



Biomass Gasification An Introduction

Ankur Scientific, Baroda, India
December 2006



Biomass as a Fuel

- Age-old and most widely used fuel source - *Annual consumption was estimated to be of the order of 20 million tonnes a few years ago*
- A **Cheap**, abundantly available fuel
- A very **Clean fuel**
 - Biomass has no Sulphur content
 - Short CO₂ fixation cycle
- **Renewable**



Why Biomass Gasification?

Biomass \longrightarrow Producer Gas

Gasification

Highly Efficient Process

Can be applied over a range of output ratings (few to hundreds of kW)

Can be used for thermal applications & electricity generation

Low initial investment and cost of power production

Allows better process control and convenience

Cleaner combustion in connected equipment

Elimination of all pollution related to Biomass use

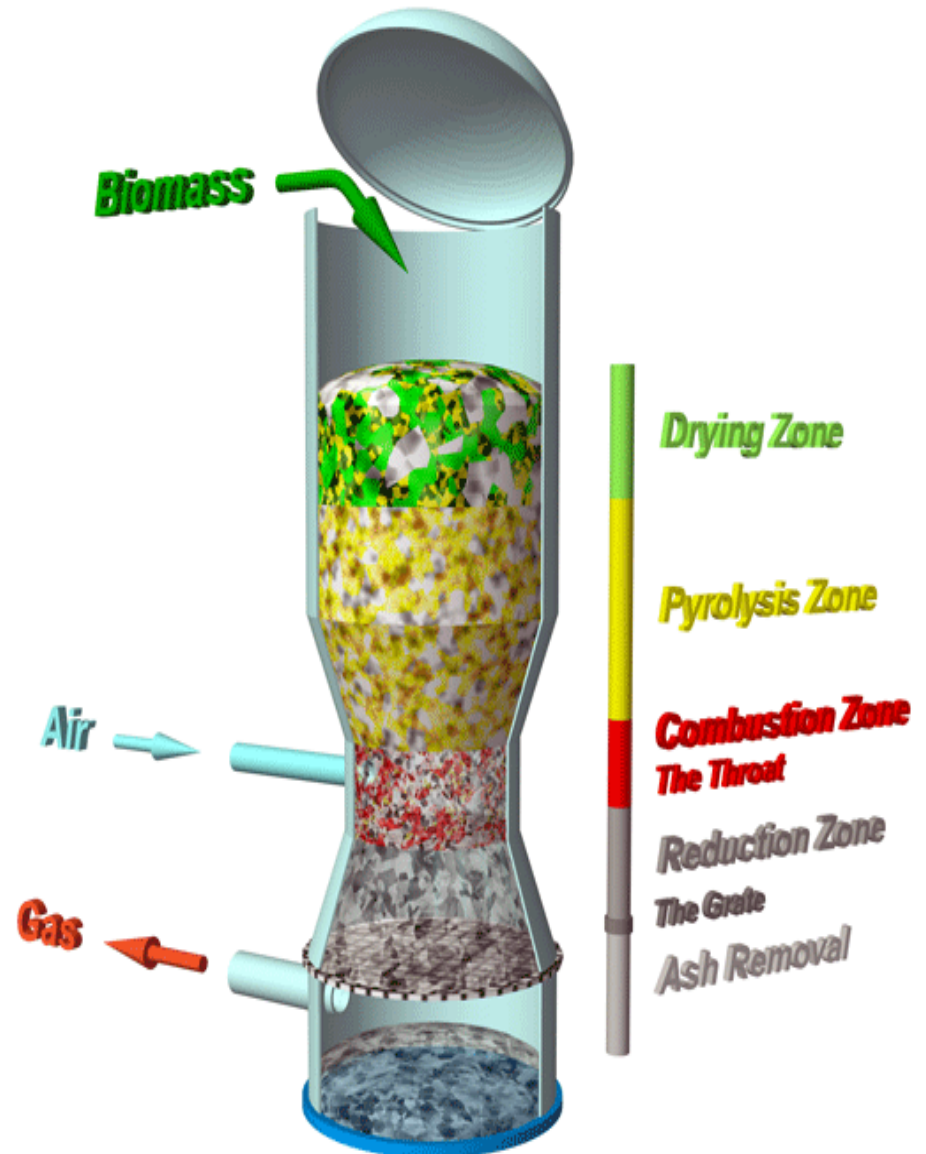


What is Gasification?

Basic Process Chemistry

- Conversion of solid fuels into combustible gas mixture called producer gas ($\text{CO} + \text{H}_2 + \text{CH}_4$)
- Involves partial combustion of biomass
- Four distinct process in the gasifier viz.
 - Drying
 - Pyrolysis
 - Combustion
 - Reduction

Gasification – Basic Process Chemistry Schematic





Producer Gas Properties

Particulars	Rice Husk as biomass	Woody Biomass
CO	15-20%	15-20%
H ₂	10-15%	15-20%
CH ₄	Upto 4%	Upto 3%
N ₂	45-55%	45-50%
CO ₂	8-12%	8-12%
Gas C.V. in kcal/Nm ³	Above 1050	Above 1100
Gas generated in Nm ³ /kg of biomass	2	2.5



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Granule Drying

- Khaitan

- One of the leading chemical manufacturers in the country
- WBG-500 is replacing 110 liters of FO per hour
- Payback in less than 8 months
- Recently installed `Ankur' 1 X WBG-850 gasifier and 2 X WBG-700. All their plants now work with Ankur Gasifiers.



Calcination Kiln

- Calchem

- One of the leading Calcium Carbonate manufacturers in the country
- WBG-850 (in Hot Gas Mode) is replacing 350 kgs of coal per hour. Recently ordered a WBG-1100
- The company had also applied for Carbon Credits and has been able to get a buyer for

6 Euros per tonne



'ANKUR' BIOMASS GASIFIERS
INSTALLED IN
DUAL FUEL
POWER GENERATION MODE

Captive Power for Rice Mill

Highlights

- 70-75% diesel replacement obtained using rice husk as feedstock.
- Diesel Savings : 22 liters/hr
- Payback Period : 6 months
- Trouble-free operation since June, 2001
- Engine performance assessed by KOEL, the Original Equipment Mfr.



Gasifier Model: FBG-120

Sree Gopal Rice Mills,
West Bengal.



FBG Series – Partial List

- Maa Rice Mill, Memari, Burdwan –
FBG-100
- LNC Rice Mill and Sabita Rice Mill, Burdwan –
FBG-300
- M/s Jai Baba Bakreshwar Rice Mill, Birbhum –
FBG-200
- Sree Brijuka Agro Products Pvt. Ltd., Burdwan –
FBG-350



'ANKUR' BIOMASS GASIFIERS
INSTALLED IN
100% PRODUCER GAS
POWER GENERATION MODE

Power Pack for Chlorate Industry

Highlights

- First installation of 200kWe (*GAS-200*) in India
- Low start-up power
- Specific fuel consumption less than 1.3 kg/kWhr
- Low cost of power has enabled the company to restart the production which was stopped 4 years ago due to increased electricity cost



System Package : GAS-200

M/s Valli Chlorate,
Kovilpatti



Power Pack for Lanka Transformers

Highlights

- First installation of GAS-40
- Low start – up power
- Specific fuel consumption: less than 1.3 kg/kWhr
- Cost of Generation as low as 2 to 3 cents per kWhr



System Package : GAS-40

M/s Lanka Transformer Ltd.,
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Other Installations

- Gasifier Power Plant at Kumarikanan, Purulia - 2 X WBG-50
- Gasifier Power Plant at Khetricherra - 4 X WBG-250
- Gasifier Power Plant at Mamit - 2 X WBG-100

A large number of other projects currently under installation in Arunachal, Nagaland, Meghalaya



'ANKUR' BIOMASS GASIFIERS
INSTALLED IN
POWER GENERATION MODE
(SMALL RATING SYSTEMS)



Power Pack for Coconut Plantation

Highlights

- First installation of GAS-4 100% Producer Gas system
- Start-up through battery
- Specific fuel consumption: less than 1.3 kg/kWhr
- Cost of Generation as low as 2 to 3 US cents per kWhr
- Visited by thousands of people from all over



Gasifier Model: GAS-4

Dr Ray Wijewardene's Coconut
Plantation, Sri Lanka

Power Pack for Village Irrigation

Highlights

- First installation of GAS-9 100% Producer Gas system
- Start-up through battery
- Specific fuel consumption: less than 1.3 kg/kWhr
- Operated by Womens' Self Help Group
- Has become a catalyst for economic growth in the village



Gasifier Model: 1 X GAS-9
Odanduthurai, Coimbatore



Other Installations

- The President, Melthattaparai Panchayat – 1 X GAS-4
- The District Forest Officer, Hosur Division – 1 X GAS-4
- The District Forest Officer, Salem Division – 1 X GAS-9
- The President, Nellithurai Panchayat – 1 X GAS-9
- The President, Semmipalayam Panchayat – 1 X GAS-9
- The President, Chikkaram Panchayat – 1 X GAS-9
- Project Officer, DRDA, Saram Village – 1 X GAS-9



EXPORTS



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EXPORTS

EERC - USA

- The whole gasifier system is mounted on a trailer
- The gasifier is coupled to three turbines of 30 kW





Export Installations

- GAS-60 + 2 X GAS-70 CAEMA S.r.l., Italy
- GAS-120 + GAS-250 Scultura, Germany
- WBG-200 Finlays Group, Sri Lanka
- GAS-22, UNIDO, Plant installed in Sri Lanka
- 2 X 240 kWe ('Ankur' WBG-500) Dual Fuel, Flex Technology, Russia
- 1 x 40 kWe Dual Fuel, Forestry Tasmania, Australia