TECHNO-ECONOMIC-FEASIBILITY REPORT

ON

COMMUNITY BIO-GAS UNIT FOR PIPED BIO-GAS SUPPLY TO 120 HOUSE - HOLDS

IN

VILLAGE: MISHRAWALLIA
BLOCK : BERUARBARI
TEHSIL : BANSDIH
DISTT.: BALLIA.

PROPOSED BY
YUVAK MANGAL DAL
MISHRAWALLIA

&

MISHRAWALLIA AUDYANIK UTPADAN EVAM VIPNAN SEHKARI SAMITI LIMITED
MISHRAWALLIA, BALLIA

PREPARED BY
"JETROPHA MISSION CELL"
DEPT. OF PLANNING, GOVT. OF U.P.
512, Vth FLOOR, YOJANA BHAWAN, LUCKNOW

(APRIL, 2007)

CHAPTER : 1
VILLAGE AT A GLANCE

1.	Name of the Village	:	MISHRAWALLIA
2.	Name of the Gram-Sabha	:	MISHRAWALLIA
3.	Post Office	:	V.B. NARAINPUR
4.	Block	:	Beruarbari
5.	Distt.	:	Ballia.
6.	Name of the Gram Pradhan	:	SMT. SAVITA MISHRA
7.	Name of the Block Pramukh	:	SMT. LALITA DEVI
8.	Name of the S.H.G.	:	Yuvak Mangal Dal, Mishrawallia. Post: V.B. Narainpur Distt: Ballia ,U.P.
9.	President of the S.H.G.	:	Sri Ajit Kumar (M) 9336848242
10.	No. of families	:	(70 A.P.L. & 50 B.P.L.)
11.	Total population of the village:		1100
12.	Community Development Centre	:	-
13.	Availability of land for community Bio-gas unit.	:	2500 sqft in each 3 different locality
14.	Cattle population in the Village:		500
15.	Name of the Bank and its Branch.	:	Gramin Bank, Rajpur
16.	Lead Bank of Ballia distt.	:	Central Bank of India.

YUVAK MANGAL DAL
VILLAGE: MISHRAWALLIA
BLOCK: BERUARBARI
DISTT.: BALLIA, U.P.

Sl. No.	Name	Caste	Post held
1.	Sri Ajit Kumar	General	Group leader
2.	Sri Vishnu Kumar	General	Member
3.	Sri Arun Kumar	General	Member
4.	Chandra Bhushan	General	Member
5.	Sri Jai Prakash	S.C.	Member
6.	Sri Om Prakash	B.C.	Member
7.	Sri Damari	B.C.	Member

CHAPTER-2

TOTAL SANTATION CAMPAIGN & COMMUNITY BIO - GAS UNIT FOR CLEAN FUEL TO EVERY HOUSE HOLD IN RURAL AREA

1.0 Background :

Government of India's **Total Sanitation Campaign (TSC)** has been focusing on safe disposal of human excreta by promoting construction of sanitary toilets and creating open defecation free environment. TSC implementation has considerably improved due to recent community based incentive scheme"-Nirmal Gram Puraskar" launched by Govt. of India. Currently, the primary objective of the Total Sanitation Campaing in India is to address the knowledge and practice of safe disposal of human faecal through a range of on plot and off plot technical options. This is based on the assumption of primary research that indicates high correlation between unsafe human faecal disposal and the prevalence of gastro intestinal illness. However, recent research by WHO (2004) and supporting studies by Godfrey et all (2005) indicate that prevalence of specific micro-organisms derived from animal source (E Coli 0157:H7, Enterococcus, Rotavirus and Cryptosproidium) suggest that management of human faeces alone is insufficient in breaking the "true" faecal-oral-transmission route. Hence, there is need to focus on animal waste management. GOI has recently modified the TSC guideline to incorporate a provision of solid and liquid waste management also having both type of waste etc. human waste as-well-as animal wastes.

2.0 Health Risk :

Livestock activities have significant impacts on almost all aspects of environment including air, land, soil, water and biodiversity. The livestock business contributes among other things to water pollution, euthropication and the degeneration of coral reefs. Livestock are estimated to be the main inland source of phosphorous and nitrogen contamination and one of the leading factors for nitrate pollution resulting in blue baby syndrome (Steinfeld et al, 2006). However, as well as chemical contamination, animal waste is a significant source of microbiological contamination of drinking water sources as well as increasing the subsequent disease burden. One of the major causes of mortality and morbidity among children below 2 years of age is rotaviral infection. The major source of rotavirus is animal faeces and drinking water contamination due to it. UNICEF concern over rotavirus contamination has resulted in the introduction of rotarirus and pneumococcal vaccines at a cost of $US200 million. Despite the global recognition of animal waste as a major source

of rotavirus, there have been limited *environmental sanitation* drives to reduce the prevalence and viral transmission in rural India.

Animal waste from about 485 million livestock population in India contributes excess nutrients, pathogens, organic matter, solids, and odorous compounds to the environment (Ministry of Agriculture, 2006). Animal waste from farms, livestock/poultry, dairy production operations and stray animals severely affects water quality if not managed properly. Though crop-increasing value of animal faeces has been recognized, more than 50% of the cattle dung produced in India is either burnt or remains unmanaged (Ministry of Agriculture, 2006).

Traditionally, the cattle-dung, together with house sweeping, is collected in the open backyard, and removed from the homestead using drawn carts. The dung is removed to another heap or to an uncovered pit in a common plot outside the village. The loose heaps lie exposed to the sun, with the result that the raw organic matter dries up quickly and does not fully decompose. Very often, a part of the dry dung is blown off by wind or washed away by rain. This can cause eutrophication of surface waters, degradation of ground water quality, and threats to human health. Furthermore, historically, animal waste is used as manure and land application of manure is considered to be the best option for animal waste management. However, recent trends and results from Multi District Water Quality Assessment (MDAWS) in Madhya Pradesh indicate increased drinking water contamination both due to animal and human waste.

Poor management of cow dung and inadequate hygiene practices are also responsible for contamination of the milk produced. Cow-dung is also primarily responsible for growth of parasites causing deadly Alzheimer (kalazar) disease.

Similarly, agriculture wastes also causing various health hazards like a weed in the eastern up districts, of U.P., popularly known as “Congress Chass” has created a panic in the rural areas. It is causing so many problems of skins and joints to the farmers.

3.0 Opportunities:

The most common way of disposal of cow-dung in rural areas is to convert into dung cakes which are burnt as fuel in rural households. Burning the cow-dung not only adds to carbon emission which is a green house gas leading to ozone layer depletion but also is an inefficient way of using the dung which is rich in calorific value and can generate efficient form of fuel if properly decomposed in a bio-digester. Anaerobic decomposition of organic waste leads to methane production which is a good fuel. As per calorific value table one kg

of methane gas is more or less equal in energy content to one kg of petrol, LPG, kerosene or diesel. The gobar gas research station in Kanpur Gaushala Samiti in Uttar Pradesh has established that one cow gives enough cow-dung in year to produce methane gas equivalent to 255 litres of petrol in energy terms.

The large scale availability of cow-dung and other organic waste in rural areas can be used to produce methane gas in an organized way. Generation of methane in this manner or " methane farming" has the potential to counter the skyrocketing prices of crude oil and emerge as an alternative to fossil fuels whose stocks may be depleted in the next 30-40 years.

It is estimated that with existing cattle population, India can produce enough methane gas to entirely replace LPG and kerosene in cooking, and substitute petrol in transportation. Methane gas can also generate enough electricity to meet all requirements, at least in rural areas[2]. The by-product can serve as excellent organic manure, substituting chemical fertilizers which require LPG as feedstock.

4.0 Technology :

Obtaining methane gas from cow dung is simple enough. When organic material decays it yields useful by-products. The kind of by-product depends on the conditions under which decay takes place. Decay can be *aerobic* (with oxygen) or *anaerobic* (without oxygen). It is possible to mimic and hasten the natural anaerobic process by putting organic wastes (manure and vegetable matter) into insulated, air-tight containers called digesters. Digesters are of two types:

1. Batch-load digesters which are filled all at once, sealed, and emptied when the raw material has stopped producing gas; and
2. Continuous-load digesters which are fed a little, regularly, so that gas and fertilizer are produced continuously.

The digester is fed with a mixture of water and wastes, called "slurry". Inside the digester, each daily load of fresh slurry flows is one end and displaces the previous days's load which bacteria and other microbes have already started to digest.

Each load progresses down the length of the digester to a point where the methane bacteria are active. At this point large bubbles force their way to the surface where the gas accumulates. The gas is very similar to natural gas and can be burned directly for heat and light, stored for future use, or compressed to power heat engines. This gas has 68 per cent methane[3] and 31 per cent carbon dioxide. It is passed through lime water to remove the

carbon dioxide and over iron fillings to remove H_2S. It then becomes enriched with methane. A compressor can extract and compress this methane gas into portable cylinders. These methane gas cylinders can then be used for cooking, or in automobiles and two wheelers. A community unit may provide piped gas to house holds whether it is in rural area or in urban area.

As much as 50 per cent of the cow dung slurry and other agro-waste is available as leftover in the gobar gas plant, which then can be used to produce organic manure rich in nitrogen and phosphorus.

5.0 The Economics of Methane farming:

1. Our petrol consumption in 2003-2004 was eight million tones. On the assumption that one cow produces methane gas equivalent to 225 litres of petrol, we will need about 36 million cows to produce an energy equivalent to eight million tones of petrol.
2. LPG is generally used for cooking in urban areas while kerosene is the preferred fuel in rural India. A 15 kg. LPG cylinder lasts about 20-25 days for a family of 7-8. This Works out to 20 cylinders LPG per house hold per year. The equivalent quantity of kerosene also true. The entire LPG and kerosene requirements of our 100 crore population can be met by methane gas cylinders, produced from the cow dung of 75 million cows.
3. A generator needs 200 gm of petrol to produce one kilowatt/hour (kwH) of electrical energy. The per capita electrical energy consumption in rural area is 112 kwH per annum. Our rural population being 74 crore, we will need another 85 million cows to meet the electrical energy needs of rural areas. This comes to a total of 200 million livestock to satisfy our energy requirements.
4. The cow dung of 200 million cow can produce 50 million tones of manure, which can be used for two rotations in a year to take care of the fertilizer needs of the entire 143 million hectares in the country. This will completely offset the need to import CNG, used as feedstock in fertilizer plants.
5. Since this process leads to safe disposal of organic waste and methane generated is used as fuel, this process saves the green house gas emission and quantum of methane generated is likely to earn carbon credits as part of the Clean Development Mechanism (CDM) which can generate sufficient fund for taking up methane farming on a large scale.

6. It is estimated that with initial investment of about Rs. 14.00 Lakh is required for a community Bio-Gas Unit which can provide piped bio-gas to a village having 80-100 house holds. The plant can be easily operated at village level by local entrepreneurs as well as women self help groups.

6.0 Advantages:

1. **Sanitation:** with proper management of animal and other agriculture/organic wastes/ village will be clean leading to better health and hygiene in rural areas.
2. **Energy security:** conversion of organic waste into methane and its use as fuel will lead to energy security because the fossil fuel is not going to last more than 30-40 years.
3. **Pollution control:** normally aerobic decay of organic waste leads to emission of green house gases like carbon dioxide or carbon monoxide. The process of methanation reduces green house gas emission and helps in arresting depletion of the ozone layer. This is likely to earn carbon credits.
4. **Employment generation:** Such plants can be easily set up and operated at village level and can be managed by women self help groups or local entrepreneurs with lower per capita investment. Since the product has a captive market the plant is bound ɒ be economically viable and generate employment opportunity for a large number of people.

CHAPTER-3

PROJECT AT A GLANCE

1.0	Name of the Unit	:	COMMUNITY BIO-GAS UNIT FOR PIPED BIO-GAS SUPPLY
2.0	Address of the Unit	:	Village: MISHRAWALLIA Block : Beruarbari Distt.: Ballia, U.P.
3.0	Implementing Agency	:	Yuvak Mangal Dal Village: Mishrawallia Block : Beruarbari Distt.: Ballia, U.P. In association with Mishrawallia Audyanik Utpadan Evam Vipnan Sehkari Samiti Limited Mishrawallia, P.O: V.B. Narainpur, distt. Ballia.
4.0	Technical Guidance	:	M/S Bala Ji Bio-Gas Plants, Bhauti, Kanpur.
5.0	Facilitation	:	"Jetropha Mission Cell", Dept. of Planning Govt. of U.P., Yojana Bhawan, Lucknow.
6.0	Installed Capacity of the Plant	:	300 Cubic Meter
7.0	Charging process	:	5625 kg. agro waste, Gobar & Other organic waste per week.
8.0	No. of families to be benefited	:	120 families each family size involves 7-8 persons.

9.0 **Project Cost:**

(i)	Cost of Land	:	Community contribution
(ii)	Cost of work shed 3No. of shed@250 sqft each@280 per sqft.	:	Rs. 2,10,000=00
(iii)	Cost of equipments: 3No. biogas unit each of 100 Cubic meter capacity @Rs. 4,85,000=00	:	Rs. 14,55,000=00

(a) Dome: 10No. @Rs.9500 per unit	:Rs.	95,000=00
(b) Construction materials	:Rs.	1,25,000=00
(c) Big size desulpherizer unit	:Rs.	30,000=00
(d) Storage tank and compressor	:Rs.	1,20,000=00
(e) Mould Royalty	:Rs.	50,000=00
(f) Labour & technical guidance fee	:Rs.	50,000=00
(g) Transportation charges etc.	:Rs.	15,000=00
Total	**:Rs.**	**4,85,000=00**

(iv)	G.I. pipes and pipe fittings 4.50km. @Rs. 60,000 per km.	:	Rs.	2,70,000=00
(v)	Gas Chullah & Lamps	:	Rs.	1,80,000=00
(vi)	MISC expenses	:	Rs.	30,000=00
(vii)	Recurring Expenses for a month 15000 kg. agro waste, gobar and other waste @050 per kg. on average basis & others.	:	Rs.	34,000=00
	Total	**:**	**Rs.**	**21,79,000=00**

10.0 **MEANS OF FINANCE:** Rs. 21.79 Lakh as grant in aid from UNICEF.

11.0 **Financial Indicators:**

(i)	Gross Profit to Sales Ratio	:	8.33%
(ii)	Net Profit to Sales Ratio	:	3.47%
(iii)	Per house hold expenditure	:	Rs. 17,500=00
(iv)	Capital subsidy proposed from govt.	:	Proposed as per different model produced at annexure.

CHAPTER-4

ECONOMICS OF THE PROJECT

1.0 INTRODUCTION:

This project has been first of it's kind in U.P.. It will provide clean, eco-friendly and piped gas supply to rural households of village Mishrawallia in V.B. Narainpur, Distt. Ballia. The total population this village is about 1200 having 112 house hold in total. It is a majra of Mishrawallia Gram-Sabha. The village is situated about 20 km. away from district H.Q. and suffering of so many economic problems. Yuvak Mangal Dal is functional since last 3-4 years and they have got their own status in the regional society. All the members of this group under close supervision of M/S Mishrawallia Audyanik Utpadan Evam Vipnan Sehkari Samiti Limited Mishrawallia one of the member of Yuvak Mangal Dal and Mishrawallia Audyanik Utpadan Evam Vipnan Sehkari Samiti Limited Mishrawallia, Sri Vishnu Kumar is also the member of "U.P. Jaiwa Indhen Paramarshi Samiti" Under Chairmanship of Agriculture Production Commissioner, U.P.. "Jetropha Mission Cell", Dept. of Planning, Govt. of U.P. is regularly facilitating this network for energy self reliance at their door-step. Based on preliminary survey, 3 units of 100 Cubic meter capacity would be installed on total cost of Rs. 21.79 lakh. Such a facility will provide clean fuel to the villagers as per their convenience on reasonable cost. The unit will provide full time employment to about 12 rural youths also. The useful life of the project has been assumed as 20 years.

2.0 MARKETING POTENTIAL:

The marketability of the products are much more easier. The major product is bio-gas, which is a clean-fuel having comparatively lower per day investment to a villagers for it's consumption in comparison to traditional L.P.G.. Based on the survey to all the 132 families in the village, about 12 families have their own L.P.G. connections. So, rest 120 families are still left, who will be served by this project, Along with, the proposed unit will produce about 5625 kg. good quality compost per month, which can also be easily marketed to either in village it's self on whole sale basis or it's small packets to urban area of Ballia, Gorakhpur & Varanasi for kitchen garden. During, desulpherization, concentrated H_2SO_4

would be formulated which can be easily sold to Chemical Unit. So, marketability is not a problem to the unit.

3.0 BASIS & PRESUMPTIONS:

Following assumptions have been made regarding formulating the project;

(i) The land would be provided by the Gram-Sabha/Debt of Youth Welfare, U.P..

(ii) All the rates regarding construction materials and daily wages have been taken as per rates available in the market.

(iii) Technical consultancy would be taken from M/S Bala ji Gas Plants, Kanpur.

(iv) 100% part of the total capital required would be as grant in aid from UNICEF.

(v) The gestation period of the project is one year.

(vi) A.P.L. families will pay Rs. 100 per month while B.P.L. families will pay Rs. 50 per month as service charges against piped bio-gas.

(vii) Depreciation rate would be 5% W.D.V.

(viii) The bio-fertilizer/compost produced would be sold @Rs. 4000 per tonne in whole sale or Rs. 8000 per tonne in retail. 50% of the fertilizers would be sold at whole sale prices while 50% would be sold at retail prices. Agro and other organic wastes would be procured @ Rs. 0.25 per kg., while cow-dung would be procured @Rs. 0.70 per by. Average rate would be Rs. 0.50 per kg.

(ix) Calculation of daily wages paid to labour has been taken Rs. 60/-.

(x) No duty or tax would be charged by the govt. dept.

(xi) The project would be fully subsidiesed.

(xii) All other conditions remain the same.

4.0 IMPLEMENTATION SCHEDULE:

Following implementation schedule has been proposed;

(i) Selection of village & Sites : completed.

(ii) Procurement of land : To be procured by 15 April, 2007.

(iii) Formulation of the Project & it's Submission to the concerned dept. For getting recommendation for Sanction. : By 15 April, 2007

(iv) Sanction of Piolet project from UNICEF as grant in aid. : By May 15, 2007

(v) Completion of civil work : By July 15, 2007

(vi) Installation of equipments pipelines and other attachments/appliances : By end of July, 2007.

(vii) Trial run : Ist week of Aug, 2007.

(viii) Commercial production : IInd week of Aug, 2007.

5.0 TECHNICAL ASPECTS:

(i) **PRODUCTION PROCESS:** All shorts of agro-and other organic house hold waste are collected and feeded in to bio-digester. After filling the required quantity, the bio-digester is sealed with pre-fabricated dome of some inert materials. Initially, after 4-5 days, the gasification starts under anaerobic condition. The gases coming act are treated with lime solution first and then it is passed through desulpherizer. After coming out from desulpherizer, the gas is stored in the storage tank and then it is supplied to the house holds in time with the help of a compressor unit. This supply is time bound like 1.30 hour in the morning say about 7.00 A.M. in the morning, 2.00-3.30 in the mid and from 6.00P.M.-10.00 P.M. in the night. In short of any emergency it can also be used as per convenience of the community.

(ii) **QUALITY STANDARDS:** Methane gas coming out from the plant is as good is C.N.G. or L.P.G.. It's burning process and thermal efficiency is also of similar nature.

(iii) **PRODUCTION CAPACITY:** The total installed capacity of the plants is 300 cubic meter each. Each house hold requires 2.25 cubic meter gas per day as per schedule mentioned above.

6.0 FINANCIAL ASPECTS:

(i) Fixed Capital:

Sl.No.	Particulars	Total Cost (Rs.)
i.	Land	Community Contribution
ii.	Work shed (250 sqft each):3 No.	2,10,000=00
iii.	P & M, equipments and other attachments.	19,35,000=00
	Total	**21,45,000=00**

(ii) Recurring Expenditures:

(a) Salary & Wages per month: To manage the activity, following staff & workers would be recruited;

Sl.No.	Particulars	Rate (Rs./Month)	No.	Amount
1.	Project Coordinator	3000	1	3000=00
2.	Supervisors	1500	3	4500=00
3.	Semi Skilled Workers	1200	8	9600=00
		Total	**12**	**17,100=00**

(b) Raw materials per month: The unit will require various kind of agro-waste, Cow-dung & other organic waste from house hold. About 22.5 tonnes of waste would be required @500 per tonnes. So, it will Cost Rs. 11250 per month.

(c) Utilities per month: Following utilities would be required on monthly basis;

Sl.No.	Particulars	Amount (Rs.)
1.	Petrol/Kerosene for start of compressor	1500=00
2.	Water	300=00
	Total	**1,800=00**

(d) Other Contingent expenses per month: Such expenses would be following;

Sl.No.	Particulars	Amount (Rs.)
1.	Postage & Stationery	150=00
2.	Telephone	750=00
3.	Transport Charges	2,250=00
4.	MISC	750=00
	Total	**3,900=00**

(e) Total recurring expenses per month: Summing up (a+b+c+d), it comes to be Rs. 34,050 says Rs. 34,000=00.

7.0 TOTAL COST OF PROJECT:

(i)	Fixed Capital	:	Rs.	21,45,000=00
(ii)	Recurring expenditures per month	:	Rs.	34,000=00
	Total	**:**	**Rs.**	**21,79,000=00**

8.0 MEANS OF FINANCE: The proposed Piolet Unit would be established under UNICEF assistance. So, the total funds would be as grant in aid.

9.0 ANNUAL REVENUE GENERATION:

The unit will provide piped bio-gas supply to A.P.L. & B.P.L. families through out the year. Along with, the unit will produce good quality compost also. Here-under are the detail of revenue;

(i)	Contribution from A.P.L. families @Rs. 100 per month X 70 families X 12 month	:Rs.	84,000=00
(ii)	Contribution from B.P.L. families @Rs. 50 per month X 50 families X 12 month	:Rs.	30,000=00
(iii)	Compost @5.625 M.T. per month X 12 month (50%@Rs.8000 PMT and 50%@Rs.4000PMT)	:Rs.	4,05,000=00
	Total	**:Rs.**	**5,19,000=00**

10.0 PROJECTED PROFITABILITY STATEMENT:

Sl.No.	Particulars	Years						
		1	2	3	4	5	6	7-20
1.	Capacity Utilization(%)	80%	100%	100%	100%	100%	100%	100%
2.	Revenue from Sale of compost and community contribution against consumption of gas.	415	519	519	519	519	519	519
3.	Cost of production	395	407	400	395	388	383	378
(i)	Agro-waste	108	135	135	135	135	135	135
(ii)	Labour & wages	115	115	115	115	115	115	115
(iii)	Utilities & services	21	21	21	21	21	21	21
(iv)	MISC expenses	46	46	46	46	46	46	46
(v)	Depreciation	105	90	83	78	71	66	61
4.	Gross Profit	20	112	119	124	131	136	141
5.	Interest	-	-	-	-	-	-	-
(i)	T/L	-	-	-	-	-	-	-
(ii)	Working Capital Loan	-	-	-	-	-	-	-
6.	Adm. Expenses	19	19	19	19	19	19	19
7.	P.B.T.	1	93	100	105	112	117	122
8.	Tax	-	-	-	-	-	-	-
9.	P.A.T.	1	93	100	105	112	117	122
10.	Add. Depreciation	105	90	83	78	71	66	61
11.	Cash accruals	106	183	183	183	183	183	183
12.	Installment of T/L	-	-	-	-	-	-	-
13.	Assistance requested	One time grant in aid requested from UNICEF is 21.79 lakh.						

11.0 SOCIO ECONOMIC OUTCOMES OF THE PROJECT:

Based on the previous analysis, the various outcomes, which are likely to be achieved, are following;

(i) Traditional method of cooking shall be fully replaced. At present direct burning of wood and other organic matters affects our eyes due to smoke, emission of CO_2 & CO affects our ozone layer ultimately to create global warming etc.

(ii) Time saving in cooking ultimately leads to more & more productivity in rural masses.

(iii) Dependence on electricity for lightening would be reduced to almost zero.

(iv) Organic farming shall be started automatically. It will ultimately affects the soil conditions in positive way as well as yield, quality and profitability of the farmers.

(v) Use of clean fuel ultimately leads to total sanitation in the village.

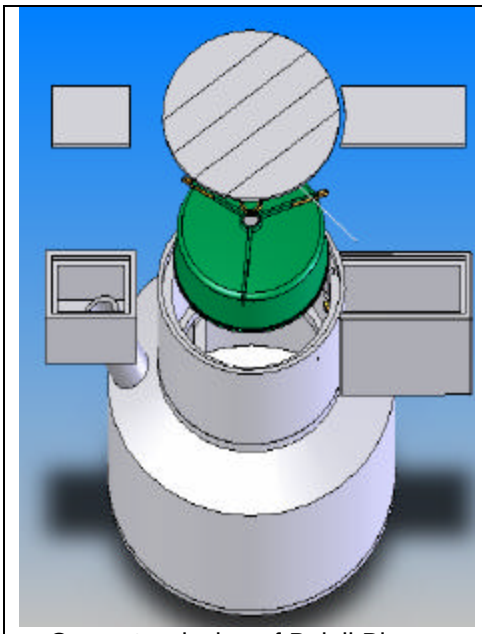
(vi) The cattle population will automatically increase. It will ultimately enhance the income level of the rural mass because real stream of "Kheti-Bari" will automatically start.

Summing-up the above parameters, we can say that Mishrawallia will create a success story regarding energy self reliance through using traditional inputs with using appropriate rural technology. Ultimately, the Socio-Economic status of the masses in the said village will automatically enrich.

ANNEXURE-I

NEW BIOGAS TECHNOLGY
BALAJI BIOGAS PLANT

Introduction:



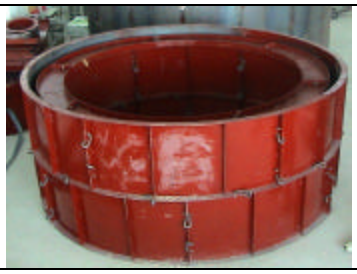
Computer design of Balaji Biogas model

Biogas is the major Energy source in renewable energy field of India. The biogas technology in India started since 1980 AD. From the starting, there are several models practiced in India. Since the introduction of K.V.I.C. model, only such plants have been in practiced. This plant is an example of traditional fixed dome plant. Daily feeding, leakage of gas, difficulty in construction, less gas discharge are the major drawbacks of traditional fixed dome plant .To remove these drawbacks, Salasar Agrotech Pvt. Ltd. has developed a new model called Balaji model which is the best example of hydraulic biogas model. This plant is made with the help of scaffolding (steel mould) by concreting the complete plant. This biogas plant can be taken as daily feeding, semi-batch and batch plant, (the three types of biogas plants practiced around the world).

PART ONE: PARTS OF THE PLANT

BALAJI BIOGAS PLANT CAN BE DIVIDED INTO THREEE MAIN PARTS

1. Concrete Digester: The stomach (digester) of the plant is made with the help of scaffolding (steel mould) by casting the concrete (mixture of cement, smashed stone, sand). Hence it is stronger than the other types of plants with brick or stonewall. The volume of digester varies according to frame .The basic sizes Balaji biogas plant are of 10 cu m. The digester has provided with four concrete slabs(covers) for keeping in the top part to press the biomass kept inside the digester.

2. Gas Holder: The gas holder is made up of reinforced glass fibre, which is 100% air and watertight. The diameter of the gas holder is 1.6 m and the volume varies with height of it. The volume of gas holder for 10 cu m plant is 1.8 cu m. The gas holder always remains below the water level and is fixed in the neck part of the plant. The gas pipe outlet is from the middle part of the gas holder.	
3. Neck and Covers: The round part above the Digester is known as neck. This is also made with the help of steel frame. The neck is essential for fixing the gas holder .The water level above the gas holder in the neck determines the pressure of Gas. The neck is covered with five concrete covers(slabs), which make the plant attractive and utilization of the plant area.	

PART TWO: ADVANTAGES

The Balaji Biogas plant has more advantages than the traditional fixed dome plant. Some of the major advantages of the Balaji Biogas plant over other plants are listed below.

1. **Easy to built and fast**: The Balaji Bio gas plant is made by concreting with the help of frame. Hence, it is easy and fast to build the plant. The Casting of whole plant can be completed in one-day work after digging the hole in the ground. There is no need of soil as in the case of traditional fixed dome plant for casting the digester.

2. **Industrial Scale**: The traditional biogas plant cannot be used to make large plant in industrial scale. The Balaji model can be used to make the plant of strong strength with larger volume than other models.

3. **Solid Organic Materials:** like grass, straw can be used. Traditional biogas plant is mainly dung based but Balaji biogas plant can use any solid biodegradable material. When this biogas plant is used as batch plant, there is regular discharge of gas for long time (4-5 months). But these materials have to be replaced after 5-6 months.

4. **Easy to Repair**: The gas holder is perfectly below the water. Hence any leakage of the gas can be seen easily and repaired immediately. The digester has 1.5 m diameter hollow part in the top(in which gas holder stands). So it is easy to repair the digester also.

5. **Durable**: The Balaji Biogas plant is concrete plant. So it can last for 30 years or more. The gas holder can last for 10 or more years.

6. **Safe**: When the Gas holder is taken out, there is no gas in the digester. So it is safe to repair the plant and to replace the solid biomass like grass and straw.

7. **Purity in the Gas**: The Balaji model consists of de-sulfurizer to absorb the unwanted sulfur compounds (H_2S, SO_2). This will help to show that biogas is odorless gas.

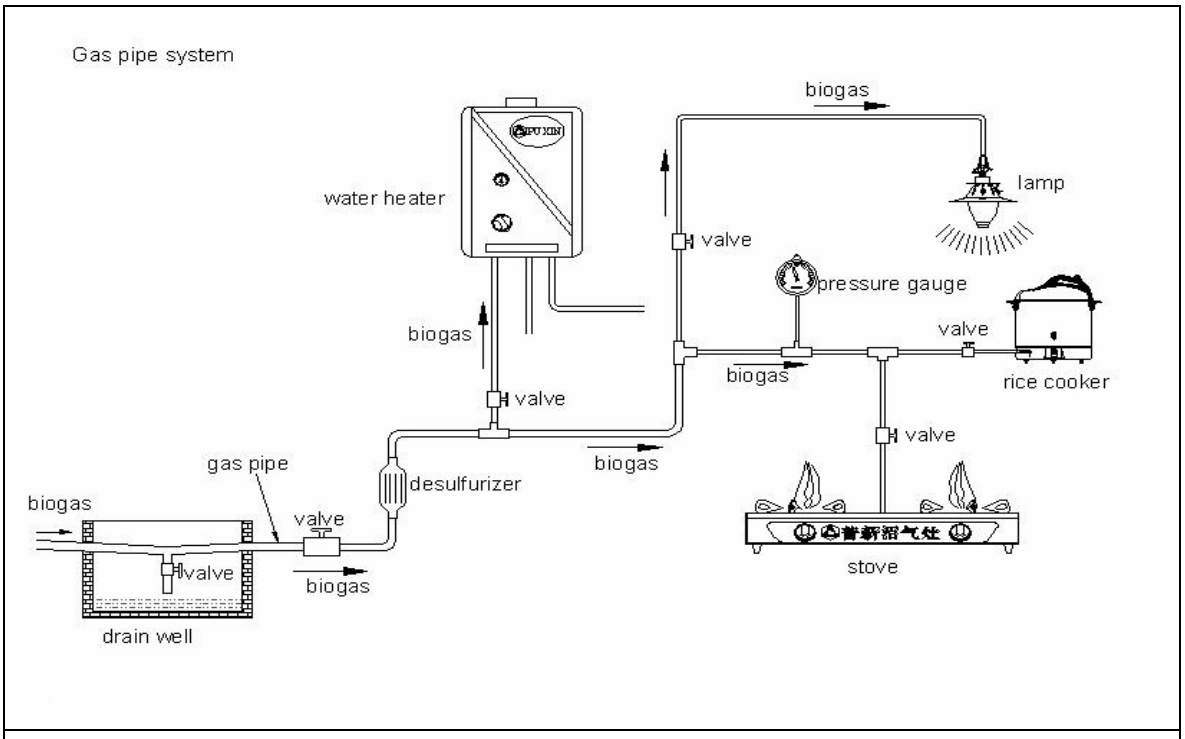
8. **The Slurry**: From the Balaji plant is perfectly digested. It consists of 90% of water.

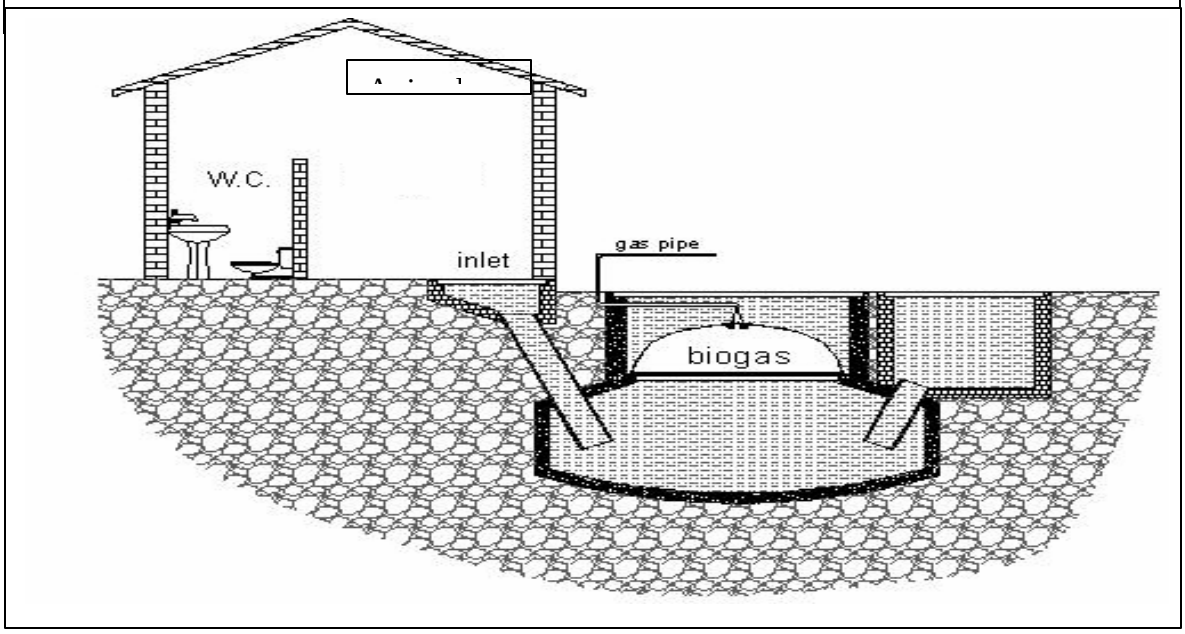
9. **The Inlet and Outlet:** Can be constructed as required by the users.

10. This biogas plant is completely submerged in the ground. So it is very **attractive** than other plants.

11. **All other wastes** (except Plastic, highly acidic and basic materials) can be feed to this Balaji plant.

12. This plant **does not require daily water addition** because it is completely submerged below the water. The feeding material takes the required amount of water.





PART THREE: PARTS OF BALAJI BIOGAS PLANT

1) Steel Mould
2) Gas Holder
3) Biogas Appliances :- a) Biogas Stove
   b) Biogas Water heater
   c) Biogas Rice Cooker
   d) Biogas Lamp
   e) Biogas pipe & fittings
   f) Pressure Gauge
   g) Desulfurizer
   h) Biogas Generator etc.

			
Bio- gas Lamp	Biogas stove	Biogas water heater	Biogas rice cooker
			
Pressure Gauge	Desulfurizer	Pipe fittings	Biogas pipe

CHARACETERISTICS:

1) **100% leak proof.**
2) **Solid wastes rather than dung can be used.**
3) **Completed in four days.**
4) **Modern construction method.**
5) **Fertilizer with high NPK value.**
6) **High efficient appliances.**

Our services:

1. Technology transfer to biogas companies.
2. Steel Moulds.
3. Modern biogas appliances.
4. Extension of biogas technology in urban and rural areas.
5. Big Bio Gas Plant for Gaushala and CNG Plant.
6. Power Generation Plant based on Bio Gas.

Construction Process: -

Digging Hole

Fitting Lower Mould

Construction for Lower Part

Fitting Upper Mould

Final Construction of Upper Neck