the purification of Biogas purified Bio-Methane can be filled in standard CNG Cylinders Cascade through a High Pressure CNG Compressor.



Schematic of Bio-CNG Bottling System

### Compressed biogas standard:

Compressed Bio Gas (CBG) will be supplied shall meet IS 16087:2016 specifications of BIS (detailed below) and any other further revisions in the said specifications.


Composition of CBG IS 16087: 2016			
S. Nos.	Standard Characteristic	Requirements	
1	Methane percentage (CH4), minimum	90.0%	
2	Only Carbon Dioxide percentage (CO2), maximum	4.0%	
3	Carbon Dioxide (CO2) + Nitrogen (N2) + Oxygen (O2)	10.0%	
	percentage maximum		
4	Oxygen (O2) percentage maximum	0.50%	
5	Total sulphur (including H2S) mg/m <sup>3</sup>	20 mg/m <sup>3</sup>	
6	Maximum Moisture mg/m <sup>3</sup> , maximum	5 mg/m <sup>3</sup>	

Also as per the IS 16087:2016 specifications, the following shall also be met CBG shall be free from liquids over the entire range of temperature and pressure encountered in storage and dispensing system

The CBG shall be free from particulate matter such as dirt, dust, etc. CBG delivered shall be odorized similar to a level found in local distribution (ref. IS 15319)

#### **Digested Slurry – Organic Fertilizer:**

Organic Fertilizer unit description for each digester the effluent would be of the order of 60 kL /day with 7- 8% TS. The Digester Effluent has wide ranging use as organic manure including for grains/ sugar cane farming, but have preferential applications for, short cycle, forage/energy crops & horticulture products farming. It is also non-pollutant because it is free from weed-seeds, foul smell and pathogens. The slurry is rich in main nutrients such as Nitrogen, Potassium and Sodium (NPK) along with micronutrients – Iron & Zinc etc. As such there is no pollution from biogas plant. The effluent from the Biogas Digester is sent to the organic fertilizer unit where the solids & the liquid is separated. The separated solids will be packaged and sell in to the market.

#### Advantages of using digester effluent as fertilizer are:

a. General Positive impacts on environment:

- Decrease of odor of manure
- Less CH4 emissions & Reduce ground water contamination

b. Close nutrient cycle with using biogas plant effluent as fertilizer:

- Nutrients in feedstock of biogas plants can be reused after anaerobic digestion.
- Only few losses of nutrients during storage, transport and biogas process.

c. Improvements on manure quality with anaerobic digestion:



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- Degradation of cells, organic acids and long chain organic matter
- Increase of availability of nutrients (especially nitrogen)
- Increase of humus on the fields (compared to combustion)

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c. Improvements on manure quality with anaerobic digestion:

- Degradation of cells, organic acids and long chain organic matter
- Increase of availability of nutrients (especially nitrogen)
- Increase of humus on the fields (compared to combustion)

Parameter	Organic	Inorganic / Synthetic
Soil Health	Helps by improving soil texture and	Known to deteriorate soil
	structure, which increase water holding	health in long run. Leads to
	capacity and beneficial microbial	pollution.
	activities	
Nutrient Content	Nitrogen and Phosphorus content is	High or configured nutrient
	often substantially lower. Nutrient content	content.
	also vary with type of feedstock.	
Release of	They need to be broken down by soil	Faster and immediate, but
Nutrients	organisms in order for their nutrients to	nutrients are vulnerable to run
	be released and takes time. Because	off, which is potential hazard
	they work slowly, nothing is wasted. Slow	for water bodies.
	and steady	
Volume and	Requires high volume, thus ineffective	Less volume compared to
Transportation	cost of transportation. But use of locally	Organic fertilizers creates a
	available sources with enrichment is	toxic concentration of salts if
	perfectly reasonable if its use is	over-applied.
	consistent with the production strategy.	
Nutrient quantity	Difficult to have control as nutrient	Easy to manage the quantity
	quantity varies with feedstock	



Output	Healthy and sustainable food for	Known to contain toxic
	population	chemicals

#### Fortified Bio-Fertilizer:

In contrast to bio-fortification, micronutrient fertilization has been found to be capable of directly increasing the nutritional content of crops in the short term.

Fortified fertilizers are enhanced phosphate and nitrogen fertilizer blends with added micronutrients designed to feed degraded soil effectively. These fertilizers increase crop yields by giving plants the nutrients they need while protecting the soil.

#### Plant Design and Operation

Flawless design is the key to smooth and efficient operation of the plant. A small design error can lead to high loss of efficiency or even complete failure of the plant. This plant being a large-scale Bio-fertilizer plant further emphasizes the need for accurate design.

#### SPECIFICATIONS OF BIO-FERTILIZERS

Ministry Of Agriculture And Farmers Welfare (Department of Agriculture, Cooperation and Farmers Welfare) ORDER New Delhi, the 13th July, 2020 S.O. 2324(E).—In exercise of the powers conferred by section 3 of the Essential Commodities Act, 1955 (10 of 1955), the Central Government hereby makes the following Order further to amend the Fertiliser (Inorganic, Organic or Mixed) (Control) Order, 1985, namely:-

1. (1) This Order may be called the Fertiliser (Inorganic, Organic or Mixed) (Control) second Amendment Order, 2020

(2) It shall come into force on the date of its publication in the Official Gazette.

(i)	Total nitrogen (ammonical and urea), per cent by weight, minimum	9.0
(ii)	Ammonical nitrogen, per cent by weight, minimum	6.3
(iii)	Available phosphorus (as P2O5), per cent by weight, minimum	24.0
(iv)	Water soluble phosphorus (as P2O5), per cent by weight, minimum	20.5
(v)	Water soluble potassium (K2O), per cent by weight, minimum	24.0
(vi)	Magnesium (as Mg), per cent by weight, minimum	0.3
(vii)	Total Sulphur (S). per cent by weight, minimum	2.1
(viii)	Total Zinc (Zn), per cent by weight, minimum	0.6
(ix)	Total Boron (B), per cent by weight	0.2-0.3
(x)	Moisture per cent by weight, maximum	1.3

#### NPK 9:24:24 fortified with Mg S Zn B



(iv)

(v)

(vi)

(vii)

(viii)

C:N Ratio

Pathogens

Conductivity (as dSm-1 ) not more than

pН

Practical Size

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<20 Minimum 90% material should

pass through 4.0 mm IS Sieve

6.5-8.0

Nil

4

(xi)	Particle size-minimum 90 per cent of the material shall be retained
	between 1 mm and 4 mm sieve.

#### LIQUID FERTILIZER - NPK 8:8:8 (liquid) (for Sugar cane crop)

(i)	Total Nitrogen (ammonical +nitrate form) per cent by weight minimum		
(ii)	Nitrogen in ammonical form per cent by weight n	ninimum	3.0
(iii)	Available Phosphorus (as P2O5) per cent by we	ght minimum	8.0
(iv)	Water soluble Potash (as K2O) per cent by weig	ht minimum	8.0
(v)	Sulphate sulphur per cent by weight minimum		2.0
(vi)	Water soluble Chlorine (as CI ) per cent by weight maximum		0.5
(vii)	pH of 1 per cent solution		3.5+0.5
(viii)	Insoluble particle will not exceed 0.1per cent by weight when filtered on muslin cloth		
(ix)	Specify gravity		1.35
Ferme	ented Organic Manure		
(i)	Moisture% by weight, maximum	30-40%	
(ii)	NPK Nutrients- Total N, P2O5 and K2O nutrient should not be less than	1.2%	
(iii)	Total Organic Carbon(minimum)	14%	



(ix)	Heavy metal content, (as mg/kg),maximum	
	Arsenic as (As2O3)	10.0
	Cadmium (as Cd)	5.0
	Copper (as Cu)	50.0
	Chromium (as Cr)	300.0
	Mercury (as Ha)	0.15
	Niekol (as Ni)	50.0
	Nickel (as Ni)	100.0
	Lead (as Pb)	1000.0
	∠ınc (as ∠n)	

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# CHAPTER 5

# LIST OF PLANT MACHENARY & CIVIL CONSTRUCTION OF CBG PLANT & ORGANIC GRANULATED BIO-FERTILIZER PLANT

Estimated Cost of 14500 CuM Biogas Plant (6 TPD CBG)				
Sr No	Particulars of unit required	Unit Price	Rate	Amount
1)	1) Pre-Operational Expenses (Before Loan Disbursal)			
i)	Formation of New Company, Obtaining MSME Registration and Registration with concerned authorities and cost of website Development and Logo Designing	INR	L/S	1.00
ii)	ROC Fee for Paid-up Capital and Company Share Demat Charges on NSDL	INR	L/S	15.00
iii)	CA Fee + Transport Cost	INR	L/S	2.00
iv)	Expenses for NOC's (PESO + Pollution + Ground Water + Local Panchayat)	INR	L/S	6.00
V)	Project Report Charges - Tech Consultant	INR	L/S	5.00
vi)	Documentation for Project Approval from IOCL / GAIL and State Nodal Agency	INR	L/S	10.00
vii)	Bank Guarantee for IOCL / GAIL for signing of CBG Sale Agreement for 15 Yrs.	INR	L/S	5.00
viii)	Property Valuation + Legal & Insurance Expenses	INR	L/S	4.00
2)	Project Finance			
i)	Loan Application Fee	INR	L/S	1.18
ii)	Loan Processing Fee @ 0.75% on loan amount (apox 29 Cr)	INR	L/S	23.00
iii)	Third Party Agency Charges + Legal Charges	INR	L/S	25.00
iv)	Electricity Connection for Project Construction	INR	L/S	5.00
v)	Project Finance + Stamp Papers + Project Insurance	INR	L/S	90.00
3)	CIVIL WORKS - Site Development			
i)	Soil Testing + Back Filling + Boundary Wall Fencing + Main Gate + Security & Weighbridge Room	INR	L/S	80.00
ii)	Road + Development of Green Area	INR	L/S	40.00
iii)	Office Block + Labor Room + Toilet Block + Kitchen (2000 Sq Ft)	INR	L/S	40.00
iv)	Shade for Gas Purification (12 X 36 Meters)	INR	L/S	20.00
v)	Shade for Fertilizer Zone (6 X 10 Meters)	INR	L/S	10.00
vi)	CCTV + Street Lights	INR	L/S	10.00
3A)	CIVIL WORKS - Feed Preparation Pits + Slurry Pit +	Digesters		
,	· · · · · · · · · · · · · · · · · · ·	•		



i)	Soil Cutting for Mixing Pits (03 Nos & Slurry Pit (8 Mtrs X 4 Mtrs)	INR		10.00
ii)	Soil Cutting for Digesters (02 Nos) - 30 Mtrs X 10 Mtrs	INR		6.00
iii)	Pilling & PCC Const of Mixing Pits (03 Nos + 01 Slurry Pit (8 Mtrs X 4 Mtrs)	INR		20.00
iv)	Pilling & RCC of Digesters (02 No) - 30 Mtrs X 10 Mtrs	INR		310.00
v)	Digester monitoring ladder & crow's nest	INR		35.00
vi)	Center Pillars for Digesters (02 No)	INR		28.00
vii)	Epoxy & Insulation on Digester	INR		25.00
viii)	Pilling & Foundation of Purification Shades (12 X 30 Meters) - 3900 Sq Ft	INR		39.00
ix)	Fertilizer Zone Shades (6 X 10 Meters)	INR		20.00
x)	Piling & Foundation of Weighbridge (250 mm) - 4.5 x 16 Mtr	INR		21.31
xi)	DG Foundation & Panel + Store Room (600 Ft)	INR		15.00
xii)	Feed Preparation Area & Ramp	INR		20.00
xiii)	Construction of Water Treatment Area & Water Storage	INR		25.00
xiv)	Parking Area	INR		7.00
4)	Mechanical Equipments			
i)	Mixers of 11 Kva for Mixing Pits & Slurry Pit (04 Nos) with Accessories	4.00	8.00	32.00
ii)	Submersible Pumps of 7.5 KVA for transferring the Slurry with Accessories	4.00	7.00	28.00
iii)	Installation of Pumps & Mixers in Mixing & Slurry Pits	8.00	2.00	16.00
iv)	Mixer / Agitators (EU Origin) of 18.5 KW for Digesters	10.00	14.00	140.00
v)	Installation of Mixer / Agitators with Accessories & Ropes	10.00	4.00	40.00
vi)	Heating System	L/S		70.00
vii)	Piping & Valves	L/S		45.00
viii)	Double Membrane Raw Gas holder of 3300 CuM (Fabric - EU Origin) including all accessories and safety valve and observation window	2.00	70.00	140.00
ix)	VPSA Biogas Purification Plant (Sonitech-100 Cum/ hr) + H2S Desulphurization Tower (Filled with Catalyst) + Chiller + Automatic Control Panel with PLC + CO2 Gas Dryer	1.00	165.00	165.00
x)	PSA Absorber Towers - Filled with Molecular Sieves (P140 + 4A + Booster Chemical) - Made in France	1.00	40.00	40.00
xi)	Biogas burner / Flare	1.00	18.00	18.00
xii)	Condensate and Sediment trap (VS-5) for removing the Moisture	2.00	16.00	32.00
xiii)	Online Biogas Analyzer for (Ch4, H2S + Co2 + Moisture)	6.00	8.00	48.00
ix)	Over / Under Gas Pressure Relief Valve ((Hvdraulic - OUPV)	2.00	8.00	16.00



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x)	Biogas Compressor (JYOTECH) of capacity 650 Nm3/hr with discharge pressure 250 Kg/cm2g for bottling of CNG into Cascades	1.00	100.00	100.00
xi)	CNG Cylinder Cascade (4500 WL of 75 Cylinders) with Tubing Sandvik, Parker / Swagelok / Jindal Fittings	8.00	22.00	176.00
xii)	Cascades Safety Valves, Tubing SS 316 connecting System with 4 Nos of Output for Cascades filling, Pressure Gauge, Safety Valves, Seal Excel Ratnamani / Sandvik	L/s		16.00
xiii)	LCV Post with Mass Flow Meter, GIC Gauge Manifold with QRC & Connected 5 Meters Hose, QRC and Vent Line	3.00	4.00	12.00
xiv)	Solid Liquid Separators with Platform	3.00	22.00	66.00
xv)	Conversion of Liquid Fertilizers into Sloid Bio Fertilizer	1.00	130.00	130.00
xvi)	WTP / ETP & Rain Water Harvesting System	1.00	60.00	60.00
xvii)	Conveyor Belt for Solid Liquid Separators & Packing	L/S		35.00
xviii)	Bio Coal - Pallets Machine (2.5 ton / hr)	L/S		40.00
xvix)	Lab setup for monitoring of digestion process stability.	L/S		15.00
5)	Electrical, Instrumentation, PLC, data collect	ion		
i)	Grid OLTC Transformer 100 KWA with Cables	1.00	15.00	15.00
ii)	Electrical Panels	1.00	40.00	40.00
iv)	CT-PT, GO-DO Set, Lighting Arrestors, Servo, Earthing, ACB Panel with Power Factor (400 KVAR ADFC with 1600 AMP ACB), VCB and Cable for HT & LT	1.00	35.00	35.00
iii)	SCADA - Schneider / Honeywell Process Solutions with Control Panel with Switches	1.00	35.00	35.00
iv)	Cables & Fittings	L/S		30.00
v)	Genset (Diesel) - 350 KVA	1.00	20.00	20.00
vi)	Fire Fighting System	1.00	25.00	25.00
vii)	Lighting & UPS	10.00	1.00	10.00
6)	Off-site Facilities			
i)	Tractor Mounted Pay loaders, Trollies & Others	1.00	15.00	15.00
ii)	Tankers (3 Nos & 02 Trolies)	5.00	3.00	15.00
iii)	Napier Grass Cutter Machine (10 TPH)	1.00	32.00	32.00
iv)	Project Vehicles / Mahindra	1.00	12.00	12.00
v)	Weighbridge - 80 Ton	1.00	12.00	12.00
vi)	Computer & Furniture etc	L/S		15.00
I				
	Sub-Total			2,764.49
7)	EPC Contractor Charges @ 4%			110.58



8)	Associated Additional Cost		
i)	Cost of 5 Acres of Agriculture Land		424.0
ii)	Expenses for Land Use conversion (CLU)	3%	10.0
iii)	Bank Guarantee for availing the 100% Stamp Duty	6%	22.0
iv)	Transport Cost	INR	15.00
v)	Electricity Connection Charges	L/s	32.32
vi)	Contingencies	INR	87.34
vii)	Working Capital	INR	75.00
viii)	Margin for Working capital & Advance for Raw Material	INR	25.00
ix)	IDC on term loan	INR	300.00
x)	Adjustable GST	INR	400.00
PROJECT COST IN INR 4,265.73			
Govt Subsidies on Plant - Rs. 80 Lac / Ton from GOI + 75 Lac/ Ton from UPNEDA + Carbon Credit @ Rs. 30 Lac / Yr			
*Proposed Collateral of 3.0 Cr for IREDA @ 10% of Loan amount (Bank need min 40% Collateral			

\*Proposed BG Limit against Collateral of 1.35 Cr for UPNEDA @ 3% of Project Cost

\*Expenses on Subsidies from PEDA / UPNEDA / MNRE / NABARD @10% arte extra

# **COMPRESSED BIOGAS**

#### *i. Biogas Production Unit:*

- System will be constructed in a manner that allow biomass to easily feed into the digester with minimal manual intervention.
- Biomass will be fed in to the digester after homogenizing with water in ration of 1:1.5.
- Composition of raw biogas:

Methane:	55-60%
Carbon dioxide:	35-40%
Hydrogen Sulphide:	~ 500 ppm

#### ii. Biogas Purification Unit:

- To remove all the impurities, present in raw biogas, need to install a biogas purification unit.
- 750 m3/hr capacity PSA based biogas to purification biogas will be installed.
- Composition of enriched biogas:

Methane:	95-96%
Carbon dioxide:	2-3%
Hydrogen Sulphide:	< 10 ppm



#### iii. Biogas Bottling Unit:

• Purified biogas will be compressed up to 250 bar pressure by high pressure booster compressor of capacity 600 m3/hr and would be bottled Cascade or IOCL may lay the Pipeline upto factory for hassle free supply of Bio-CNG.

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# CHAPTER 6 RAW MATERIALS & RATE OF FINISHED PRODUCTS

**Compressed Biogas known as Bio-CNG -** The Bio-CNG is cost effectively used to replace CNG as an automotive fuel (for CNG buses and tractors) and LPG for cooking purposes.

**Fermented Organic Manure (Bio Fertilizer) -** Processed inoculated compost from any organic material that has undergone rapid decomposition by the introduction of homogeneous microbial inoculants. To produce quality organic fertilizer, plant residues like mud press, rice straw etc.

#### **Raw Materials:**

- **Napier Grass (Majorly)** Napier Grass is an ideal substrate for biogas Production. Napier grass and cattle slurry-based biogas production application that could be applied more cost-effectively more sustainable production biogas.
- **Press Mud / Spent Wash -** waste of **sugarcane industries** can be used to produce biogas. In order to produce biogas from press mud, press mud is allowed to ferment anaerobically in a digester for 3-4 hours at a temperature of 35-40°C.
- Cow Dung & Poultry Litter Widely used in the plant as a part of waste management and biogas production.
- Fruit & Vegetables Mundi Waste Contains 93.7% of volatile solids thus it has a great potential of biogas production and can be used easily and potentially as a raw material for biogas production

# Fermented Organic Manure (Bio Fertilizer)

- **Bio-fertilizers** act as a supplement to the chemical fertilizers in meeting the nutrient requirement of the crops. Fermented Organic Manure (Bio Fertilizer) application results in the increased uptake of water, development of roots, vegetative growth, increased minerals and increased fixation of nitrogen
- Bio-fertilizers restore normal fertility to the soil and make it biologically alive. They boost the amount of organic matter and improve soil texture and structure. The enhanced soil holds water better than before.
- Bio-fertilizers add valuable nutrients to the soil, especially nitrogen, proteins and vitamins.
- They also helps in reducing dependence upon expensive petroleum sources of chemical **fertilizers**.
- They restore normal fertility to the soil and make it biologically alive.



# TIE-UP FOR RAW MATERIAL

We are in process to finalize the long-term Purchase of Napier Grass as Raw Material from FPO's & Direct local Farmers.

2. Cattle Dung & Agriculture Waste: Through Gram Panchayat / Farmer's SHG / Gaushalas / Farmers

# PRODUCT PROPOSED PRICE FOR SALE OF BIO-CNG

#### Assured Long term Pricing

• An Expression of Interest (EOI) to procure CBG by Indian Oil was released under the SATAT scheme on 1st October 2018. As per the EOI, the price offered for CBG by Oil & gas companies is as follows:

Item	Price
Basic Price of CBG meeting IS 16087 : 2016 standard, compressed	Rs. 46.0 / kg
at 250 bar and delivered at Indian Oil Retail Outlets in cascades	
GST at 5%	Rs. 2.3 / kg
Total supply price (incl. GST) to be paid to party	Rs. 48.0 / kg

OMC (Indian Oil Corporation) has revised the CBG Procurement Rate (82.50% of Retails Selling Rate at Retails Outlet) under their Notification Ref. No. CO/AE&SD/01 dated 20.05.2022.

# For Example – The Current Retails Price of CNG at Shamli / Saharanpur is Rs. 84/ kg including GST, The IOCL Procurement rate will be Rs. 68 per Kg including 5% GST & Transport cost, Delivered at Karnal, Haryana IOCL's Retails outlet.

IOCL is taking the lead in terms of setting up plants for generation of Bio-CNG so that farmers can supply biomass instead of burning it. IOCL is going to buy back Bio-CNG and sell the same and execute this Programme in north India.

Government of India has released the National Policy on Biofuels 2018 vide Gazette Notification No. 33004/99 dated 8.6.2018. The policy emphasizes on promotion of advanced Biofuels including CBG.

Basic Price of CBG meeting IS 16087: 2016 standard, compressed at 250 bar and delivered at OMC Retail Outlet in cascades.



The CBG cab also be sale in open market on the rate of Rs. 80 - 83/ kg

#### Product Proposed Price for Sale of Organic Fertilizer

To ensure promotion of organic farming in India and enhance revenue from sale of biproducts of CBG plants such as "Fermented Organic Manure", Ministry of Agriculture has included them in Fertilizer control Order, thus facilitating marketing of Organic manure throughout India under The Fertilizer (Inorganic, Organic or Mixed) (Control) second Amendment Order, 2020 in Gazette notification on 13 July 2020 & 1<sup>st</sup> June 2021 and IOCL is in discussion with Indian fertilizer marketing companies for tie-up of Sale of Bio Fertilizer in India

The product will be sale through Own Sale Network, Stat Govt. Agriculture & Horticulture cooperatives, Farmer's SHG and Gram Panchayats

The apox rate of Dry & Fortified Bio-Fertilizers (Fermented Organic Manure) @ Rs. 8

 10/kg.

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# CHAPTER 7 GOVERNMENT SUPPORT & INCENTIVE

The National Policy on Biofuels 2018 emphasizes active promotion of advanced bio-fuels, including CBG.

# MNRE SUBSIDY SCHEME (CFA):

The Ministry of New and Renewable Energy, Government of India supports Biogas Power Plants under above program. Projects for co-generation /power generation and production of bio-CNG from biogas.

Programme on Energy from Urban Industrial, Agriculture Waste / Residue and Municipal Solid Waste (Under Circular F. No. 20/222/2016-17-WTE dated 28.02.2020)

Mixing of other wastes of renewable nature, including rice husk, bagasse, sewage, cowdung, other biomass and industrial effluents (excluding distillery effluents) will be permissible. There will be no minimum / maximum limit on capacity of projects supported under this program;

• **Bio-CNG / Enriched Biogas** from Urban waste / Agricultural wastes / Industrial waste / Effluents or mix of these wastes. Our 6 TPD CBG (14,400 M3 capacity) Plant is eligible for subsidy (CFA) of Rs. 4.80 CR from MNRE.

#### UP GOVT. SUBSIDY

**Bio-CNG / Enriched Biogas** from Urban waste / Agricultural wastes / Industrial waste / Effluents or mix of these wastes. Our 6 TPD CBG (14,400 M3 capacity) Plant is eligible for subsidy (CFA) of Rs. 4.50 CR from **UP Government (UPNEDA) under UP Bio-Energy Policy 2022.** 

#### **BIO-FERTILIZER PLANT**

Capital Investment Subsidy Scheme (CISS) from NABARD under Soil Health Management Scheme

Under this scheme, 100 percent assistance is provided to state government, government agencies for setting up of mechanised fruit and vegetable market waste, agro waste compost production unit up to a maximum limit of Rs 190 lakh per unit (3000 Total Per Annum TPA capacity). Similarly, for individuals and private agencies assistance up to 33 percent of cost limit **to Rs 50 lakh per unit as capital investment is provided.** 



# Commercial loans under Agriculture Infrastructure Fund (AIF) of GOI

Ministry of Agriculture, (loan – interest subvention) of DACFW : All loans under this financing facility will have an **Interest Subvention of 3% PA up to a Limit of Loan Amount of Rs. 5 Crores and Credit Guarantee of 2 Crores**. This subvention will be available for a maximum period of 7 years. In case of loans beyond Rs. 5 crore, interest subvention will be limited up to the loan amount of Rs.5 crores.

# Gold Standard Carbon Credits: -

As per the prevailing practices any effort by an organization to reduce Green House Gas emissions, will be awarded with the carbon credits. These credits are sold in the advanced countries. This system is called the Gold voluntary carbon market.

A project of 14400 CUM capacity will receive about 30,000 carbon credits per year for next 20 years. It will mean a gain of Rs 30 Lakh per year at the present market rates of carbon credits.

# **Central Pollution Control Board**

CPCB categorized the CBG plans into Orange / Green & White in 2020 & 2021

# Financing as Priority Sector Lending:

To assist financing to CBG projects, Reserve Bank of India has categorized CBG plants in "Priority Sector" for lending on September 04, 2020 and Canara Bank, Bank of Baroda, Punjab National Bank, State Bank of India & IREDA has already come out with a specific scheme to finance the CBG projects and other banks are also working similar schemes for project financing.

# Support in Sale of Fermented Organic Manure (Bio-Fertilizer)

To ensure promotion of organic farming in India and enhance revenue from sale of biproducts of CBG plants such as "Fermented Organic Manure", Ministry of Agriculture has included them in Fertilizer control Order, thus facilitating marketing of Organic manure throughout India.

# Market Development Assistance (MDA) for Promoting Organic Fertilizers from Gobardhan Plants

For innovative incentive mechanism for the restoration, nourishment, and betterment of the mother earth. A Market Development Assistance (MDA) scheme in the form of Rs 1500 per MT to support marketing of organic fertilizers, viz., Fermented Organic Manures (FOM)/Liquid FOM/Phosphate Rich Organic Manures (PROM) produced as by-product from Bio- gas Plants/Compressed Biogas (CBG) Plants set up under umbrella Gobardhan initiative.



Such organic fertilizers would be branded in the names of Bharat Brand FOM, LFOM and PROM. This on one hand will facilitate in addressing the challenge of management of crop residue and problems of Parali burning, will also help in keeping the environment clean and safe and at the same time provide an additional source of income for farmers. Farmers will get organic fertilizers (FOM/LFOM/ PROM) at affordable prices.

**A Gazette Notification No. S.O. 2324(E).** As amendment in Fertilizer (Inorganic, Organic or Mixed) (Control) Order, 1985 was done on 13<sup>th</sup> July 2020 and This Order may be called the Fertilizer (Inorganic, Organic or Mixed) (Control) Second Amendment Order, 2020

**A Gazette Notification No. S.O. 2126(E).** As amendment in Fertilizer (Inorganic, Organic or Mixed) (Control) Order, 1985 was done on 1<sup>st</sup> June 2021 and This Order may be called the Fertilizer (Inorganic, Organic or Mixed) (Control) Third Amendment Order, 2021 Inclusion of Digested Bio Gas Slurry is under consideration by Central Fertilizer Committee.

# Product Proposed Price for Sale of Biomass Pellet/ Briquettes

GOI announced on 8<sup>th</sup> October 2021 to make mandatory for three categories of thermal power Generation plants to use a 5% blend of **Agro residue based Biomass pallets** / **Biomass** along with coal **through Co-Firing in Pulverized Coal Fired Boilers.** 

**Ministry of Power notified the** Price Benchmarking of Non-Torrified Biomass Pellets for cofiring in Thermal Power Plants **Notification No. File No. II/86/2017-Th.II (C. No 23A797) dated 23.08.2023** @ Rs. 2.32 per 1000 kca. The pellets shall have moisture content below 14% and GCV between 2800- 3400 kcal/kg (Rs. 7500 / Ton Ex-Factory + TPT + GST)

**Mandatory blending of Compressed Bio-Gas in CNG (Transport) & PNG (Domestic) –** Ministry of MOP&NG, GOI notified the mandatory blending of Compressed Bio-Gas in CNG (Transport) & PNG (Domestic) segments of CGD Sector.

#### It was, inter-alia, decided that:

a. CBO will be voluntary till FY 2024-2025 and mandatory blending obligation would start from FY 2025-26.

b. CBO shall be kept as 1%, 3% and 4% of total CNG/PNG consumption for FY 2025-26, 2026-27 and 2027-28 respectively. From 2028-29 onwards CBO will be 5%.

c. A Central Repository Body (CRB) shall monitor and implement the blending mandate based on the operational guidelines approved by Minister, PNG.



#### UP MSME PROMOTION POLICY 2022

#### **KEY INCENTIVES:**

- Single window facility for approvals.
- Subsidy ranging from 10 percent to 25 percent will be made available as capital subsidy to the new MSME enterprises to be set up. Capital subsidy (rebate) is available for investment on plant and machinery etc.
- In Bundelkhand and Purvanchal, would get capital subsidies in the range of 15 to 25 percent. In central and western Uttar Pradesh, the corresponding capital subsidies will be set at 10 to 20 percent. 2 percent more relaxation will be given for SC-ST and women entrepreneurs.
- The maximum limit of gratuity has been fixed at Rs 4 crore per unit. There is a provision for capital subsidy of up to 25 percent on investment and up to 50 percent interest subvention on loans taken.
- Under the capital interest subvention for new micro industries to be set up in the state, 50 percent discount will be available on the annual interest payable on the loan. This interest subsidy will be given for 5 years and the maximum limit will be Rs 25 lakh per unit. For SC-ST and women entrepreneurs, this interest subvention will be up to 60 percent.
- MSME units will be encouraged to list on the stock exchange to provide credit from as many sources as possible. All such entities will be compensated for 20 per cent of the expenditure of listing and a maximum of Rs 5 lakh. Establishment of flatted factory will be encouraged.
- The process of allotment of plots and sheds in industrial establishments will be made online. In order to encourage MSMEs in rural areas, 35 acres or more of gram sabha land will be recaptured and transferred to the Directorate of Industries free of cost.
- 5 km on either side of the expressway. MSME units will be encouraged through development of industrial estates within a distance of Rs. There is also a provision to encourage CETP in view of the problem of effluent treatment in traditional industrial clusters.
- Financial assistance up to 75% of the total cost and up to a maximum of Rs 5 lakh will be provided for achieving quality standards such as Zero Effect-Zero Defect, WHO GMP, Hallmark etc. and up to Rs 2 lakh for obtaining GI registration and patent etc.
- Financial assistance up to a maximum of Rs 20 lakh will be provided to MSME units for adopting clean and green technology.
- Entrepreneurship Development Institute will be developed as a centre of excellence and entrepreneurship will be spread among the youth of the state on the basis of entrepreneurship courses.



UP BIO ENERGY POLICY 2022

The bio-energy policy will help increase farm income by making better use of stubble and agricultural and sugar mill waste and promote rural employment by using organic waste for energy generation

# **INCENTIVES:**

- CBG Plant Subsidy of Rs 75 lakh per tonne (maximum Rs 20 crore) will be provided on compressed biogas production (subsidy would be 15 percent of the total incurred cost).
- Biomass Pellets Subsidy of Rs 75000 / Ton (maximum Rs 20 crore) will be provided on compressed biogas production (subsidy would be 15 percent of the total incurred cost).
- District level for opening plants on land given by the government on a long lease of 30 years against a token amount of Rs 1/acres / year.
- 100% stamp duty exemptions
- A committee will also be formed for aggregation of raw material or bio-material from farmers, producer organisations or Mandi Samitis etc. In case of those engaged in aggregation work, the government will provide 30 per cent subsidy on the purchase of machinery for collection, transportation and storage of the material.
- Stamp duty on purchase of land for project is 100% exempted against the submission of Bank Guarantee.
- Electricity duty on Bio-Energy Plants are exempted.

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# CHAPTER 8 STATUTORY REQUIREMENTS AND CHALLENGES

#### **Statutory Requirements**

- Approval from State Nodal Agency We need to submit a Detailed Project Report to the state Govt. for approval. It helps in getting subsidy and other benefits offered by the state Govt.
- NOC from Pollution Control Board approvals:
- 'Consent to establish' (NOC) under the provisions of the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981.
- NOC from state Fire Department
- NOC from Ground Water Department
- Gas Cylinders Rules, 2016. There are regulatory requirements for filling of Compressed Biogas. We have to obtain a license to fill compressed biogas cylinders from Petroleum and Explosive Safety Organization, (PESO) (Govt. of India) under Gas Cylinders Rules, 2016. For this, an online application has to be filled-up.
- NOC from Village Panchayat

#### Main Constraints:

- High value investment of promoters (30%)
- Motivation and Growing of Napier grass by local farmers
- Collection of Raw Martials like Cow Dung and collection of Agri / Vegetable Mundi Wastes is a challenge
- Great government effort is needed towards the NOC's and Project Approvals
- Credit limitations, access to credit.
- Lack of qualified extension/dissemination personnel
- Land use conversion
- No sufficient capacities in the rural setting to access the technology
- Marketing & Sale of Bio Fertilizer
- Lack of awareness about the benefits of organic fertilizer hinders business development. Farmers continue to use synthetic fertilizers across developing and underdeveloped areas, as they are cheap and readily available on the market. Thus, it is expected that the lack of understanding of the benefits would hamper the growth of Organic Fertilizer Market size.



# Challenges & Mitigation Strategies in Indian Biogas Industry

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Area	Challenges	Mitigation Strategies
Market	<ul> <li>Social Stigma (NIMBY syndrome)</li> <li>Market for organic manure missing</li> <li>Nascent Market with limited players</li> </ul>	<ul> <li>Promoting Awareness, Reaching last mile with NGOs</li> <li>Work on amendment to FCO, Dept. of Fertilizer</li> <li>Awareness building, collaboration with Academic institute</li> </ul>
Operations	<ul> <li>Feedstock security/Repeated break in Supply Chain</li> <li>Non-Segregated waste supply</li> <li>Availability of Skilled Manpower</li> </ul>	<ul> <li>Resource Mapping, emphasis on pre-feasibility</li> <li>Pan-India adaptation of SWM rules</li> <li>Capacity Building, Tailor made courses</li> </ul>
Finance	<ul> <li>Insecurity over business viability</li> <li>Lack of credibility of customers</li> <li>Access to loans from FI</li> <li>Higher capital cost/ payback period</li> </ul>	<ul> <li>Securing 15 Years CBG off-take, roping in OMCs</li> <li>Due diligence, Certification of players</li> <li>Priority Sector lending, Innovative Financial Models</li> <li>Market development, Fostering Industry-Institute Partnership</li> </ul>
Regulations	<ul> <li>Inclination towards power based projects</li> <li>Lack of concrete Standardization</li> <li>Non-Synchronous Centre and State Policies</li> <li>Lengthier subsidy sanction method of MNRE</li> </ul>	<ul> <li>Balance of centralized and decentralized tech</li> <li>Expedite development of Indian Standards</li> <li>Building regional working groups to work on local policies</li> <li>Performance based Incentives shall induce faster clearances</li> </ul>

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# CHAPTER 9 RELEVANT REGULATORY AGENCIES

#### **Relevant Regulatory Agencies**

Project require observations of rules, regulations and laws under the following key regulatory agencies.

- The Petroleum and Explosives Safety Organization (*PESO*) for Bottling, Storage & transportation of Bio CNG
- Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA) State Nodal Agency
- District Industry Centre NOC's, if any
- Village Panchayat NOC for Setting up of plant in their area
- State Pollution control Board For NoC of "Consent to establish" and "Consent to Operate"
- Ground water department
- Indian Oil Corporation For Sale of Bio CNG
- Ministry of New and Renewable Energy (MNRE) For Central Govt. Subsidy
- Department of Agriculture & Farmers Welfare (National Agriculture Infra Financing Facility) for Interest subvention and Credit Guarantee for Project loans
- UP Ground Water For Ground Water NOC

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# CHAPTER 10 CURRENT STATUS OF PROJECT & DETAILS OF COMISSIONED PLANTS UNDER SATAT

A. LAND – 05 Acres of land is being purchased by Promoters for setting-up of plant.

**B. Tie-Up with Indian Oil for Sale of Bio-CNG** – The purchase of CBG by OMC/GMC **(INDIAN OIL)** from the plant owner shall be governed through a firm commercial Agreement signed with plant owner for supply of CBG under SATAT for initial period of *FIFTEEN (15)* **YEARS** from the date of signing. Further, before the expiry of commercial agreement, both the Parties may agree to extend the same for a further period on mutually agreed terms and conditions.

The company obtained the LOI from IOCL and Bank Guarantee of Rs. 5 lac was submitted. The Commercial Collaboration agreement with IOCL will be signed soon.

**C. Strategic Tie-Up for Sale of Bio-Fertilizer** – Make an Association with Punjab Agri Export Corp Ltd. through Sevozone Energies for Sale of Bio-Fertilizers. (A Punjab Govt. Undertaking) Nodal Agency of Organic Farming in the Punjab State thru associate co.

# D. Procurement of Raw Material:

- 1. Tie-Up with local FPO's for growing the Napier grass in local area.
- 2. Community Model: We will create village wise group of min 50 households per village in 30-35 villages surrounding 10 km of our plant locality. The Cattle Dung will be collected from households and transported to the biogas plants. While the biogas generated will be supplied to households/ restaurants/institutions, etc., the slurry can be used in agriculture/sold to farmers/converted to bio-fertilizers/organic manure.

S. Nos	Name of Plant	Location	CBG Product ion capacit y	Feedstock	ОМС
1	Bleach Energy	Sundalpura,	2 TPD	Cow dung, Press	IOCL
		Umreth, Gujarat		mud, potato waste	
2	Clarus Bioenergy	Shirala, Sangli	4 TPD	Press mud	IOCL
	Pvt. Ltd.	District,			
		Maharashtra			

#### DETAILS OF COMISSIONED PLANTS UNDER SATAT IN INDIA



3	Glow Green Biotech	Dungara, Surat, Gujarat	2.1 TPD	Cow dung, Spent Wash, Press mud	IOCL
4	Green Earth Biogas Pvt. Ltd.	Kukda, Surendranagar, Gujrat	5 TPD	Press mud, Cow dung, Potato waste, MSW, Agricultural Waste	IOCL
5	IOT Biogas Pvt. Ltd.	Namakkal, Tamil Nadu	15 TPD	Chicken litter and Press mud	IOCL
6	Noble Exchange Environment Solutions	Pune LLP Talegaon, Pune	14 TPD	Municipal Solid Waste	IOCL
7	Solika Energy Pvt. Ltd.	Shadnagar, Hyderabad	2 TPD	Poultry litter	IOCL
8	Spectrum Renewable Energy Pvt. Ltd.	Rohtak, HR	6 TPD	Press mud and cattle dung	IOCL
9	Spectrum Renewable Energy Pvt. Ltd.	Warna Nagar, Kohlapur, Maharastra	6 TPD	Press mud	IOCL
10	Sri Lakshmi Venkateshwara Green Projects Pvt. Ltd.	Kadapa, Andhra Pradesh	3 TPD	Press mud	IOCL
11	R Mega Foods and Beverages LLP	Ludhiana, Punjab	5 TPD	Dairy waste	IOCL
12	Indian Potash Limited	Rohana Kalan, Muzzafarnagar, Uttar Pradesh	9 TPD	Press mud	IOCL
13	Vyzag Bio- Energy Fuel Pvt. Ltd.	GVMC Dumping Yard, Visakhapatnam, Andhra Pradesh	2 TPD	MSW	IOCL
14	SLR Energy	Kuzhandaikuppam, Cuddalore district, Tamilnadu	2.8 TPD	Press mud, Spent wash, Dairy Waste, Agri Residue	HPCL

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# CHAPTER 11 COMPANY KEY PROMOTORS BRIEF & FINANCIAL DETAILS

We are Agri entrepreneur and formed new company by registering on Startup India for the specific purpose of setting-up of Compressed Biogas plants and Granulated Fortified Fermented Organic Manure (Bio-Fertilizer) Plant in Rural India

M/s. Superior Agro Ventures Pvt. Ltd. (Registered under MSME)

Reg. Off. – Backside Old Grain Market, Railway RD, Kapurthala, Punjab 144601

**Address for Correspondence** - # E/2479, Amba Vihar, Saharanpur Bypass Road, Gangoh, Tehsil – Nakur, District – Saharanpur 247341 Uttar Pradesh.

#### Directors of M/s. Superior Agro Ventures Pvt. Ltd.:

Name	Designation	Shareholding	Net worth / Rs in Crores
Jaivil Rana	Director	50%	11.27 CR
Mini Panwar	Director	50%	18.38 CR

# **BASIC DETAILS / BACKGROUND OF PROMOTERS:**

#### 1. Mrs. Jaivil Rana (Agriculturist)

DIN No. 02013601 Res. Address – B1/09, Silver City2, Sector Pi2, Greater Noida 201308 G B Nagar, UP Tel. No. - 9319061936 Email Id – jaivilrana24@gmail.com PAN No. AJCPR4687B

#### Brief details of Jaivil Rana:-

Educational qualifications - Post Graduation

Professional experience: - 17 Years

M/s. Sevozone Energies and Fertilizers Pvt. Ltd. (Director) - Biogas Plant Owner

#### Euro Motors Pvt. Ltd. New Delhi - (2005 - 2009)

5 Years' Experience in the field of Marketing, Sales and Budget Preparation of Marketing, Assisting in Sales



# Miracle Adventures and Hospitality Pvt. Ltd., New Delhi (2010 - 2016)

5 Years' Experience in the field of Marketing, Hotel Inventory Management, Guest Relationship, Quality Management

# Knutson Int. Trading, LLC, Czech Republic (2017 - 2021)

Advisor for procurement and quality control, Documentation for Grain Export from India to EU / Gulf Countries.

# 2. Mrs. Mini Panwar – Director

Din No. 10449033

Res. Address: Plot No. B-1/16, Upper Ground Floor, Nangal Dewat,

Vasant Kunj, Delhi-110070

Tel. No. - 8750701282 Email Id – panwarmini13@gmail.com AADHAR No. – 644562875178 PAN No. – ADEPT6104D

# Brief details of Mini Panwar:-

Educational qualifications - Post Graduation/LLB

Professional experience: - 16 Years

# M/s. Akash & Associates

Taxation and corporate consultancy, Legal Arbitration, GST Appeals, Income Tax Appeals etc. of more than 16 years' Experience.

# 3. Mr. Amit Rana – CEO (Superior Agro)

CEO - M/s. Sevozone Energies & Fertilizers Pvt. Ltd. (Biogas Plant Owner & EPC Contractor) Partner - M/s. Golden Global Agrotech (RICE MILL), From 2021 Mob. – 9911351936 I Email id - amitrana2002@gmail.com

# Brief Profile – Amit Rana:-

Belongs to Farmer family and known as passionate towards the Agriculture Development/ Green Energy, Transformation with new technologies, serious interaction with Farmers' Cooperatives, SHG and FPO with a knack for uncovering unique opportunities in both the market place and within the organization.

A proven, dynamic approach to integrating creative National & International Sales of Agro commodities (Edible Oils & Cereals / Grains) utilizing innovative product technology,



customer's service and proprietary manufacturing processes into significant revenue and profit drivers in Domestic and International market.

Comfortable and effective communicating strategic vision from the shop floor to the Board of Directors. Well-rounded experience in all facets of business including finance, manufacturing, supply chain management, distribution, product development, insure success of strategic initiatives in fast growth organizations.

#### Worked with MNRE

#### **Professional Synopsis**

- □ Presently working as Chief Executive Officer with Sevozone Energies and Fertilizers Pvt. Ltd. and Partner of Golden Global Agrotech
- Worked with MNRE
- □ Highly experienced of 28 Years with a proven record of accomplishment in start-ups, turn around, purchasing and selling. Retail, Distribution and manufacturing experience.

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# CHAPTER 12 INDUSTRY MARKET & DEMAND INSIGHTS

#### **Compressed Biogas**

The global biogas market size was valued at USD 55.1 billion in 2019 and is anticipated to expand at a CAGR of 4.48% over the forecast period. The market is driven by increasing greenhouse gas emissions and their destructive impact on the environment. Various governing bodies across the world are investing heavily in the production of renewable energy sources to curb carbon emissions and to ensure a stable and secure energy supply.

The production of biogas as fuel is anticipated to eliminate various environmental issues related to waste as all the organic materials are incorporated and its ability to be used as a form of biomass for further production. Specific government initiatives, for instance, Cogeneration and Biomass Power Programme mentioned by the Ministry of New & Renewable Energy India, are likely to attract noteworthy investment in this market.

Biogas has emerged as a promising renewable technology to convert agricultural, animal, industrial and municipal wastes into energy. Biogas development can be integrated with strategies to improve sanitation as well as reduce indoor air pollution and greenhouse gases. Currently, the total biogas production in India is 2.07 billion m<sup>3</sup>/year. This is quite low compared to its potential, which is estimated to be in the range of 29–48 billion m<sup>3</sup>/year. Biogas dissemination is affected by various waste, renewable energy, and urban policies. Barriers were therefore identified individually for rural and urban biogas systems existing in India using decomposition analysis.

#### Fermented Organic Manure (Bio Fertilizer)

The **bio-fertilizers market** is estimated to be valued at USD 2.3 billion in 2020 and is projected to reach USD 3.9 billion by 2025, recording a CAGR of 11.6% during the forecast period. The **market** is driven primarily by the increasing organic farmland as well as the rising acceptance of **bio-fertilizers** among farmers.

At present in India the market for bio-fertilizers is Rs 750 crore which **is likely to rise to over Rs 1,000 crore in coming few years** due to growing awareness and demand," **said Puneet Gautam,** Head, strategic marketing and business development, UPL Ltd Mumbai

#### **BIO-FERTILIZER**

The **bio-fertilizers market** is estimated to be valued at USD 2.3 billion in 2020 and is projected to reach USD 3.9 billion by 2025, recording a CAGR of 11.6% during the forecast period. The **market** is driven primarily by the increasing organic farmland as well as the rising acceptance of **bio-fertilizers** among farmers.



#### **Bio-Fertilizers in Indian Agriculture**

- India is one of the 12 mega-biodiversity countries of the world. With only 2.5% of the land area it already accounts for 7-8% of the recorded species of the world. Indian soils are losing C and hence its biodiversity is critically affected.
- As population is increasing, to increase the food production in India will require additional fertilizers (N+P+K). Visualizing the economic burden and environmental cost of applying this huge quantity of additional fertilizer, even if a small part of this increased demand if can be met from biological sources like biofertilizers, will have large impact.
- Biofertilizers are known to not only improve yields and produce quality but also improve nutrient use efficiency.
- The use of cheap and eco-friendly inputs like biofertilizers is especially important for India where most of the farming will continue to be in the hands of small farmers.

#### MARKET DYNAMICS:

#### Driver: Growth in the organic food industry

Consumers nowadays are becoming highly concerned about food safety issues, the rising residue levels in food, and environmental issues, due to the rising concerns about their health. This rise in awareness has induced them to prefer chemical-free food products. As a result, major supermarket chains such as Wal-Mart and COSCO are increasing their product offerings of organic foods. The restaurant industry in many developed countries is also offering organic food menus to serve health-conscious consumers. The growth in the organic food industry is triggering the demand for biofertilizers and organic manures, as these are pre-requisites of organic farming. With the outbreak of the COVID-19 pandemic, people have become more conscious about healthy organic food products, which has driven the market growth of biological inputs, such as biofertilizers. These factors have increased organic retail sales in many countries, such as the US, Germany, China, Switzerland, and Denmark.

#### **Restraint: Environmental and technological constraints**

Bio-fertilizer products have a limited shelf-life and run a high risk of contamination. The microorganisms used as biofertilizers become non-viable when exposed to high temperatures. Therefore, it is very important to store them in a cool and dry place. The major problem in the agricultural inoculation technology is the survival of microorganisms during storage; other challenges revolve around several parameters such as culture medium, physiological state of the microorganisms when harvested, dehydration process, rate of drying, temperature maintenance during storage, and water activity of inoculants. These challenges influence the shelf-life of microbes. The market also has less availability of research & development and testing labs, which is hindering the growth of the biofertilizers



market. There is also a need for a quality management system to provide better microbial products to farmers.

#### **Opportunity: New target markets: Asia Pacific & Africa**

The Asia Pacific and African regions are the largest consumers of fertilizers. The increasing rate of population, especially in Asia, has resulted in the increasing demand for food, which would, in turn, lead to the increased consumption of fertilizers. However, the major concerns in this region are pollution and contamination of soil as well as their harmful effects on human beings. To combat the harmful effects of chemical fertilizers, governments in these regions are emphasizing the use of environmental-friendly fertilizers, such as biofertilizers and organic manure.

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# CHAPTER 13 ASSUMPTIONS & FINANCIAL PROJECTIONS

The report has been prepared based on the following assumptions;

- 1. Proposed Installed capacity of the unit is 14,400 CuM/ day, CBG production capacity of 06 Ton / Day.
- 2. Capacity Utilization is assumed as under:

Particulars - CBG	2026	2027	2028	2029	2030
Installed Capacity per Day (CuM)	14400	14400	14400	14400	14400
Capacity Utilisation (%)	85%	90%	95%	100%	100%
Production / day in kg	5100	5400	5700	6000	6000

Particulars – Bio-Fertilizers	2026	2027	2028	2029	2030
Production per Day (in Kg)	20000	20000	20000	20000	20000
Production Capacity (%)	85%	90%	95%	100%	100%
Production / day in kg	17000	18000	19000	20000	20000

3. Gross Income Per day assumptions are as under;

Particulars	Revised Sale Rate /Kg (Rs)	Quantity in Kg	Amount in INR
CBG (average)	63	6000	3,78,000
Bio-Fertilizer	5	20000	1,00,000

4. The availability of Raw Material and proportion of raw material utilised for Biogas production has been assumed as under:

Raw Material for Phase	In ton / day
*Napier Grass + Sugarcane Pressmud	115

\*Sugar Cane Pressmud is available from Nov. to May

- Napier Grass & Cattle Dungs will be available for use round the year.
- 5. Cost towards raw material is considered as below,

Particulars	Rate in Rs /MT
Napier Grass	800-1200
Sugar cane Press Mud	800



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- 6. Raw Gas Production in different raw materials are as tabulated below,

Rate Material	Methane %
Cow Dung	67%
Sugar Cane Press Mud	60-70%
Napier Grass	64.40%
Poultry Manure	69%
Agriculture Waste	46%

- 7. However, Promoters has assumed total production of 6 Ton /day of CBG and 20 Ton Bio-Fertilizer production / Day at 85% capacity utilisation.
- 8. Density of Methane yield is assumed as under,

Installed Capacity	14500	Cu. M Per Day	
Density of Methane	0.65	Kg/m^3	

- 9. The rate of interest for the term loan is assumed at 10% per annum.
- 10. Depreciation is calculated as per Companies act.
- 11. Tax has been calculated on the taxable income in CMA.
- 12. IRR is calculated 21% and project Avg. DSCR is 2.88
- 13. Cost of transportation and loading & unloading is assumed in CMA.
- 14. Fixed and Admin Expenses includes expenses under communication, AMC, other Misc Expenses are assumed in CMA.

#### FINANCIAL PROJECTIONS & MAJOR ASSUMPTIONS

- ✓ All prices In INR
- ✓ Non-Current Liability (Loan) Interest rate at 10.50%
- ✓ Current Liability (Overdraft) Interest rate 10%
- ✓ Total annual working Days is 335



# **FINANCIAL ASSUMPTIONS:**

S. No	Details		Value In Lakhs
1	Installed Capacity		
	Compressed Bio-Gas	MT/annum	1,323
	Bio-Fertilizer (Dry)	MT/annum	350
2	Plant Utilisation Factor		
	First year	%	85%
	Second year	%	90%
	Third year onwards	%	95%
3	Sale Price		
	Compressed Bio-Gas	Rs/kg	63
	Bio-Fertilizer (Dry)	Rs/kg	5
	Increase in Sale Price	%	4%
4	Expenses details		
	Raw material 1 - Napier Grass/Agro Residue/Mandi Waste	tonnes/annum	28,175
	Cost of Raw Material	Rs/tonne	1000
	Raw material 2 - Cow Dung	tonnes/annum	12,075
	Cost of Raw Material	Rs/tonne	700
	Escalation on RM Cost	%	5%
	Power (For fully installed capacity)	Rs/annum	98,76
	Escalation on Power Cost	%	5%
	Salaries & Wages	Rs/annum	41.22
	Salary escalation rate	per annum	10%
	Repairs and Maintenance, O& M	% of Hard Cost	6.03%
	Escalation on repairs and maintenance	%	5.00%
	Transportation Cost		66.80
	Escalation on Transport Cost		5%
	Packaging Cost		-
	Capacity of each Gunny Bag	Ka	30.80
	Cost of each Gunny Bag & Packaging	INR	15.00
	Escalation rate		5%
	Insurance (Fixed)	% on project	0.25%
		cost	
5	Project Cost	Rs. Lakhs	4265.73
	Means of Finance (Proposed)		
	Equity	30%	650.00
	Promoters and Relative Unsecured loans		615.73
	Debt – IREDA	70%	3000.00
6	Debt details		
	Interest rate	%	10.50%
	Loan term	Years	10
7	Interest on working capital loan	%	10.00%



8	Depreciation Rates (SLM - CA Act, 2013)		
	Civil Works	No. of years	30
	Plant & Machinery	No. of years	15
	Electricals	No. of years	10
	Vehicles	No. of years	8
	Office equipment	No. of years	5
9	Depreciation Rates (WDV - IT Act, 1961)		
	Civil Works	%	10%
	Plant & Machinery	%	40%
	Electricals	%	10%
	Vehicles	%	40%
	Office equipment	%	15%
11	Income Tax Rate (Under Section 115BAA)	%	26%

# COST OF PROJECT & MEANS OF FINANCE:

	(INR Lacs)
Particulars	Total
Land cost	434.00
Building & Civil Works	781.31
Plant & Machinery	1524.00
Electricals	210.00
Vehicles	42.00
Office equipment	15.00
Pre-Operatives	350.08
Interest During Construction	300.00
Contingencies at 2% of Civil works, P&M, Electricals	87.34
Associated Additional Cost	522.00
Total Project Cost	4265.73
Means of Finance	
Particulars	Total
Equity	650.00
Promotors and Relative Unsecured Loans	615.73
Debt	3,000.00
Total	4265.73



# **APPORTIONMENT OF SOFT COST:**

Particulars	Value	Pre-op exp	IDC	Contingencies	Total (INR Lacs)
Civil works	781.31	106.33	91.12	26.53	1,005.29
Plant & machinery	1,524.00	207.41	177.74	51.75	1,960.89
Electricals	210.00	28.58	24.49	7.13	270.20
Vehicles	42.00	5.72	4.90	1.43	54.04
Office equipment	15.00	2.04	1.75	0.51	19.30
Total	2,572.31	350.08	300.00	87.34	3,309.73

# **DEPRECIATION:**

Book Depreciation (SLM)	100.00%		(INR Lacs)
Particulars	Total	No. of years	Book Dep
Civil Works	1,005.29	30	33.51
Plant & machinery	1,960.89	15	130.73
Electricals	270.20	10	27.02
Vehicles	54.04	8	6.76
Office equipment	19.30	5	3.86
Total	3,309.73		201.87

# **DEPRECIATION:**

Depreciatio n - Income	Civil Works	Plant & Electricals Vehicles machinery		Vehicles	Office equipment	Total (INR Lacs)
Dep. Rate	10%	40%	10%	40%	15%	
1						
Gross Block	1,005.29	1,960.89	270.20	54.04	19.30	3,309.72
Depreciation	100.53	784.36	27.02	21.62	2.90	936.42
Closing	904.76	1,176.53	243.18	32.42	16.41	2,373.30
2						
Opening	904.76	1,176.53	243.18	32.42	16.41	2,373.30
Depreciation	90.48	470.61	24.32	12.97	2.46	600.84
Closing	814.28	705.92	218.86	19.45	13.94	1,772.47
3						
Opening	814.28	705.92	218.86	19.45	13.94	1,772.47
Depreciation	81.43	282.37	21.89	7.78	2.09	395.56
Closing	732.86	423.55	196.98	11.67	11.85	1,376.91
4						
Opening	732.86	423.55	196.98	11.67	11.85	1,376.91
Depreciation	73.29	169.42	19.70	4.67	1.78	268.85
Closing	659.57	254.13	177.28	7.00	10.07	1,108.06
5						
Opening	659.57	254.13	177.28	7.00	10.07	1,108.06



Depreciation	65.96	101.65	17.73	2.80	1.51	189.65
Closing	593.61	152.48	159.55	4.20	8.56	918.41
6						
Opening	593.61	152.48	159.55	4.20	8.56	918.41
Depreciation	59.36	60.99	15.96	1.68	1.28	139.27
Closing	534.25	91.49	143.60	2.52	7.28	779.14
7						
Opening	534.25	91.49	143.60	2.52	7.28	779.14
Depreciation	53.43	36.59	14.36	1.01	1.09	106.48
Closing	480.83	54.89	129.24	1.51	6.19	672.66
8						
Opening	480.83	54.89	129.24	1.51	6.19	672.66
Depreciation	48.08	21.96	12.92	0.61	0.93	84.50
Closing	432.74	32.94	116.31	0.91	5.26	588.16
9						
Opening	432.74	32.94	116.31	0.91	5.26	588.16
Depreciation	43.27	13.17	11.63	0.36	0.79	69.23
Closing	389.47	19.76	104.68	0.54	4.47	518.93
10						
Opening	389.47	19.76	104.68	0.54	4.47	518.93
Depreciation	38.95	7.90	10.47	0.22	0.67	58.21
Closing	350.52	11.86	94.21	0.33	3.80	460.72
11						
Opening	350.52	11.86	94.21	0.33	3.80	460.72
Depreciation	35.05	4.74	9.42	0.13	0.57	49.92
Closing	315.47	7.11	84.79	0.20	3.23	410.80
12						
Opening	315.47	7.11	84.79	0.20	3.23	410.80
Depreciation	31.55	2.85	8.48	0.08	0.48	43.43
Closing	283.92	4.27	76.31	0.12	2.75	367.37
13						
Opening	283.92	4.27	76.31	0.12	2.75	367.37
Depreciation	28.39	1.71	7.63	0.05	0.41	38.19
Closing	255.53	2.56	68.68	0.07	2.33	329.18
14						
Opening	255.53	2.56	68.68	0.07	2.33	329.18
Depreciation	25.55	1.02	6.87	0.03	0.35	33.82
Closing	229.98	1.54	61.81	0.04	1.98	295.35
15						
Opening	229.98	1.54	61.81	0.04	1.98	295.35
Depreciation	23.00	0.61	6.18	0.02	0.30	30.11
Closing	206.98	0.92	55.63	0.03	1.69	265.25



# TERM LOAN REPAYMENT SCHEDULE

										(INR L	.acs)
Particulars	1	2	3	4	5	6	7	8	9	10	11
Opening	3,000.00	2,760.00	1,939.44	1,805.78	1,656.65	1,490.27	1,304.64	1,097.52	866.43	608.61	320.95
Interest	300.00	295.66	206.73	191.27	174.01	154.76	133.27	109.31	82.57	52.73	19.44
Payment	540.00	1,116.23	340.39	340.39	340.39	340.39	340.39	340.39	340.39	340.39	340.39
Closing	2,760.00	1,939.44	1,805.78	1,656.65	1,490.27	1,304.64	1,097.52	866.43	608.61	320.95	-
Principal Repayment	240.00	820.56	133.66	149.13	166.38	185.64	207.12	231.08	257.83	287.66	320.95

# **REPAYMENT SCHEDULE:**

						(INR Lacs)
Year	Quarter	Opening	Principal repayment	Closing	Interest on opening	Interest + Principal payment
	1	3,000.00		3,000.00	75.00	75.00
1	2	3,000.00		3,000.00	75.00	75.00
	3	3,000.00		3,000.00	75.00	75.00
	4	3,000.00	240.00	2,760.00	75.00	75.00
	5	2,760.00	38.51	2,721.49	75.55	114.06
2	6	2,721.49	39.58	2,681.92	74.48	114.06
2	7	2,681.92	40.67	2,641.24	73.38	114.06
	8	2,641.24	701.80	1,939.44	72.25	774.06
	9	1,939.44	32.06	1,907.38	53.04	85.10
3	10	1,907.38	32.94	1,874.44	52.15	85.10
5	11	1,874.44	33.86	1,840.58	51.24	85.10
	12	1,840.58	34.80	1,805.78	50.30	85.10
Δ	13	1,805.78	35.76	1,770.01	49.33	85.10
т	14	1,770.01	36.76	1,733.26	48.34	85.10

Superior Agro Ventures Pvt. Ltd.-6 TPD Bio-CNG Project in Un Tehsil of Shamli District of UP


	15	1,733.26	37.78	1,695.48	47.32	85.10
	16	1,695.48	38.83	1,656.65	46.27	85.10
	17	1,656.65	39.90	1,616.75	45.19	85.10
	18	1,616.75	41.01	1,575.74	44.09	85.10
5	19	1,575.74	42.15	1,533.59	42.95	85.10
	20	1,533.59	43.32	1,490.27	41.78	85.10
	21	1,490.27	44.52	1,445.75	40.58	85.10
6	22	1,445.75	45.76	1,399.99	39.34	85.10
0	23	1,399.99	47.03	1,352.97	38.07	85.10
	24	1,352.97	48.33	1,304.64	36.77	85.10
	25	1,304.64	49.67	1,254.96	35.42	85.10
7	26	1,254.96	51.05	1,203.91	34.05	85.10
	27	1,203.91	52.47	1,151.44	32.63	85.10
	28	1,151.44	53.92	1,097.52	31.17	85.10
	29	1,097.52	55.42	1,042.10	29.68	85.10
8	30	1,042.10	56.96	985.14	28.14	85.10
0	31	985.14	58.54	926.60	26.56	85.10
	32	926.60	60.16	866.43	24.93	85.10
	33	866.43	61.83	804.60	23.26	85.10
9	34	804.60	63.55	741.05	21.55	85.10
5	35	741.05	65.31	675.74	19.78	85.10
	36	675.74	67.13	608.61	17.97	85.10
	37	608.61	68.99	539.62	16.11	85.10
10	38	539.62	70.90	468.71	14.19	85.10
	39	468.71	72.87	395.84	12.23	85.10
	40	395.84	74.89	320.95	10.20	85.10
14	41	320.95	76.97	243.98	8.12	85.10



42	243.98	79.11	164.87	5.99	85.10
43	164.87	81.30	83.56	3.79	85.10
44	83.56	83.56	0.00	1.54	85.10

### **ESTIMATE FOR WORKING CAPITAL:**

											(INR L	acs)
Particulars	St. Pd. (mth)	1	2	3	4	5	6	7	8	9	10	11
R & M/Inventory	1.00	0.00	227.57	234.40	241.43	248.67	256.13	263.81	271.73	279.88	288.28	296.92
Receivables	1.00	0	105.85	112.91	115.17	117.47	119.82	122.22	124.66	127.15	129.69	132.29
Maintenanc e Spares	1.00	0	0	0	0	0	0	0	0	0	0	0
Total Current Assets		0.00	333.42	347.31	356.60	366.14	375.95	386.03	396.39	407.03	417.97	429.22
Creditors	0.50	0	7.09	7.63	8.06	8.33	8.61	8.91	9.21	9.53	9.87	10.22
Total Current Liabilities		0	7.09	7.63	8.06	8.33	8.61	8.91	9.21	9.53	9.87	10.22
Less – Margin	25%	0	83.355	86.826	89.149	91.535	93.988	96.508	99.097	101.759	104.494	107.30
Bank Borrowing s		0.00	242.97	252.85	259.39	266.28	273.35	280.61	288.08	295.75	303.61	311.69
Required Bank Borrowing		0.00	200	200	200	200	200	200	200	200	200	200
Interest on working capital	10%	0.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00

## **PROJECTED PROFIT & LOSS ACCOUNT:**



Particulars	1	2	3	4	5	6	7	8	9	10
Production										
Compressed Bio-Gas (MT)	1,785.00	1,890.00	1,995.00	2,100.00	2,100.00	2,100.00	2,100.00	2,100.00	2,100.00	2,100.00
Bio Fertilizer (Dry) (MT)	5,950.00	6,300.00	6,650.00	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00	7,000.00
Sales price										
Compressed Bio-Gas	63.00	65.52	68.14	70.87	73.70	76.65	79.72	82.90	86.22	89.67
Bio Fertilizer (Dry)	5.00	5.20	5.41	5.62	5.85	6.08	6.33	6.58	6.84	7.12
Revenue										
Compressed Bio-Gas	1,124.55	1,238.33	1,359.41	1,488.20	1,547.72	1,609.63	1,674.02	1,740.98	1,810.62	1,883.04
Bio Fertilizer (Dry)	297.50	327.60	359.63	393.70	409.45	425.83	442.86	460.58	479.00	498.16
Add: GST ITC	71.10	78.30	85.95	94.09	70.55	-	-	-	-	-
Total revenue	1493.15	1644.22	1804.99	1975.99	2027.73	2035.46	2116.88	2201.55	2289.62	2381.20
Closing Stock	227.57	234.40	241.43	248.67	256.13	263.81	271.73	279.88	288.28	296.92
Total	1720.72	1878.62	2046.42	2224.66	2283.86	2299.27	2388.61	2481.43	2577.89	2678.13
Opening Stock	0.00	227.57	234.40	241.43	248.67	256.13	263.81	271.73	279.88	288.28
RM Cost	509.57	304.29	336.20	370.30	388.82	408.26	428.67	450.10	472.61	496.24
Power	98.76	103.70	108.88	114.33	120.04	126.05	132.35	138.97	145.91	153.21
Salaries and wages	41.22	45.34	49.88	54.86	60.35	66.39	73.02	80.33	88.36	97.19
Repairs and maintenance	62.52	65.65	68.93	72.37	75.99	79.79	83.78	87.97	92.37	96.99
Transportation Cost	66.80	70.14	73.65	77.33	81.20	85.26	89.52	93.99	98.69	103.63
Packaging Cost	30.80	32.34	33.96	35.65	37.44	39.31	41.27	43.34	45.51	47.78
Insurance	9.61	9.61	9.61	9.61	9.61	9.61	9.61	9.61	9.61	9.61
Administration Expenses	11.00	11.55	12.13	12.73	13.37	14.04	14.74	15.48	16.25	17.06
Interest cost										
- On Term	205.66	206 72	101.27	174.01	154 76	100.07	100.21	00 E7	50.72	10.44
- On Working	293.00	200.73	131.21	174.01	134.70	133.21	109.31	02.37	52.13	19.44
capital	<u>1</u> 1.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Depreciation	185.87	138.73	138.73	138.73	138.73	134.87	134.87	134.87	128.11	128.11
Total Expenditure	1322.82	1226.65	1268.62	1312.36	1339.97	1363.97	1391.96	1419.95	1441.04	1468.55



397.90	651.97	777.80	912.30	943.89	935.31	996.65	1061.48	1136.86	1209.58
0.00	0.00	0.00	0.00	0.00	242.03	266.51	289.08	310.89	332.67
397.90	651.97	777.80	912.30	943.89	693.27	730.14	772.40	825.96	876.91
	<b>397.90</b> 0.00 <b>397.90</b>	397.90         651.97           0.00         0.00           397.90         651.97	397.90         651.97         777.80           0.00         0.00         0.00           397.90         651.97         777.80	397.90         651.97         777.80         912.30           0.00         0.00         0.00         0.00           397.90         651.97         777.80         912.30	397.90         651.97         777.80         912.30         943.89           0.00         0.00         0.00         0.00         0.00           397.90         651.97         777.80         912.30         943.89	397.90         651.97         777.80         912.30         943.89         935.31           0.00         0.00         0.00         0.00         242.03           397.90         651.97         777.80         912.30         943.89         693.27	397.90         651.97         777.80         912.30         943.89         935.31         996.65           0.00         0.00         0.00         0.00         242.03         266.51           397.90         651.97         777.80         912.30         943.89         693.27         730.14	397.90         651.97         777.80         912.30         943.89         935.31         996.65         1061.48           0.00         0.00         0.00         0.00         242.03         266.51         289.08           397.90         651.97         777.80         912.30         943.89         693.27         730.14         772.40	397.90         651.97         777.80         912.30         943.89         935.31         996.65         1061.48         1136.86           0.00         0.00         0.00         0.00         242.03         266.51         289.08         310.89           397.90         651.97         777.80         912.30         943.89         693.27         730.14         772.40         825.96

### **COMPUTATION OF INCOME TAX:**

									1I)	NR Lacs)
Particulars	1	2	3	4	5	6	7	8	9	10
Book Profit	397.90	651.97	777.80	912.30	943.89	935.31	996.65	1061.48	1136.86	1209.58
Add: Book										
Depreciation	185.87	138.73	138.73	138.73	138.73	134.87	134.87	134.87	128.11	128.11
Less: WDV Depreciation	936.42	600.84	395.56	268.85	189.65	139.27	106.48	84.50	69.23	58.21
Less: Set-off of previous loss	-	-352.64	-162.78	-	-	-	-	-	-	-
Profit / (loss) attributable to income tax	-352.64	-162.78	358.20	1,140.38	892.96	930.90	1,025.04	1,111.86	1,195.74	1,279.48
Tax Payable	Exempt	Exempt	Exempt	Exempt	Exempt	242.03	266.51	289.08	310.89	332.67

### PROJECTED CASH FLOW STATEMENT:

										(INR	Lacs)
Particulars	0	1	2	3	4	5	6	7	8	9	10
Cash Inflow											
Profit after tax	-0.11	397.90	651.97	777.80	912.30	943.89	693.27	730.14	772.40	825.96	876.91
Depreciation	0.00	185.87	138.73	138.73	138.73	138.73	134.87	134.87	134.87	128.11	128.11
Gross Cash Accruals	-0.11	583.77	750.78	843.23	850.04	858.96	689.04	689.46	695.34	705.85	720.66
Change in Share Capital	450.00	-	-	-	-	-	-	-	_	-	-
Increase in LT Loans	3000.00	-	-	-	-	-	-	-	-	-	-
Change in USL	505.73	-	_	_	-	-	_	-	-	_	_
Change in WC Borrowing		100.00	-	-	-	-	-	-	-	-	-
Current Liabilities		192.73	21.82	24.17	26.75	29.81	214.50	50.74	52.70	56.42	61.50
Total Cash Inflow	3955.62	900.15	744.62	862.24	986.55	1041.94	1100.88	927.85	969.67	1018.56	1073.63
Cash Outflow											
Change in Capex/CWIP	3353.73	-	-	-	-	-	-	-	-	-	-
Principal repayment of Term loan	240.00	183.25	204.46	228.12	254.51	283.97	316.83	353.49	394.39	440.03	490.95



Change in Non-	_		_	_		_	_	_	_	_	_
Current Assets	-		-	-	_			-	-	-	-
Increase in											
current assets	272.00	333.42	13.89	9.29	9.55	9.81	185.97	24.86	22.72	21.87	21.87
Total Cash											
Outflow	3865.73	516.67	218.34	237.41	264.06	293.78	562.75	389.16	428.04	473.03	524.18
Net Cash											
Balance	89.89	900.21	35.16	860.04	1008.80	977.34	642.31	647.92	665.95	685.75	706.57
Opening Cash											
Balance	0.39	90.28	990.49	1025.65	1885.69	2894.50	3871.84	4514.15	5162.06	5828.01	6513.76
Closing Cash											
Balance	90.28	990.49	1025.65	1885.69	2894.50	3871.84	4514.15	5162.06	5828.01	6513.76	7220.33

### **PROJECTED BALANCE SHEET:**

Particulars	0	1	2	3	4	5	6	7	8	9	10
Share Capital	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00
Reserves	030.00	030.00	030.00	030.00	030.00	030.00	030.00	030.00	030.00	030.00	030.00
110301703	(0.33)	397.57	1,049.55	1,827.35	2,739.65	3,683.54	4,376.81	5,106.95	5,879.35	6,705.31	7,582.23
Promoters and											
loans	615.73	625.00	625.00	625.00	625.00	625.00	625.00	625.00	625.00	625.00	625.00
LT Loans	2760.00	1020 44	1905 79	1 656 65	1 400 27	1 204 64	1 007 52	966 42	609 61	220.05	
Working Capital	2760.00	1939.44	1600.76	1,000.00	1,490.27	1,304.04	1,097.52	000.43	000.01	320.95	-
Borrowing	0.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Trade Payables	0.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
	-	7.09	7.63	8.06	8.33	8.61	8.91	9.21	9.53	9.87	10.22
Expenses											
Payable	0.11	2.50	2.58	2.65	2.73	2.81	2.90	2.99	3.07	3.17	3.26
Provision for											
	-	-	-	-	-	-	242.03	266.51	289.08	310.89	332.67
Current Maturity											
On LI Loans	-	820.56	133.66	149.13	166.38	185.64	207.12	231.08	257.83	287.66	320.95
	4025.51	4642.16	4474.19	5118.84	5882.37	6660.23	7410.29	7958.17	8522.47	9112.85	9724.32
Gross Fixed											
Assets	3743.73	3503.73	2657.86	2657.86	2657.86	2657.86	2657.86	2657.86	2657.86	2657.86	2657.86
Less:		405.07	400 70	077.40				004.05	050 50	4007.00	1015 75
	0.00	185.87	138.73	277.46	416.19	554.91	689.78	824.65	959.52	1087.63	1215.75
Less. Susidy	240.00	660.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Fixed											
Assets	3503.73	2657.86	2519.13	2380.40	2241.67	2102.94	1968.08	1833.21	1698.34	1570.23	1442.11
Progress		-	-	-	-	-	-	-	-	-	-
Non-Current											
Assets											
(FD/DSRA)	22.00	322.00	322.00	322.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
Inventory											
Dahtara	-	227.57	234.40	241.43	248.67	256.13	263.81	271.73	279.88	288.28	296.92
Deptors	-	105.85	112.91	115.17	117.47	119.82	122.22	124.66	127.15	129.70	132.29



Cash & Bank											
Balance	90.28	990.49	1,025.65	1,885.69	2,894.50	3,871.84	4,514.15	5,162.06	5,828.01	6,513.76	7,220.33
Other Current											
Assets	409.50	338.40	260.10	174.15	80.05	9.50	242.03	266.51	289.08	310.89	332.67
Total Assets	4025.51	4642.16	4474.19	5118.84	5882.37	6660.23	7410.29	7958.17	8522.47	9112.85	9724.32

### **PROJECT IRR & PAYBACK PERIOD:**

Particulars	0	1	2	3	4	5	6	7	8	9	10
Cash Inflow											
Profit after tax	-	397.90	651.97	777.80	912.30	943.89	693.27	730.14	772.40	825.96	876.91
Depreciation	-	185.87	138.73	138.73	138.73	138.73	134.87	134.87	134.87	128.11	128.11
Interest	-	306.66	217.73	202.27	185.01	165.76	144.27	120.31	93.57	63.73	30.44
Salvage value at the end of 15th year		-	-	-	-	-	-	-	-	-	-
Total Cash Inflow	-	890.44	1008.43	1118.80	1236.04	1248.37	972.41	985.32	1000.84	1017.81	1035.47
Cash Outflow											
Capital Expenditure	-4265.73	-	-	-	-	-	-	-	-	-	-
Change in WC		202.02	10.07	0.70	0.20	0.45	0.70	0.07	10.04	10.51	10.90
Total Cash Outflow	-4265.73	323.83 - 323.83	- 13.27	-8.78	9.20 - 9.20	9.45 - 9.45	9.70 - 9.70	9.97 - 9.97	- 10.24	- 10.51	- 10.80
Net cash flows	-4265.73	566.61	995.16	1,110.01	1,226.84	1,238.92	962.72	975.34	990.60	1,007.30	1,024.67
Project IRR	21%										
Cumulative cash flows	- 4265.73	- 3,938.39	- 2,943.23	- 1,833.21	- 606.37	632.55	1,595.27	2,570.62	3,561.22	4,568.52	5,593.19
Payback period	4 years 6 months										



Avg. DSCR

2.88

DSCR: Particulars 10 2 3 4 5 6 8 1 7 9 Total Profit after tax 397.90 651.97 777.80 912.30 943.89 693.27 730.14 772.40 825.96 876.91 7,582.56 Depreciation 185.87 138.73 138.73 138.73 138.73 134.87 134.87 134.87 128.11 128.11 1,401.62 Interest on term loan 295.66 206.73 191.27 174.01 154.76 133.27 109.31 82.57 52.73 19.44 1,419.75 Profit before interest and depreciation (PBIT) 879.44 997.43 1,107.80 1,225.04 1,237.37 961.41 974.32 989.84 1,006.81 1,024.47 10,403.92 Interest on term loan 206.73 295.66 191.27 174.01 154.76 133.27 109.31 82.57 1,419.75 52.73 19.44 Principal repayment of Term loan 820.56 133.66 149.13 166.38 185.64 207.12 231.08 257.83 287.66 320.95 2,760.00 Term loan payments 1,116.23 340.39 340.39 340.39 340.39 340.39 340.39 340.39 340.39 340.39 1,116.23 DSCR 0.79 2.93 3.25 3.60 3.64 2.82 2.86 2.91 2.96 3.01 0.79

Superior Agro Ventures Pvt. Ltd.-6 TPD Bio-CNG Project in Un Tehsil of Shamli District of UP



Project Cost

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### CHAPTER 14

# PROJECT COST AND SOURCES OF FUNDING & FINANCIAL INSTITUTION'S RISK COVERAGE ASSESMENT

The total integrated Plants cost of 6 TPD Compressed Biogas & Bio-Fertilizer plant is about **INR 42.65 CR** and to be funded by equity and debt.

Rs. 42.65 Cr

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The following gives the project cost and detailed funding matrix:

Promoter Share 30%	-	Rs. 6.50 CR
Promoters and Relative	-	Rs. 6.15 CR
Unsecured loans		
Project Finance 70%	-	Rs. 30.00 CR

Project payback time is 6 to 7 years and Term loan repayment period is 10 years.

### PROJECT FINANCIAL RISK ASSESSMENT:

Project Term Loan for 10 Years	-	Rs.	30.00 Cr
Promoters' contribution	-	Rs.	12.65 Cr
Project Land Cost including Registration Cost	-	Rs.	4.34 Cr
Pre-operative and Project Finance	-	Rs.	3.61 Cr
Cost of Civil Construction	-	Rs.	7.82 Cr
Plant & Machinery (mechanical) Items	-	Rs.	15.24 Cr
Plant & Machinery (Electrical) Items	-	Rs.	2.10 Cr
Vehicle	-	Rs.	0.42 Cr
Office Equipment's	-	Rs.	0.15 Cr
IDC Charges	-	Rs.	3.00 Cr
Contingencies Items	-	Rs.	0.87 Cr
Project Management Charges	-	Rs.	1.11 Cr
GST	-	Rs.	4.00 Cr
Outraidiae / Inconstitute			
		<b>D</b> -	4.00.0-
	-	RS.	4.80 Cr
	-	KS.	4.50 Cr
Interest Subvention in / Years from Agriculture		_	
Intrastructure Fund (AIF) Ministry of Agriculture, GOI	-	Rs.	2.00 Cr



Bio-Fertilizer Market Assistance

Rs.1500.00 Ton

### **OTHERS SECURITY:**

- Personal Guarantee of Promoter's
- Escrow account/Trust & Retention Account Agreement
- MNRE Subsidy of Rs. 4.80 CR
- UP Govt. subsidy of Rs. 4.50 CR
- 51% Share of SPV / Firm may be pledged to Lender

### Loan Amortization:

- 1. Moratorium: 1 Years (12 Months)
- 2. **Principal Repayments:** Quarterly repayments spreading over 10 years post moratorium period
- 3. Non-Current Liability Interest Rates: Negotiable but not above 10.50%
- 4. Current Liability (Overdraft) Interest Rates: Negotiable but not above 10.50%
- 5. Interest Payment: To be spread alongside principal payment periods
- 6. **Project Commissioning Time –** 15 Months

### FINANCIAL INSTITUTION'S RISK COVERAGE ASSESMENT Proposed Security on Project for Financial Institutions:

<ul> <li>Exclusive charge on entire project assets including immovable assets, movable assets, cash flow, Commercial Agreement and Escrow accounts, DSRA/ISRA etc.</li> <li>Execution of Commercial Agreement between Project Developer (Seller) and OMCs (buyer) and an Escrow</li> </ul>
<ul> <li>account shall be maintained by the CBG Plant owner in which all sales proceeds received from the Indian Oil (OMCs) from sale of CBG and Bio-manure will be credited.</li> <li>The proceeds in the Escrow account shall be appropriated first towards Bank's term loan interest &amp; repayment.</li> <li>The overall door-to-door tenor (moratorium + repayment tenor) not to exceed tenor of off take agreement, which is 15 years and may be extended on mutual consent.</li> </ul>
Hypothecation of Stocks & Receivables
<ul> <li>Pledge of shares: (In case of companies) 51% of shares of the borrower to be pledged where Security Trustee is available.</li> </ul>



	• In other cases, as per Bank's extant guidelines. In rare				
	cases where mortgage ability of lease-hold land is not possible, equivalent amount of collateral to be obtained.				
	<ul> <li>Commercial loans under Agriculture Infrastructure Fund of GOI - Ministry of Agriculture, (loan – interest subvention)</li> </ul>				
Additional Security	of DACFW : All loans under this financing facility will have an Interest Subvention of 3% PA up to a Limit of Loan Amount of Rs. 2 Crores. This subvention will be available				
	for a maximum period of 7 years. In case of loans beyond				
	Rs.2 crore, interest subvention will be limited up to the loan				
	amount of Rs.2 crores.				
Civil Construction	Rs.10.05 CR				
Plant & Machinery	Rs. 19.61 CR				
Personal / Corporate	<ul> <li>Personal Guarantee of all the Promoters</li> </ul>				
Guarantee					
Additional Security	• Term Loan disbursements shall be made directly to the				
and sharing of	suppliers/ contractors by debit to the term loan account on				
advance Promoter's	obtaining Lender's approval. KYC of suppliers / contractors				
Contribution	to be verified to ensure the credentials.				
Fixed Asset	Project FACR – 1.97 (First year of Operation) and then gradually				
Coverage Ratio	Increase Y-o-Y.				
	<ul> <li>Credentials of equipment vendor, technology being used, performance, etc., are important espect and may be</li> </ul>				
Technical	examined before lending decision				
Parameters	The project comply with technical specification standards				
	and certifications, by MNRE.				
	<ul> <li>The technical specifications as mentioned in EOIs.</li> </ul>				
Deve meterial	Napier Grass through FPO and local Gram Panchayat & Earmore				
Raw malenal	Pressmud from Shamli / Un Sugar Mill				
Availability	The Ministry of New and Denswehle Energy (MNDE) has				
	<ul> <li>The Ministry of New and Renewable Energy (MINRE) has notified Control Einancial Assistance (CEA) of Rs. 4 crores</li> </ul>				
	notified Central Financial Assistance (CFA) of T(3.4 Crores				
	meters of biogas per day with a maximum of Rs 10 cr				
	per project				
Capital Subsidv	pital Subsidy Hence CFA Subsidy received from MNRE for 6Ton				
	day of CBG generation @ Rs. 4.80 CR				
	• The entire CFA will be released to the developer's loan				
	account in the lending financial institution/banks for the				



# purpose of offsetting the loan amount only after successful<br/>commissioning of the project, after achievement of COD.• UP Govt. subsidy for 6 Ton / day of CBG generation @<br/>Rs. 4.50 CR• Rs. 40 Lacs from NABARD for Bio-Fertilizer Plant unitMSME IncentivesApplicable as per UP Govt. MSME & Bio Energy Policy 2022

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### CHAPTER 15

### COMPRESSED BIOGAS PLANT SITE LOCATION, BIOMASS ASSESMENT, PROJECT DEVELOPMENT & IMPLEMENTATION SCHEDULE

The Following is to be the Basic Profile of this Project:

- ✓ **Name of Firm:** Superior Agro ventures Pvt. Ltd.
- Registered Address: Backside Old Grain Market, Railway RD, Kapurthala, Punjab 144601

**Correspondence Address:** # E/2479, Amba Vihar, Saharanpur Bypass Road, Gangoh, Tehsil – Nakur, District – Saharanpur 247341 Uttar Pradesh.

**Proposed Plants Location:** Village – Harsana, Tehsil – Un, District Shamli 247778 Uttar Pradesh

Apox Distant from Delhi Airport: 2.40 Hr. Drive (170 KM)

Apox Distance from Rail Route (Karnal): 20 Km (30 Min)

**BIOMASS ASSESMENT: -** Approximate Quantities of Requirement of Raw Material:

The main any one raw material required for plant is Pressmud, Cattle Dung, Agro Residuals, Poultry droppings and Food waste.

S. No.	Plant	Feedstock /	CBG Yield	Qty in Ton	CBG Generated
	Capacity	Day			in Ton
1		Napier Grass	6%	100	6.0
3	14,500	OR			
4	CuM	Pressmud*	4.0%	150	6.0
Total Qty of Raw material needs / Day in MT					
	()	round off)		100 to 150 10h	6.0 Ion

\*Pressmud is considered as backup Raw material source



### **IMPLEMENTATION SCHEDULE**

Activities	Time	Stage wise	
	required in	funds required	
	months for	in % on the	
	activity	project	
Company name approval, Company incorporation,			
Issue of Certificate			
Commencement of Business certificate			
TOTAL TIME AND COST FOR THE PHASE	01	0.25%	
PROJECT DEVELOPMENT			
Site selection	1	5%	
Detailed Project Report	1	1%	
PESO license application	1	0.50%	
Documentation for Loans	1	2%	
TOTAL TIME AND COST FOR THE PHASE I	2	8.50%	
DESIGN AND ENGINEERING			
Detailed design and engineering			
TOTAL TIME AND COST FOR THE PHASE II	2	3.0%	
CONSTRUCTION AND COMMISSIONING			
Order for the Plant and Machinery	1	10%	
Start of civil work	1	10%	
Completion of the civil work of the Digester	4	20%	
Completion of the entire mechanical work of the	4	35%	
digester and biogas holder Fabrication and			
commissioning of Purification Holder			
TOTAL TIME OF THIS PHASE	6		
Commissioning of the compressor System	1	5%	
Completion of the slurry system	1	5%	
Commissioning of the complete System	1	3.25%	
TOTAL TIME AND COST FOR THE PHASE	2		
TOTAL TIME OF PROJECT	12	100%	

### \*\*\*\*\*\*\*



### CHAPTER 16

### **DETAILED GENERAL ACTIVITIES**

### Key Favourable Factors of the Project

- Replacement of fossil fuels & their migration of GHG emissions & Environmental Pollution.
- Land use of project land will be changed after getting the Land registration on the name of SPV.
- The proposed plant will also provide the clean cooking gas to the hotels/ institutes / Industries or replacement of LPG for a better fuel.
- Replacement of fossil fuels & their migration of GHG emissions & Environmental Pollution.
- Raw material for Plant will be arranged directly from Sugar Mills, FPO, Farmers, Gram Panchayat and local farmers.
- Raw material for Plant will be arranged under government mechanism of long term agreements to be developed by state government from the nearest Sugar Mills (Operative & Shamli Sugar Mill) / GRAM PANCHAYAT / Farmers.
- By-product Granulated Bio-Fertilizers and Green Coal by briquetting machine as Fuel to be sold by Punjab Agri Export Corporation Ltd. (A Punjab Government Undertaking).
- Green Coal by briquetting machine as Fuel to be sold to NTPC.
- 15 Acres of Govt land may be available for raw material Storage nearby plant area under the provisions of UP Bio Energy Policy 2022
- Fermented Organic Manure (Liquid fertilizer, if any) will be sold by Punjab Agri Export Corporation Ltd. (A Punjab Government Undertaking) / OWN Mkt. Network / Bio-Fertilizer's Manufacturer
- Creation of rural jobs
- Eliminate the dependency on the grid for the gas.
- Clean environment

### **Active Security**

Operating in a secure and safe environment is a major priority and should be addressed from project initiation.

### Technical feasibility & Project Designing and Engineering

The technical engineering and feasibilities are done by the Engineers and project management team in conformity to regulatory Authorities and Agencies guidelines and designing on safety, environmental protection, structural engineering, wiring, fire prevention etc.



### Company Registration, Notification and & Establishment

The Company at this time can be registered putting in place all the Directors in place to begin formulating the guiding policies and principles of the Company. The appointment of Contractors to work with technical team consultants and the basic staff appointment is to be made to facilitate the construction and establishment of the project site.

### Infrastructure Development

Once the security for the site is in place, the basic infrastructure will be implemented such as access roads and drains. Alongside the access roads and drains, utilities such as water and energy will also be provided at this stage to allow the site to operate within and off Nationalgrid, ensuring that any issues with electricity outages and water supply do not affect the use of the site.

### Master plan Infrastructure

- Factory Shed& Foundations
- Digesters &Tanks
- Laboratory
- Stores Shed for Raw materials & Bio Fertilizers
- Office Block & Pantry
- Servant Room & Toilet block
- Security room
- Recruitment of Staff & Training

### **Certifications by Regulatory Authorities**

After all the plant is set regulatory agencies are to be invited to inspect and certify with provisional approval the readiness for the Plant facility to start operations.

### **Design Supply & Erection**

The next stage is to finalize the designing of the Manufacturing plant which is to be followed by the supply of same and subsequent erection of the plant

### Technical Training and Knowledge Transfer

At this stage, the technical contract clause of technology transfer from the Technical Developers and Engineers to local content staff begins. For two months the Engineers are to work with the local staff and build them up to take over full running of the plant.

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# CHAPTER 17 THE PROJECT OVERVIEW - (FEED STOCK & MANPOWER)

The plant and its establishment shall be named as Bio CNG & Fermented Organic Manure (Organic Fertilizer) Plant and to be run by a well-established management team with all the required expertise.

On Yearly basis, biogas plant will generate about 6 TPD of CBG in each phase.

- The plant will generate ~ Approx. 1980 ton/annum CBG. (Saleable @ 80% CUF)
- The plant will generate ~ Approx. 6600 ton/annum Dry Granulated Fortified Bio-Manure. (Saleable @ 95% CUF) on the consideration of 330 days working / Year.

3/4th of the water will be recycled in the process and 1/4th will be utilized as fertilizer.

### **Project Overview**

- Project will be designed to utilize the available waste which is to be collected from nearby vicinity of the plant.
- In the proposed project produced biogas of the plant will be used for the CBG after removing carbon dioxide and H2S.
- Produced Bio-Manure of the plant could be sold at competitive prices to farmers.
- Alternatively, the dried sludge will be used for production of "green coal" for its combustion in furnaces.
- With reference to the cash accrual (as mentioned in indicative financials) the payback for such a project is 4 5 years.
- The project will also generate local employment during construction, operation and maintenance of the project.

FEED STOCK: - Approximate Quantities Of Requirement of Raw Material:

The main any one raw material required for plant is Pressmud, Cattle Dung, Agro Residuals, Poultry droppings and Food waste.

S. No.	Plant Capacity	Feedstock / Day	CBG Yield	Qty in Ton	CBG Generated
					in Ton
4		Naniar Crass	60/	100	C
1		Napler Grass	0%	100	0
		OR			



3	14,400 CuM	Pressmud*	4%	150	6
Total Qty of Raw material needs / Day in MT (round off)				120	6.0 Ton

\*Pressmud is considered as backup Raw material source

### Advantages:

- The cultivation of Super Napier stick seed grows very easy and fast and get the height of 6 feet in 30 days.
- It contains apox 14% to 18% protein with high yield and good Raw Material for Biogas Plant.
- GOI Crop Diversification Scheme and support to PM Modi vision for doubling the farmers' income
- Promote the cultivation of Napier grass on Barren Land
- Napier is good green fodder for Gaushala and may help in reducing the government expenses on running Gauslaha
- No usage of pesticides on Napier Cultivation
- Helping in good health of Soil.

**Procurement of Raw Materials:** We design our plant of mixed feed and Napier Grass will be used as major feed stock.

In surrounding of our proposed plants, we are distributing Super Napier Grass (Co5 / Co6 MilkZen) stick seed free of cost to 50 farmers for cultivation of Napier Grass on 130 Acres of land (1 to 3 Acre / farmer) under contract farming in close vicinity (30 villages within 10 KM radius) of our plant.

- Production of Napier Grass in 1 Acres / Year:
- Cutting on every 45 days 30 Ton/ Cut
- Total No of cutting / Year Min 5
- Total Production / Year / Acres = 30 Ton X 5 Cutting = 150 Ton
- Purchase rate = Rs. 1000 / Ton
- Total Income to local farmers on Napier Cultivation = Rs. 1000 X 150 Ton = Rs. 1.50 Lacs
- Payment to Farmers on every 60 days



### Logistic, Storage and Supply:

We are importing 02 Nos of Super Napier Cutter Harvester Machines for Napier Grass from Brazil with 10 Ton / hr capacity. These machine will cut the Napier Grass from field and chop in 2.5 to 6 MM particles for direct feed into Biogas Plant pre-treatment pit.

No need for labour for cutting the Napier Grass from Fields

No need for big area of Raw Material storage

### Manpower Requirement: For Operation of Compressed Biogas Plant:

- Plant Manager 01
- Jr. Engineer 02
- Accountant 01
- Store Keeper 01
- Electrician cum Supervisor 02
- Driver 04
- Bio-Fertilizer Expert (Agriculturist) 01
- Unskilled Manpower 20

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### CHAPTER 18 INNOVATIVE ON SUPPLY CHAIN, SOCIO ECONOMIC IMPACT AND EMPLOYMENT GENERATION

### Innovation-Feedstock Management, Supply Chain, Quality & Quantity Management

The Superior Agro Ventures envisioned to build the compressed biogas (CBG) and Biomanure plant under SATAT / Gobardhan scheme of Govt. of India in Tehsil – Unn, District Shamli of UP state of INDIA.

The project carries vision to produce 14,400 m3/day Biogas (6 TPD of CBG) and 20 Ton / day Bio-Fertilizer from valuable Napier Grass, Pressmud and Fruit & Vegetable Waste etc.

The Compressed biogas will be supplied to the nearest IOCL CNG station. This project will serve as a model project which would promote more such plants across the region. This will also highlight the importance and high value of Napier Grass and Pressmud. It will also provide farmers and village community with quality manure and fertilizer for their fields.

The availability of quality raw material is a pre-requisite in the production of quality biogas andbiomanure. Due to a lack of waste supply and mismanagement, the majority of CBG an d biomanure plants constructed in India between 2010 to 2018 failed or were operating und er Capacity.

The majority of the units were built without first conducting a survey to determine the availa bility of high-quality waste. In order to ensure a regular supply of essential raw materials in the required quantities and after analysis of the above-mentioned challenges, Golden Global Agrotech decided to innovate the supply chain, feed stock management, of suitable quantity and quality. Thus, decided to create some models at ground level for the same with the help of farmer's co-operatives and **SHG's**.

The required raw material such as press mud, cow dung and rice straw would be directly procured from farmer's co-operatives and SHG's. Co-operatives and SHG's will be in charge of supplying ready-to-use feedstock at the plant end, any waste segregation and pre-treatment will be in scope them, that may be necessary. Laboratory testing facilities for testing of raw materials will be there to confirm their suitability for the production of quality biogas.



The availability of raw materials, of suitable quality and quantity, is a basic factor in making decisions on the establishment of CBG production plants, regardless of the scale of production. Further, co-operatives and SHG's would have the following responsibilities:

- Signing of long term contract with local farmers for cultivation of Napier Grass as raw Material of Biogas Plant.
- To managing the feedstock supply, analysing the supply chain, controlling the cost, managing suppliers as well as maintaining all documentation pertaining to feed supply of a Bio-CNG plant.
- SHG's will procure of feedstock, monitor resource mobilization, analyse the supply chain and ensure the quality and quantity of the feedstock as per specified instructions for a Bio-CNG plant.
- Perform thorough analysis of stakeholder requirements and market provider.
- Gather and analyse information regarding the feedstock suppliers near the plant.
- Develop supplier options/pool for sourcing of new and existing materials.
- Identify the suppliers, build, and maintain strong relationships with them.
- Obtain feedstock samples from the identified suppliers or third parties to test suitability.
- Negotiate an ideal binding supply agreement with suppliers available on the organization's panel as per the specified standards.
- Scope out and develop long-term structural opportunities for feedstock supply in coordination with the feedstock suppliers.
- Identify new opportunities to secure feedstock from various sectors.
- Develop logistics supply chains for feedstock supply.
- Define and implement appropriate procurement processes and sourcing strategies for the entire supply chain.
- Forecast inventory movements proactively across feeds owner in order to prevent any over or under supply penalties.
- Identify bottlenecks in the process and resolve them at the earliest.
- Maintain feedstock delivery forecast and present the same to the plant head periodically.
- Deliver savings and benefit through effective sourcing and procurement activities.
- Ensure that feedstock is aligned to sales target and growth.
- Monitor feedstock levels daily to ensure sufficient supply is on site or planned for delivery to meet the plant's needs.
- Report any shortages or discrepancies to the plant manager.
- Inform the plant head of any deviation in the quantities ordered, received, and fix it during price settlement.
- Ensure proper storage of the feedstock in the biomass depot.
- Identify recyclable and non-recyclable, and hazardous waste.
- Dispose of hazardous waste appropriately as per SOP.



### Socio-Economic impact of the Innovation:

- The feedstock's quality, timely supply and consistency are ensured by its reliance on restricted sources.
- Generally, Bio-CNG plant feature in-house pre-treatment, sorting, segregation facility at plant's end. However, in this case there is no need of any investment on such facilities.
- The waste will be ready-to-use, high quality and uniform, which will enhance the biomethanation process inside the digester.
- Transportation and labor cost will be saved, as FPO's will provide ready-to-use waste at plant end.
- This project provides employment opportunities to local people during construction and maintenance of the biogas plants.
- It improves the economic level of the local community. In general, an improvement in the quality of life of the local people, living within the project boundaries.
- Market will be created for presently unused / wasted commercially viable cow dung, press mud and rice straw.
- Plant will not only help farmers inch towards self-reliance, but also inspires them to make use of alternate energy.
- By-product from the biogas plants can be used as liquid fertilizer. It has potential to replace the chemical fertilizer completely.
- Local farmers will get large quantity of fertilizer which can be applied to fields which would save each villager cost of spending on DAP and Urea. Saharanpur being a farming zone, will benefit the farmers and the farming with organic production of food.
- With proper management of animal and other agriculture/organic wastes, nearby areas will be clean leading to better health and hygiene in rural areas.
- Dissemination of information, to local community, on the advantages of renewable energy-based technologies and their applications in creating local value-addition.
- The reduction of CO2 and other GHG will not only be beneficial locally but will contribute in achieving the globally fixed targets. Community participation will be an added benefit to promote and expand the technology among the masses over wide areas. The technology used is simple and all the materials involved are local.
- Biogas plant provides improvement in the environment, sanitation and hygiene. Proposes unit are effective means for the sanitary disposal of cow dung/press mud/ rice straw. Generally, in Indian villages people used to dump the cow dung along the road side, which leads to create from for commuters, environment etc.,
- Moreover, biogas is clean fuel does not cause air pollution. It is considered a better fuel than natural gas and liquefied petroleum gas.
- Replacement of fossil fuels & their migration of GHG emissions & environmental pollution.
- Normally aerobic decay of organic waste leads to emission of greenhouse gases like



carbon dioxide or carbon monoxide. The process of bio-methanation reduces greenhouse gas emission and helps in arresting depletion of the ozone layer. This is likely to earn carbon credits.

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## CHAPTER 19 SWOT ANALYSIS

The SWOT analysis brings to bear the anticipated internal strengths of the proposed Plant and how to address the weaknesses and mitigate the threats from outside whilst taking advantage of the opportunities offered within the Economic environment in which we operate.

### **Possible Strengths**

The company is to engage the services of experienced professionals. This is where our strengths will be concentrated which is to include Knowledgeable and Experienced workforce with expertise are to be engaged, if necessary from outside the country to train where need be and transfer knowledge to local staff.

### **Possible Weakness**

The possible weakness will be the teething stage and the initial learning curve that the new Company is to go through but with the willingness to learn culture of the Group this can be overcome within the shortest possible time.

### **Opportunities**

Our strengths will help us capitalize on emerging opportunities.

### Threats

Awareness of Bio Fertilizer in Farmers and Marketing of Organic Fertilizer

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### CHAPTER 20 CONCLUSION

The model for the techno-economic analysis was defined based on the current available acceptable Bio-methanation process technology. The results from techno-economic analysis showed that implementing a 14,400 m3 per day Biogas (6 TPD CBG / Bio-CNG) & 20 TPD Bio-Fertilizers / Fermented Organic Manure Plant in Village – Harsana, Tehsil – Un, District – Shamli 247778 Uttar Pradesh is economically feasible.

It was also determined that the Carbon Revenues and Government Subsidies and incentives are the most attractive option having the highest NPV and IRR. Furthermore, the analysis showed that the investment costs can be recovered in a period of 6 to 7 years.

The Government of India is committed to transforming India into Sasya - Syamala Bharat, a Sujala - Suphala Bharat Launched on the penultimate day of the ongoing Swachhta Hi Seva fortnight, a mass movement to fulfil Mahatma Gandhi's vision of a Clean India, this initiative holds great promise for efficient municipal solid waste management and in tackling the problem of polluted urban air due to farm stubble-burning and carbon emissions.

### Target group

We mainly focus on small marginal farmers in communities in low-income states in India. Within these communities, we try to improve the situation of women especially. We do so by providing clean cooking & Bio fuels, but we also employ women in our project. They collect the waste, maintain contacts and work in the plants.

### Gain trust from the communities

We work together with farmer producer organizations and women self-help groups. They have already gained trust from the community as they have been working with them for many years.

The production and use of biogas for domestic purposes **can drastically reduce the depletion of natural resources like forests, Mineral Fuels & Chemical Fertilizers**, which are otherwise the prominent and traditional source of energy for cooking, lighting, Moto Fuel and Bio Fertilizer for Farmers. It removes dependence on forest and enhances greeneries leading to improved environment.

Use of Compressed Bio-Gas (CBG) & Fermented Organic Manure Plant will also help bring down dependency on crude oil & Chemical fertilizer imports and in realizing the Prime Minister's vision of enhancing farmers' income, rural employment and entrepreneurship.





What is considered as waste today can be transformed into energy in the near future! Every bit of biomass can be used to produce Compressed bio-gas and bio-manure. This will go a long way in making India energy self-reliant, help combat global warming and mitigate climate change.

## CONCLUSION OF NATFRENZ TECHNOLOGIES AS TECHNICAL EXPERT

*"In view of the above foregoing favourable financial indicators, M/s Superior Agro ventures Pvt. Ltd. – Establishment of CBG manufacturing facility with per day production capacity of 06 TPD CBG / Bio-CNG and 20 TPD of Bio-fertilizer,* 

The project is technically feasible and financially viable subject to mitigation measures, remarks and assumptions mentioned in the report."

### **END OF REPORT**