

Demonstration of Biogas Purification and Bottling Technology developed by IIT Delhi at Shri Madhav Govind Gaushala (Cattle Farm) in Bhilwara (Rajasthan) India



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Biogas in India

- Biogas is an environment friendly, clean, cheap and versatile fuel can be used for thermal applications, power generation and as an automobile fuel.
- In India there is an estimated potential of 63.8 billion cubic meter (m^3) of biogas per annum from 980 million tones of cattle dung produced from around 280 million cattle.

- In addition to this it can be also obtained from agro residues, kitchen waste, municipal solid waste, industrial effluents and other biodegradable wastes.
- The gas produced from cattle dung has a net heat value of 1300 billion Mega Joules.
- 350 million tones of manure would also produce along with biogas.
- IIT Delhi has developed a simple and low cost biogas upgradation system in which biogas can be upgraded to auto mobile fuel having around 95 % methane , hydrogen sulphide less than 25 ppm and water vapor less than 0.02 gm/cum. It has been demonstrated the technology at few cattle farms (Gaushalas) in India at pilot level.

Gaushalas (Cattle farm)

- *Goshalas* (common cattle sheds) – where old, sick and non milching cows are kept - cow slaughter is banned in India
- There are large no. of gaushals in India (approx more than 10000, with cows ranging from 100 to 1000 and even more
- Goshalas are generally run on charity basis and most of them are in financially poor state but they have valuable resources – animals and cowdung
- Installation of new biogas technologies will enable them to utilize their own resources for financial viability i.e. cattle dung to produce biogas; enrich, compress and store it in cylinders to earn money
- Digested slurry of biogas plant is very good manure and its sale also adds income to Goshala.
- In this way Goshalas can make themselves financially self reliant

About Madhav Go Vigyan Gaushala in Bhilwara Raj

- It has five large cattle sheds (500 cows),
- 65 & 45 cum biogas plants,
- biogas engine – generator (20 kW),
- vermin -compost pits, chaff cutting system, grazing field,
- bull house, veterinary care unit,
- *panchgavya* (medicines from cow products mainly urine) and products making lab etc.
- The Gaushala has dedicated team of volunteers and people working for improving rural economy through cows, organic agriculture and decentralized energy system.
- It is 500 km (approximately) far from Delhi.

Utilization of Biogas at Madhav Govigyan Anusandhan Sansthan, Bhilwara

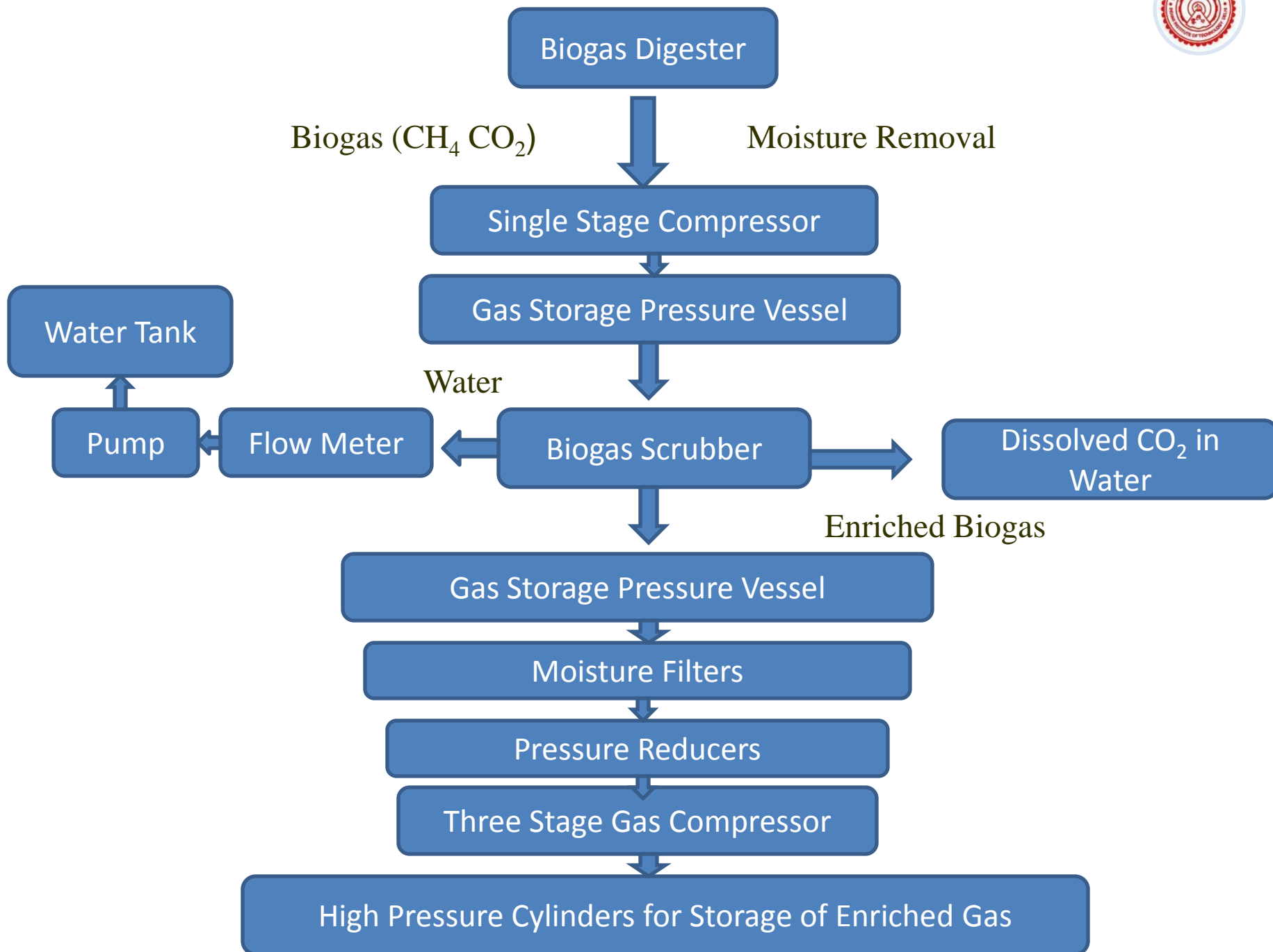
- There is no grid electric supply; and meeting its energy needs from biogas based captive power.
- There are two biogas production plants; one having capacity is 65 Nm³/day and other one is 45 Nm³/day
- Raw biogas is utilized about 13 Nm³/day for cooking, medicine preparation in the laboratory and water heating.
- Remaining biogas is available for upgradation about 75 Nm³/day.
- Purified biogas without bottling is utilized in Natural Gas DG set for electric power generation,
- Purified biogas about 6 Nm³/day is bottled for running CNG auto luggage carrier for about 125 km/day.

biogas demonstration Project for vehicular application

- Pilot level water scrubbing based biogas upgradation system has been installed in 2008 by IIT Delhi
- To utilize biogas and to use it as replacement of petroleum fuels in vehicles
- Techno – economic viability study has been made

Description of the Installed System

- Biogas Enrichment Plant (Plant for upgradation of Biogas) through Water Scrubbing System (Capacity 16 m³/hr including, Heatless Dryer and Skid)
- Bio-CNG Cylinder Filling & Dispensing to CNG Vehicle having Cascade of two CNG Cylinders of 49.1 Litre (250 bar)
- Bio CNG Compressor Model BG 5 with Standard Accessories (Didwania made) for filling in the range of 200 bar
- Bajaj Max Auto Luggage Carrier (DL 1VB 5830) Three Wheeler
- Total Cost – for biogas upgradation & bottling system including biogas vehicle Rs 1.4 million (USD approx 31100)





BIOGAS ENRICHMENT AND BOTTLING SYSTEM

- | | |
|-------------------------------|-------------------------------|
| 1-Biogas plant | 11-Safety valve |
| 2-Ball valve | 12-Water sprayer |
| 3-Water remover | 13-Flange |
| 4-Receiver mounted compressor | 14-View glass |
| 5-Pressure gauge | 15-Water outlet |
| 6-Gas Storage Vessel | 16-Water pump |
| 7-Rotameter | 17-Gas filter |
| 8-Supporting stand | 18-Pressure reducer |
| 9-Reshching rings | 19-Three stage gas compressor |
| 10-Scrubber | 20-CNG Cylinder |

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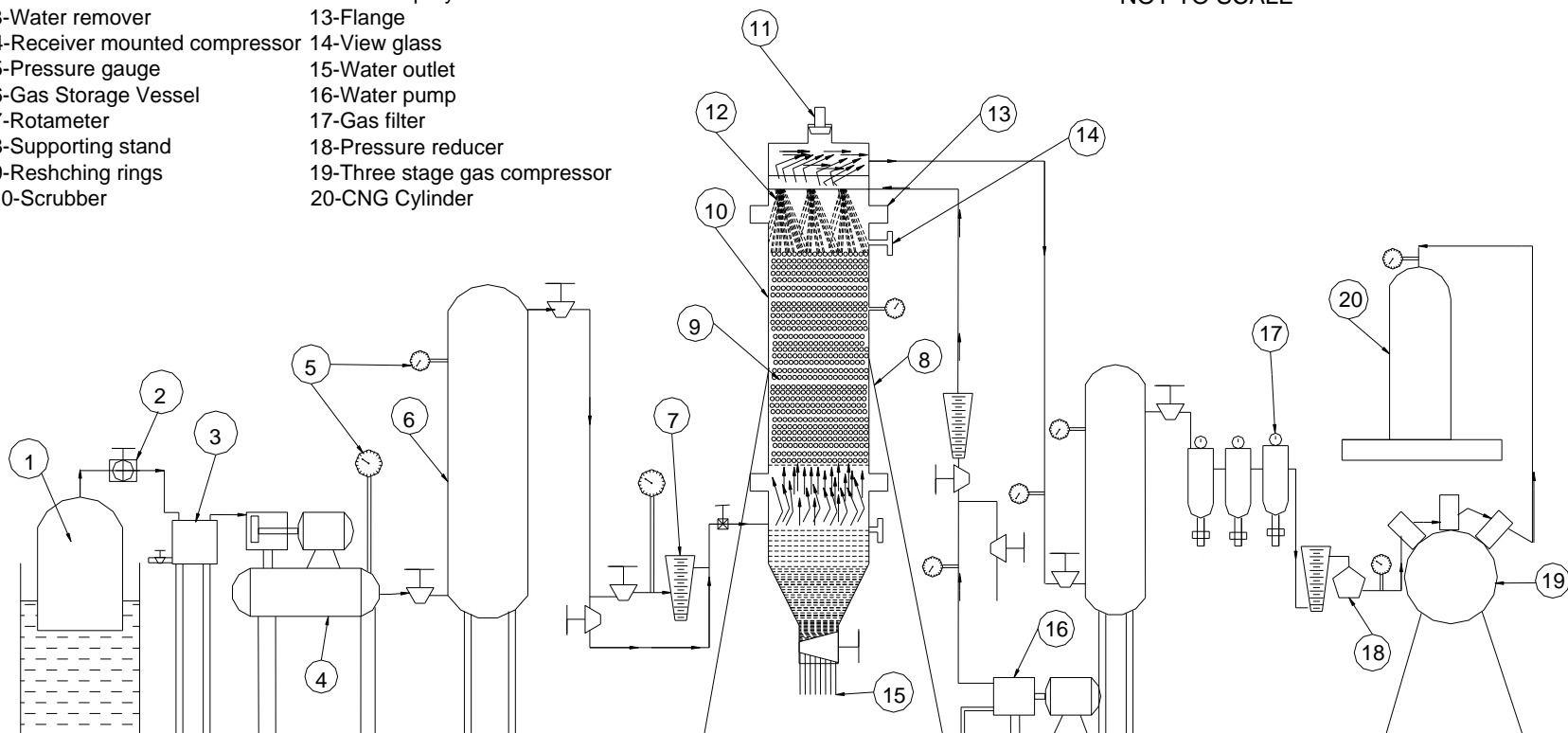
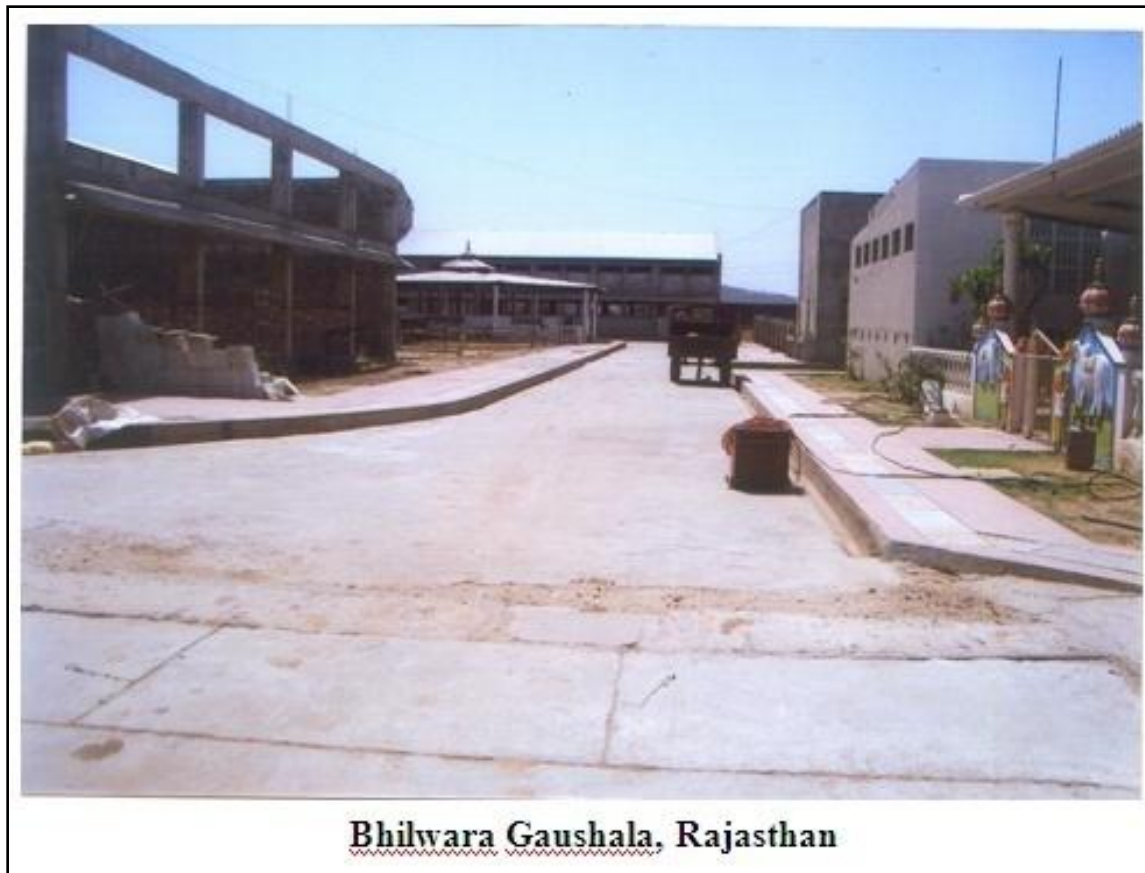


Fig.1: Experimental setup for biogas purification and bottling

Some Pictures of the gaushala



Bhilwara Gaushala, Rajasthan

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Biogas Plant at Bhilwara Gaushala



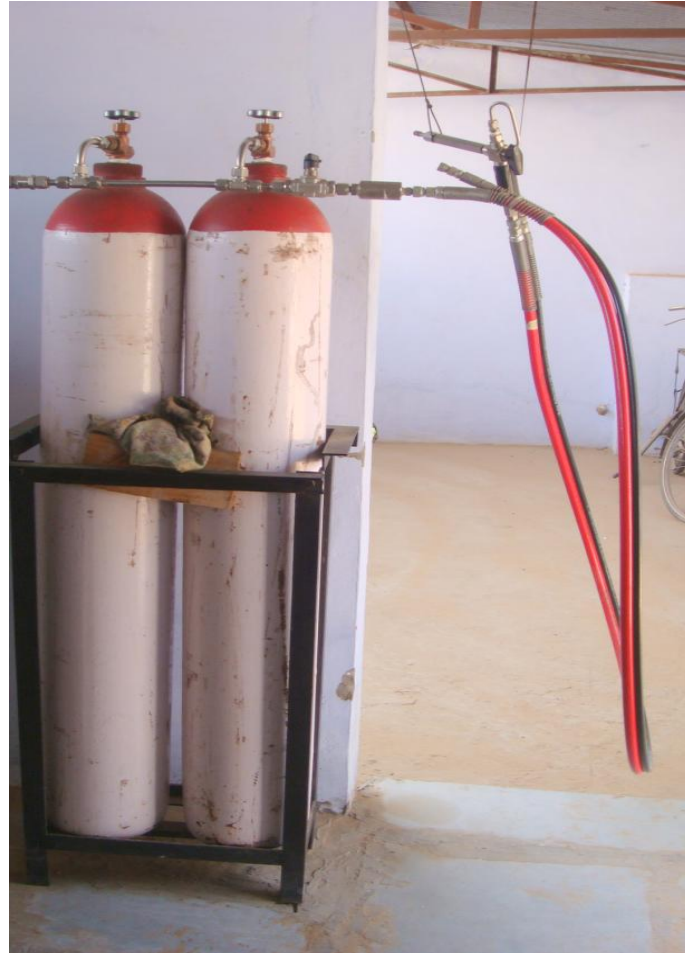
Biogas Enrichment Plant

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High Pressure Compressor

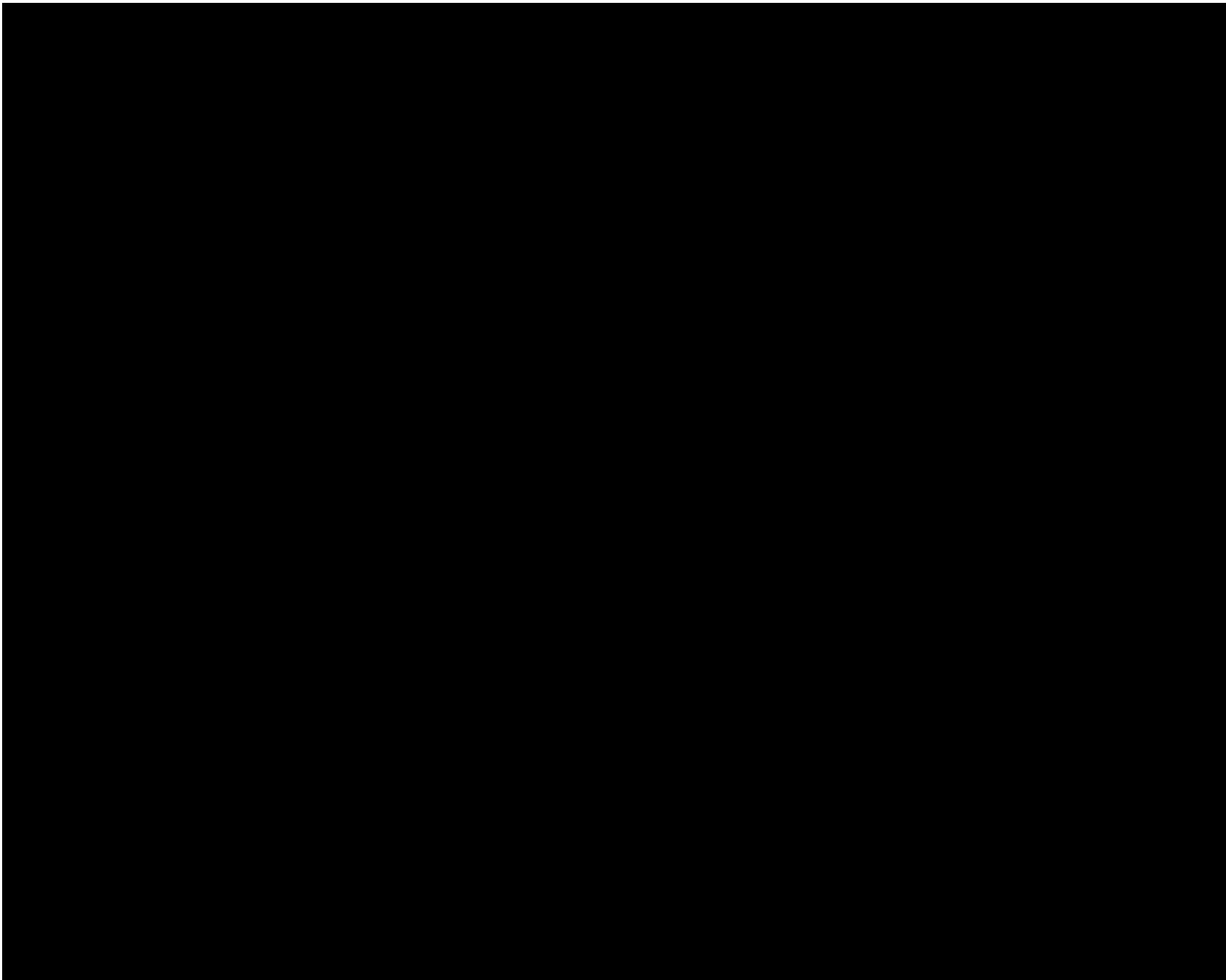
Purified Biogas Dispensing System in Vehicles at Gaushala



Enriched Biogas Operated Three Wheeler Luggage Carrier at Goshala



Biogas Dispenser



Conclusion

- There is need to develop a sustainable biogas system for replacing petroleum products by utilization of biomethane.
- Biogas generation and subsequent bottling will cater the energy needs of villages, supply enriched manure and maintain village sanitation.
- The bottling system will work as a decentralize source of power with uninterrupted supply using local resources, generate ample opportunities for employment and income of the rural people.
- This will help in energy security and reducing green house gases emissions



THANK YOU