Directory of Service providers of Gasifier based Systems (Technology and Manufacturing)

BERI Project Management Unit

February 2011

Directory of Service Providers of Gasifier based Systems (Technology and Manufacturing)

This publication presents profiles of solely the agencies / organisations whose technologies have been recognised and named by the MNRE. It includes the key agencies/organisations that are involved in the various stages of the supply chain of biomass gasification for thermal and electrical end-uses such as research and development, manufacturing, marketing , operation and maintenance. The information about the agencies/ organisations is collated from the information available on the public domain and also collected first-hand through contacts within the organisations.

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Development and dissemination of biomass gasifiers in India

Development and dissemination of biomass gasifiers in India

The development and dissemination of modern biomass gasifiers in India began in the early 1980s. During this period, a number of research institutions commenced efforts to examine different aspects of biomass gasifier use as well as to develop indigenous gasifiers and gasifier-based energy systems. Much of the initial work centered on small wood-based gasifiers that would be useful for applications such as powering irrigation pumpsets. This focus was motivated by the thinking within the Department of Non-conventional Energy Sources (DNES) that it would be beneficial to utilize renewable energy sources to provide power for irrigation pumping even at that time.

Institutions that were forerunners in terms of the effort to develop bio-energy through gasifiers were:

- Indian Institute of Science (IISc): With financial support from the Karnataka State Council for Science and Technology, research was taken forward at the IISc.
- Tata Energy Research Institute (TERI): Researchers were first trained on gasifiers at TERI in 1982. TERI's Field Research Unit constructed a 5 hp gasifier by 1984. This effort was funded by TERI's internal resources, with the institute providing the hardware components and manpower.
- Indian Institute of Technology (IIT)- Bombay: A group at the IIT-Bombay realized the need for appropriate testing facilities to support the nascent gasifier efforts in the country. DNES funded a testing laboratory.
- IIT-Delhi: IIT Delhi worked on biomass characterization in the early 1980's.

- Other institutes such as Punjab Agricultural University, Ludhiana, and Nimbkar Agricultural Research Institute, Phaltan, also started work on biomass gasification.

The DNES launched its first major initiative under the Biomass Gasifiers Programme in 1987. The initiative was intended to give an impetus to biomass gasification efforts in the country. Demonstration of a large number of small-scale gasifiers in rural areas was one of the key activities. It was expected that this would also yield valuable experience and feedback for improving technologies and programs. The effort focused on systems for irrigation pumping and power generation, with the former application utilizing gasifiers of 5 and 10 hp and the latter application focusing on 30 to 100 kW. A generous subsidy was provided for this scheme. Users contributed between 20 to 50% of total capital cost of the system. Highest subsidy was provided for irrigation pump set application. Soon small biomass gasifier systems were developed indigenously in the range of 3 kW to 500 kW for thermal, electrical and mechanical applications.

The DNES identified six manufacturers as potential suppliers under this program but only three of these eventually supplied gasifiers. These were:

- Ankur, Baroda, Gujarat (with its own design),
- M&M Engineers and Fabricators, Bangalore, Karnataka (using the design licensed from Indian Institute of Science), and
- Associated Engineering Works (AEW), Tanaku, Andhra Pradesh (using design licensed from SPRERI in Gujarat).

This initiative resulted in placing over a 1,000 gasifiers in the field. An evaluation conducted in 1993 indicated not many were functional and had severe limitations in terms of (i) life of the gasifier reactor, (ii) cumbersome operation, (iii) tar problem hampering engine operations, etc. Thus this was not considered a resounding success. However, these early examples of transfer of technology from research institutions to manufacturers provided immense lessons learnt.

In the meantime, DNES was converted to full fledged Ministry which came to existence in 1992 and was known as Ministry of Non-Conventional Energy Sources (MNES). The Ministry was renamed as Ministry of New and Renewable Energy (MNRE) in October 2006.

Gasifier development and dissemination was also supported by other bilateral and multilateral agencies also. gasifiers have found utility in a range of industries for thermal applications across the country.

MNRE supported four Action Research Centres (ARCs) to catalyze and coordinate R&D in various areas such as biomass characterization, technology modification, cost reduction . The areas of specialization of various ARCs are:

- IIT, Delhi: (i) biomass characterization, and (ii) development of process technology packages.
- IIT, Bombay: (i) product development and research, (ii) technology modification, (iii) testing and instrumentation, and (iv) standardization and development of procedures and methods, quality assurance criterion and cost reduction.
- IISc, Bangalore: (i) basic research in biomass gasification for non woody biomass materials, and (ii) upgrading and up-scaling wood based systems.
- Madurai Kamraj University: (i) Field evaluation and testing, (ii) monitoring, re-validation and training, and (iii) development of application packages including implementation.

The institutions that had begun work on gasifiers in the area of technology design, development applications and testing in the early 1980s were Indian Institute of Science (IISc) , Bangalore; The Energy Research Institute (TERI) ; Indian Institute of Technology (IIT) , Bombay and Delhi ; Punjab Agricultural University, Ludhiana; Nimbkar Agricultural Research Institute, Phaltan. They continue to be active in these

areas. A very few R&D players have emerged subsequently such as Madurai Kamaraj University, Tamil Nadu; Sardar Patel Renewable Energy Research Institute (SPRERI), Gujarat ; Anna University, Tamil Nadu. Most of the technology designing and development has happened with the support of the Government of India. MNES, now MNRE, has remained the main funder of gasifier R&D in the country and also its deployment through subsidy program. It has supported 5 gasifier action research projects (GARPs) at IIT, Delhi and Bombay ; Indian Institute of Science, Bangalore; Madurai Kamaraj University, Madurai and Sardar Patel Renewable Energy Research Institute (SPRERI) in Vallabh Vidyanagar, Gujarat during the earlier part of the decade (2000 - 2010).

The main features of the GARPs

- Basic and applied research and design and development of biomass conversion and utilization devices and systems.
- Field demonstration of the technology with action research for resolving the problems in field applications and technology improvements
- Quality assurance through testing and performance evaluation of the gasifier systems

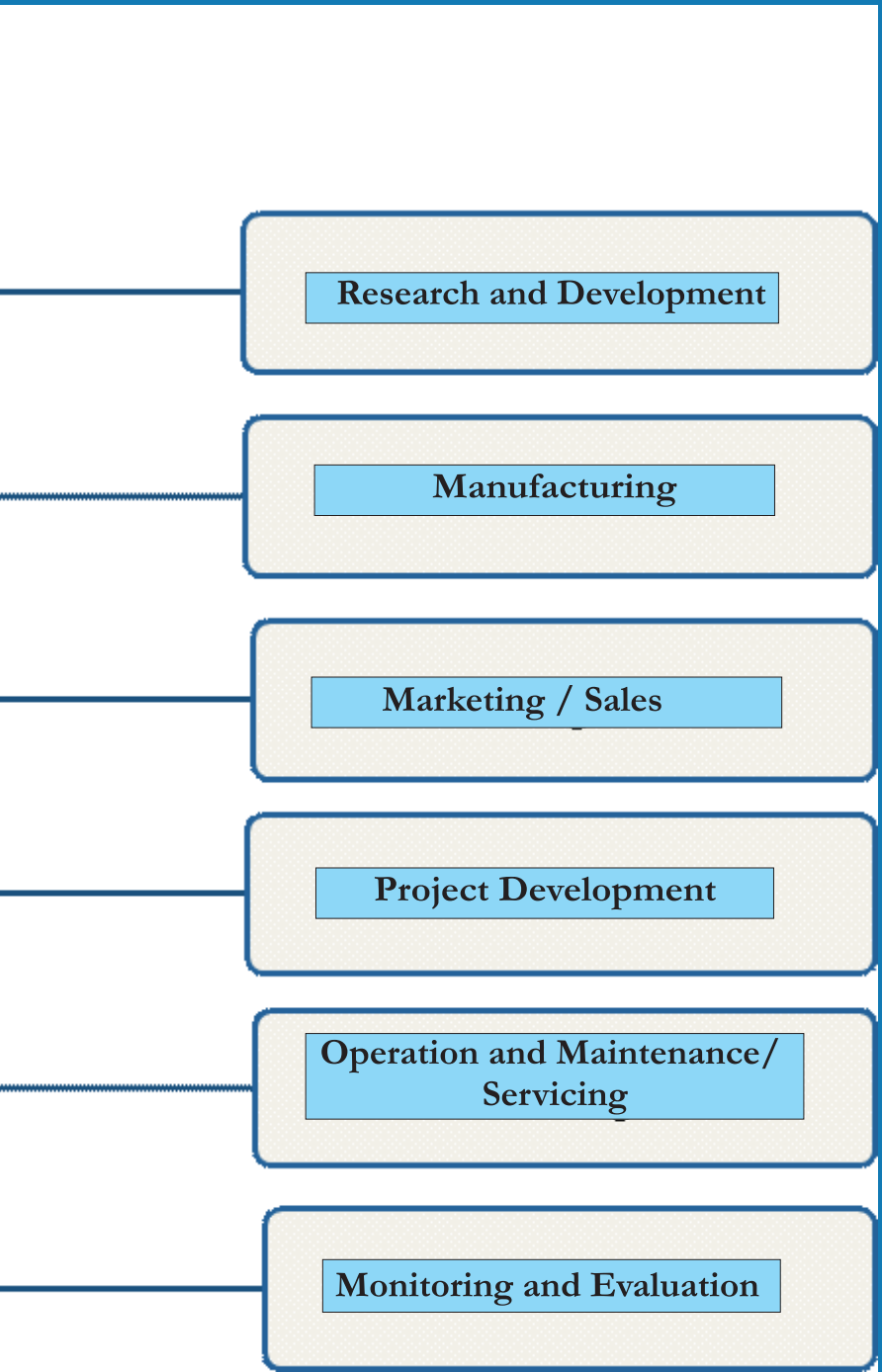
MNRE has designated these R & D Institutions as its testing centres of the gasifier systems in the country and approve the one that qualify the benchmarked standards. Technologies that are approved and recognized by the MNRE are eligible for subsidy/ incentives. However, the gasifier systems have to go through a series of tests for gasification efficiency, maximum permissible levels of tar and particulate content of the gas, capacity realisation, engine exhaust emissions, duration sustainable for uninterrupted continuous operation, fuel conservation/consumption, overall system efficiency at rated load for performance compliance with the qualifying norms prescribed in the MNRE.

Recently, several small-scale entrepreneurs are trying to manufacture and/or install gasifiers on purely commercial basis. Certification is a 'requirement' for only those manufacturers/users who wants to avail subsidies. Partly as a result of this situation, there is a large variation in performance of systems, capital costs, and maintenance requirements/commitments. There appears to be uncertainty on many of the claims of gasifier manufacturers/installers may not stand the scrutiny of a rigorous field evaluation. lack of systematic data-gathering about experiences with, and performance of, installed systems accentuate this problem further.

Since MNRE continues to provide financial assistance under the Biomass Gasifier based Programmes for Energy Service Companies (ESCOs), Co-operatives, Panchayats, SHGs, NGOs, manufacturers or entrepreneurs, independent power producers, promoters & developers who can submit the detailed proposals through the State Nodal agencies (essentially the respective state energy development agency), this directory of technology providers and manufacturers of gasifier based systems may help these groups to select / contact agencies of their choice for the technology.

This directory compiled and presented below highlights only the organisations/ agencies whose technologies have been recognised and named by the MNRE. The directory highlights key organisations/agencies involved in the various stages of the supply chain of biomass gasification in India. Additional tables provide information of those institutions involved in each area of the supply chain. The directory presents the information collated from the available literature on the public domain and collected first-hand through contacts within the organisations. It includes solely for organisations that are involved in the biomass gasification for electrical end-uses.

BIOMASS GASIFIERS SUPPLY CHAIN


Research and Development
Manufacturing
Marketing / Sales
Project Development
Operation and Maintenance/ Servicing
Monitoring and Evaluation

Key Organizations Involved in the Supply Chain

Ankur Scientific Energy Technologies Pvt. Ltd

Technology

Ankur Gasifiers – Downdraft with closed top and throated design.

End-use

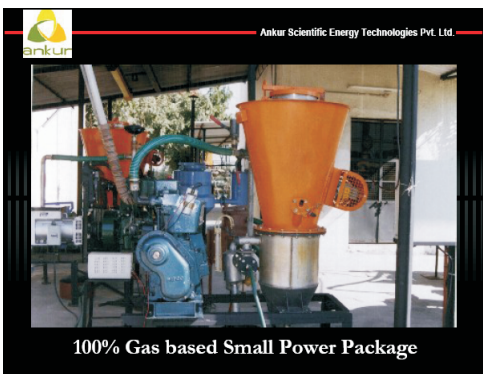
Electrical and Thermal applications

Product Range

- WBG series: using woody biomass such as firewood, waste wood, branches & twigs, coconut / groundnut / arcenut shells, agri-residues like cotton / soya / tuvar stalks, mustard crop residues, corn cobs etc;
- FBG series: using fine biomass such as rice husk etc; and
- COMBO series: using both fine and woody biomass

Facilities

- Extensive R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation



100% Gas based Small Power Package

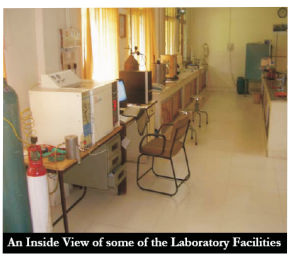
Profile

Ankur Scientific Energy Technologies Pvt. Ltd., a company established in 1986, has been in the forefront of development activities in the area of non-conventional energy sources. The company has, since its inception, an enviable record of development both in the area of Biomass Gasification as well as Biogas Systems based on Poultry Litter, Sewage, Municipal Solid Waste, Cattle dung, Kitchen Waste, Organic household waste, Fruit & Vegetable waste etc.

The company has successfully developed and commercialized a very wide range of biomass gasifiers ranging in size from as small as 10 kWe output to 2-MWe output levels. A number of field installations both in industrial applications and in power generation applications, either Captive or Grid connected or rural / village electrification are a testimony not only to the long-term reliability of the gasifiers, but also of the growing acceptance of the technology developed by the company. These field installations have proved their worth in saving large sums of money for the owners by replacing expensive conventional liquid fuels with cheap, locally available biomass.

Continuous development and improvements in product design have been a corner-stone of the company's policy and these have helped it retain the position of a pioneer and market leader in the field of biomass gasification. All this has been possible because of an able and focused leadership, state-of-the-art facilities (to undertake in-house research and development) and the employees who form the Ankur Family.

A number of patented designs have been developed and wide recognition achieved in the form of National Award for Technology Development with a number of awards for excellence in this field. The company's policy is to provide prompt and efficient after-sales service to its customers. A large number of satisfied clients are a testimony to the successful implementation of this policy.



An Inside View of some of the Laboratory Facilities

Salient Features of Ankur Gasifiers

- Very wide range of gasifier systems in terms of feed-stocks that can be used. Provide flexibility of using various types of feed stocks as the gasifiers work on multiple feedstocks on as is basis, without the need of briquetting.
- The gas from 'Ankur' gasifiers is extremely clean. This is because of the gasifier design and the patented cooling and cleaning system.
- A wide turn down ratio. The gasifiers easily run on 50% of rated output.
- Gasifier systems convert the biomass materials into a combustible gas which can either be burnt in an appropriate burner or which can be fed into diesel engines for saving of fuels like FO, LDO, HSD or LPG etc.
- Can provide wide range of Gasifiers suitable for 10-KWe to 2-MWe levels of Power generation and equivalently Thermal output of 25,000 kcal/hr to 54,45,000 kcal/hr and for higher ratings can provide multiple systems.
- Flexible and Modular systems. Can be scaled according to the need.
- The systems are cleaner & easy to operate & maintain.
- Less requirement of Water & Space as compared to other technologies.
- Multiple Revenue Streams.
- Can be installed faster (1-2 MWe levels in 7-9 months time).
- Good servicing and maintenance due to regional offices and associates all over the country.

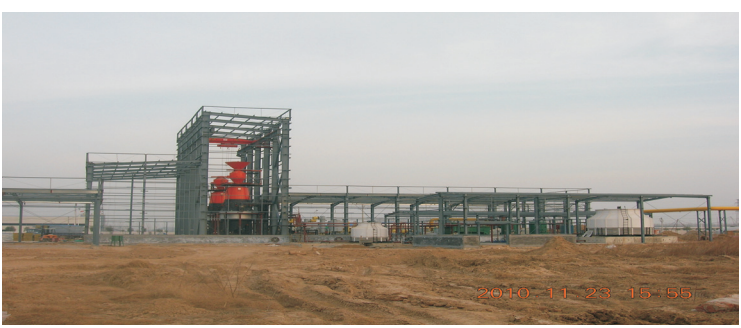
Case Studies

- Dal Drying - SS Industries, Jalagaon
- Steel Tubes Annealing - Patson Industries
- Gosaba Island, Sunderbans

Looking Ahead

Concerns about global warming are providing a further impetus to the compan endeavors. The company is looking towards addressing the challenges of the future with products that will utilize the wide variety of forest and agricultural wastes.

Address
Ankur Scientific and Energy Technologies
Near Navrachana School, Sama
Vadodara – 390024, Gujarat, India
Contact: Mr. Ashok Chaudhuri
General Manager
Business Development
Phone: +91-265-2793098
Fax: +91-2652794042
Email:ascent@ankurscientfic.com
Site: www.ankurscientific.com



Associated Engineering Works (AEW)

Technology

AEW Gasifiers - Downdraft with throat construction

End-uses

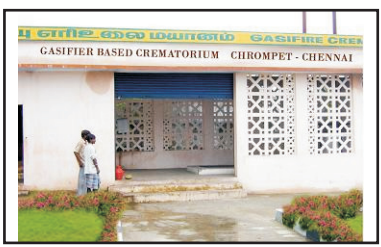
Electrical and Thermal applications

Product Range

- Woody Biomass Based Thermal Gasifiers GT-500/GT-600/GT-700/GT-1000
- Woody Biomass Based Electrical Gasifiers GE-100/GE-350/GE-600
- Multi-purpose Facility Gasifier GE-100-MP
- Gasifier based Cremation Facility GT-600-CR
- Wood Chip Cutters BC-SB-5HP/ BC-MB-12HP
- Gasifier based hospital incinerator (GT-600- INC)
- Rice Husk Based Thermal Gasifiers GT-650 H/GT-750 H

Facilities

- Extensive R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation



Profile

AEW was established in 1995 with a specific mission to provide alternative energy in the form of biomass. It is known in the industry for its efforts in developing unique designs of gasifiers using various types of biomass for meeting varied industrial energy intensive applications in a most convenient and economic way. The company has received a national award from the Government of India for its efforts in developing innovative gasifiers in the renewable energy sector.

In addition to offering several standard capacities for various commercial application modes, AEW can specially develop gasifiers for specific research and development needs.

Salient Features of a AEW Biomass Gasifiers

- Can use both powdery and woody biomass
- Simple design, easy to operate and maintain.

Case Studies

Gasifier based Crematorium – Chrompet, Chennai

Looking Ahead

The company is looking to further their operations and develop their already accomplished gasifiers

Address
Associated Engineering Works
Gamini Compound, Main Road,
Tanuku – 534211, Andhra Pradesh , India
Contact: Mr. Rao
Phone: + 91-8819-222950
Fax: +91- 8819-224801
Email: aewgamini@rediffmail.com
Site: www.aewgasifiers.com

Chanderpur Works Pvt. Ltd.

Technology

CPW gasification systems - down draft throat less

End-use

Electrical and Thermal applications

Product Range

50-1000 KW single unit gasifiers using dry biomass

Facilities

- R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

Chanderpur Works is a leading turnkey solution provider & engineering company with state-of-the-art designing & manufacturing facilities. Incorporated in 1962, the company has been executing different turnkey business solutions for cement, mineral processing, fertilizers and the renewable energy industry.

With regards to the renewable energy industry, Chanderpur Works Pvt. Ltd. is a leading designer, manufacturer and supplier of Biomass Gasifiers, Coal Gasifiers and gasification based power plants for thermal and electrical applications. While Chaderpur has their own R&D unit, they also manufacture thermal gasifiers under a technical collaboration agreement with "TERI" (The Energy & Resource Institute, New Delhi). Chanderpur Works Pvt. Ltd. is now offering "CE" Marked Gasifiers. They have supplied around 20 gasifiers of different capacities for rural, industrial and urban projects.

In addition to designing and manufacturing the gasifiers, the company offers turnkey solutions and undertakes all aspects of plant construction, feasibility studies, technical consultation, equipment supply, construction, supervisory services, commissioning etc. The biomass gasification plants are guaranteed against any manufacturing defect for a period of 12 months from the date of commissioning or 18 months from the dispatch (whichever is earlier). The gasifier system is also guaranteed for the performance of the System (i.e. quality and quantity of the gas produced) and raw material consumption per unit of the product.

Salient Features of a CPW Biomass gasifier

- Down draft, throat less design with low specific gasification rate, which facilitates smooth fuel flow and avoids bridging
- Multi-fuel capability which can accommodate fuel wood, wood chips, agriculture stalk, coconut shells, briquettes of several residues, mustard stalk, cashew-nut shells and lantana
- Air pre-heating for gasification maintains high temperatures resulting in better quality of gas
- Insulated firebox, which maintains high temperatures resulting in better quality gas and longer service life.
- Reliable and rugged system, specially designed for rural areas
- Does not consume diesel or any other fossil fuel for operation
- Uses spark ignition engines
- Efficient cleaning and cooling train

Case Studies

- Zenith Energy: Purchased 120kW Gasifier system from CPW, for the production of power
- S.D.Udyog: Purchased a 100kW Gasifier system in the year 2006 for their Stainless steel rolling furnace
- Ramanath Industries: Purchased a 100kW Gasifier system, for the production of power
- TERI, Gurgaon: purchased a 100 kWe (100% producer gas based) for power generation

Looking Ahead

The company is further expanding on projects for supplying their biomass gasifiers to P.O.P. industries, stainless steel industries and for power producing projects. Power generation from agricultural waste technology is also being looked into.

Address

Chanderpur Works Pvt. Ltd.

Yamunanagar - 135 00Haryana , India

Contact : S. K. Patnaik

Phone: +91-01732-250546

Fax: +91-01732-279852

Email: info@chanderpur.com

Cosmo Powertech Pvt. Ltd.

Technology

Updraft multi-fuel gasifiers and Downdraft wood gasifiers

End Uses

Thermal applications

Product Range

- Updraft multi-fuel gasifiers: 600-12000 kWh output (Equivalent to 50-1000 litre/hr oil substitution
- Downdraft wood gasifiers: 120-1500 kWh output (Equivalent to 10-125 liter/hr oil substitution)

Facilities

- Extensive R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

Cosmo Powertech Pvt. Ltd. manufactures gasifiers, developed through in-house R&D, in the capacity range of 120-12000 kWth (Equivalent to 10-1000 litres/hour oil substitution).

Cosmo Gasifiers operate at near atmospheric pressure and use air as the gasifying medium to convert solid biomass or coal into producer gas through partial oxidation process. The gas contains CO, H_2, CO_2, N_2 and hydrocarbons as main constituents and has a calorific value of 1000-1300 Kcal/Nm3 (4.2-5.4 MJ/Nm3). These gasifiers have a solid fuel to gas conversion efficiency of 70-85%, depending upon fuel and type of reactor.

Cosmo Gasifiers have been developed in both downdraft and updraft designs. While Downdraft Wood Gasifiers convert wood chips or wood like biomass materials into producer gas, the Updraft Multi-Fuel Gasifiers can accept either coal or biomass as fuel. The selection of the type of gasifiers would depend upon available solid fuel and the requirements of the envisaged application.

Gasifiers convert solid fuels into clean combustible gas, which can be used for variety of applications. Substitution of petroleum based fuels (Diesel, fuel oil, LDO, LPG etc.) in the stationary equipment (Such as furnaces, kilns, boilers etc.) is among the most prominent applications.

Salient Features of Cosmo-Gasifiers

- Solid fuel to gas conversion efficiency of 70-85%

- Offers choice of updraft or downdraft depending on application

Case Studies

Cosmo Gasifiers have, so far, catered to various applications in industrial sectors such as Steel re-rolling, steel wires, ceramics, welding fluxes, refractories, and galvanizing among others.

Looking Ahead

The company has a vision to further diversify its activities in the field of Bio-diesel and other Liquid Gaseous fuels from agro-waste. Biomass Gasifier based improved Stoves etc in association with National / International agencies. For International activities the Company has established a liaison office in Pittsburgh City of United States of America.

Address
Cosmo Powertech Pvt.Ltd
Devpuri, Near Jain Public School
Dhamtari Road, Raipur , India
Phone: +91- 771-4011262
Fax: +91- 771-4010190
Email: cosmo_powertech@yahoo.co.in
Site: www.cosmogasifiers.com

Combustion Gasification Propulsion Lab (CGPL) Indian Institute of Science

Technology
Open top re-burn down draft gasifier

End-Uses
Electrical and Thermal applications

Product Range
From 5 kW to 1200 kW in electrical and thermal range (including grid-connected versions)

Facilities
- R&D
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile
The Combustion, Gasification and Propulsion Laboratory (CGPL) at the Indian Institute of Science (IISc), is involved in innovative research and developmental activity in the field of Bio-resource in addition to frontier work in Aerospace propulsion. The work on combustion and propulsion has been going on since 1970 and the work on biomass gasification was started in 1982. Besides fundamental studies, the laboratory has developed techniques of gasification of a wide range of biomass including agro-residues. These techniques have been perfected into small independent power plants, which could serve thermal or electricity needs of industry or rural society.

One of the principal features of the work at the laboratory has been a pursuit to further efficient ways of harnessing energy through gasification process. The development work became so substantive and relevant that a separate society called Advanced Bioresidue Energy Technology Society – ABETS was established in the laboratory to function as an independent society under the chairmanship of the director of IISc. In order to pursue these activities funding for basic research have been sought from several agencies. The principal funding agency is the Ministry of Non-conventional Sources of Energy (MNES). Funding for carrying out special tests and developments are received from other private and governmental agencies (like TIFAC).

One of the Action Research Centres set up by the MNRE to undertake research in developing and upscaling woody and non-woody biomass gasifiers. It has several licensees who have paid a fee and acquired the technology from CGPL. The following are the 8 licensed holders who manufacture the gasifiers:

1. Bioresidue Energy Technology Private Limited
2. Arrya Hi-Tech Energy
3. Synergy Renewable Energy(P)Ltd. "Trishul"

4. SunTechnics Energy Systems Pvt. Ltd.
5. OVN Bioenergy Private Ltd
6. Aruna Electricals Works Pvt. Ltd
7. High Temperature Furnaces
8. Satake Corporation, Japan

Salient Features of CGPL Gasifiers

- It is a modern fuel –flex system that includes urban solid waste.
- It has an open top as against closed top of most designs
- It has staged air injection that is not adopted by any other gasification technology in the world
- Its reactor design with a ceramic inner shell – diameter and stages of air injection and associated details are tuned to provide a thermal and chemical environment to convert most tar molecules to simpler compounds.
- The quality of the gas from the gasification system in terms of gas composition, hot and cold tar are established in rigorous tests in India and overseas as per the European test requirements through third party inspection and independent laboratory tests.
- The patented clean system is capable of reducing the particulate matter from 1000 mg/Nm3 to just 5 mg/Nm3

Case Studies

- Arashi Hitech Biopower Ltd, Coimbatore
- TANFAC Industries Ltd., Cuddalore

Looking Ahead

The following are the broad areas of research in the field of Bio-energy that are currently being undertaken at the laboratory

- Torrefaction of Bamboo
- Precipitated Silica from Rice Husk Ash - IPSIT Process
- Optimization Studies of Turbocharger for Producer Gas Engines
- Adaptation & Testing of Various Models and Make of Gas Engines
- Oxygen Gasification

Address
CGPL
Indian Institute of Scienc,
Bangalore-560 012, India
Contact : Prof. P.J. Paul
Phone: +91-80-23600536
Fax: +91-80-22932338
Email: paul@cgpl.iisc.ernet.in
Site: cgpl.iisc.ernet.in

GP Green Energy Systems Pvt. Ltd.

Technology

GP gasification systems – Up-draft gasifiers with provision to inject steam

End-use

Electrical and Thermal applications

Product Range

- 50kW to 600 kW updraft gasifiers
- Larger capacity custom–built plants designed and installed as required by the customers.

Facilities

- R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

Grain Processing Industries (India) Pvt. Ltd. (GPI) private limited company was established in 1967. GPI entered into the field of renewable energy in 1988. It took up the challenge to generate energy from biomass by adopting the up-draft gasification technology under the brand name of 'GP' Gasification Plant.

The technology and basic engineering package for biomass gasification was supplied to GPI in 1988 by an expert who worked for large overseas companies having vast experience on gasification. With continuous R&D, GPI has always been upgrading its systems for various innovative applications with consistent performance. Performance of GP systems are tested by the renowned institutions like, Indian Institute of Technology, Central Fuel Research Institute etc.

With expanding market and enormous scope of work, GPI felt the necessity of a separate company which would focus and concentrate its activities only in the field of energy. Therefore, in 2006 GP Green Energy Systems Pvt. Ltd was formed. GP Energy installs complete energy solutions on a turn–key basis. GP Energy works with a strong dedicated team of qualified engineers and operators, who are responsible for designing, manufacturing, marketing, quality control, installation and servicing of the GP Gasification System.

GP Energy designs tailor-made solutions for individual clients, manufactures the entire gasification plants, fabricates the structures, incorporates all electrical and electronic items, puts up and paints the plants (on foundations provided by the customers), commissions the plants, trains the customer's personnel and ensures the achievement of the desired results. The company accepts responsibility for the entire operation & maintenance of the plant on a contract basis, for the capacities of 1MW and above. The plant remains under warrantee for a period of one year from the date of commissioning. On expiry of the warrantee period GP Energy undertakes Annual Maintenance Contract (AMC), when engineers are sent four times in a year, (once in three months) for routine inspection and maintenance of the plant. Technicians are also sent in case of any emergency, as many times as necessary. The company has already installed about 100 systems for various industrial applications. It is also regularly exporting to Nepal, Thailand, Guyana (South America).

Salient Features of GP Gasifiers

- Low cost energy: The capital investments as well as the cost for generation of energy are very low compared to any other system.
- High Calorific Value of the gas with consistent quality: The system is designed to produce a gas having heat value in the order of 1200 – 1300 Kcal / Nm3, which is higher by 20 - 25 % compared to other down-draft systems available in the market. As a result, higher heat value can be achieved consistently against lower consumption of feedstock.
- Continuous Operation: It is designed for continuous operation of 24 hours a day and up to 350 days in a year. On-line stand-by for all mechanical items like blower, motor, pump etc. is provided for this purpose.
- High Flexibility: It is a multi-fuel system, which can beside rice husk, also run with wood blocks, saw dust, wood bark, sun flower seed husk, ground nut shell, coconut shell etc. without any modification of the system.
- Unique Gas Cleaning System: It is coupled with unique gas cleaning and cooling system (Patent applied for) to ensure tar and particulate concentration

in gas not exceeding 10 mg/ Nm3.

- Economic viability: Recovery of the capital investment is very interesting. In some cases, it might be even less than one year, depending on the specific site condition.

Case Studies

- Electrical power, boiler firing, hot air generation for dryer -entire energy for a rice mill, Bijoy Lakshmi Rice Mill, Midnapore, West Bengal with a capacity of 500 kW.
- Selling of power to the third party using national grid, Harsha Power Projects (P) Ltd, Hyderabad with a capacity of 1000 kW.
- Electrical power for captive use in a rice mill for the past five years without having any grid connection, Mohor Rice Mill, Burdwan, West Bengal having capacity of 500 kW.
- Repeat orders from seven domestic and overseas clients including from MNC, like Dabur Limited.
- Numbers of installations are operating in Biscuit industry, steel reheating furnaces, galvanising bath in zinc coating industry, for boiler burner application, ceramic industry etc. for thermal application.

Looking Ahead

The company is looking to get into the business of total energy solution for the industries by selling of mechanical/electrical power and gas for thermal applications.

Address
GP Energy Systems Pvt. Ltd.
BH-114, Salt Lake
Kolkata – 700091, India
Phone: +91-33-23210809
Fax: +91-33-23580114
Email: info@gpenergy.net
Site: www.gpenergy.net

Infinite Energy Pvt. Ltd.

Technology

: Infinite Vergassen include updraft and downdraft, & Entrained Flow

End-use

Electrical and Thermal applications

Product Range

- 7.5 kW – 220 kW (Power generation)
- 150 kWth -2000 kWth (Thermal Application)

Facilities

- Extensive R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

INFINITE Energy (P) Ltd., is one of the leaders in biomass conversion & processing technology in India. Since inception, the company's focus has been to develop better technologies and products to process biomass for energy. It has indigenously designed and developed various systems for biomass gasification, biomass pyrolysis, biomass briquetting and biomass drying.

Initially the gasifiers were solely used in thermal applications with fully automatic burners. The past five years have seen a large development in manufacturing and promoting gasifiers for the use of power generation as well.

The engineers and designers work in tandem to device products in accordance to the exact customer specifications. It is their commitment to customers business that drives their efforts towards creating advances in technology through innovation.

Salient Features of Infinite Gasifiers

Dry Gas System

The Infinite Vergassen design is incorporates a completely dry gas generation, handling & distribution system as scrubbing the gas with water is not necessary. Thus, there is no sticky "tar" and tar contaminated effluents to be handled / disposed.

Hot Gas Filter System

The Infinite Vergassen incorporates a unique hot gas fine filtration system (optional), a first of its kind, which can clean hot gases (temperatures upto 600^{O} C). The dry gas filtration has an efficiency of over 96% for particulates over 10 micron size. It can typically produce a clean gas with less than 80 micrograms per m3 of particulate matter.

Compact foot print

The Infinite Vergassen series is an extremely compact gasifier. A typical 600 kWth system complete with reactor, gas cleaning & handling system would occupy a space of only 20ft x 20ft (Excluding fuel storage). The system design is such that the support structure and access platforms and ladders are integrated. The reactor does not require any foundation. So, only site preparation and light civil work (flat concrete flooring and approx.15 cu.ft foundation for blower) would be required.

Wide Range of Fully Automatic Burners to suit any application

We have a wide range of burners which are specially designed for specific applications. Each type of burner is designed so as to meet the requirement of flame profile, flame temperature and other furnace characteristics.

We also have in our range, fully automatic producer gas burners for use in applications such as baking ovens, POP kilns, hot air generators etc. where temperature control is critical. The automatic burners are fully loaded with safety features and interlocks to have reliable, safe and completely automated operation.

Quick Start and Shutdown

The Infinite Vergassen series has extremely quick start capability and reach 75% of its capacity with 30 mins of cold start and 15 minutes of restart (within 12 hours of shut down). Typically the shutdown time is lees than 15 minutes.

- The gasifiers have multi-fuel capabilities and both powder and liquid biomass can be used.

Case Studies

- Food Industries like Biscuit , Bread, Namkeen, Sesame Seed,
- NTPC power sector

Looking Ahead

1. The company is looking to develop a multi-fuel system based gasifier for water pumping & lighting in agriculture field for Farmers.
2. The company is developing a powdery biomass based gasifier , where all type of biomass (in powder form) an be used

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Email: infinitenergy@vsnl.net
Site: www.infiniteenergyindia.com

NETPRO Renewable Energy (India) Pvt. Ltd

Technology
NETPRO gasification system - down draft gasifier

End-uses
Electrical and Thermal applications

Product Range
1 kW to 1500 kW depending on customer requirement.

Facilities
- R&D;
- Manufacturing;
- Marketing/Sales
- O&M Servicing
- Monitoring and Evaluation
- Project Development Service

Profile
NETPRO Renewable Energy (India) Pvt. Ltd., is a leading supplier of biomass gasification systems for both electrical power generation and thermal applications. The company has built many gasifier plants of different capacities for rural, industrial and urban projects. NETPRO was established in the year 1994, promoted by Dasag Energy Engineering Ltd, Switzerland.

NETPRO, who are on their own now, started out as an IISc licensee, manufacturing and selling biomass gasifiers. With the backing of Dasag Switzerland and its technically adept sister company, DESI power, NETPRO started designing small scale biomass gasification systems for electrical application. Together with DESI Power, the company has built and operated power plants over thousands of hours working towards overall improvements in reliability, performance and economics.

NETPRO's first plant of 100 kWe in DF mode was commissioned during 1996 at Orchha. The plant has completed more than 35,000 hrs of operation and is perhaps globally the longest running biomass gasifier power plant. In 2004, a 100% gas engine of 50kWe was tested over long duration and then installed at this site. The debugging of pure gas engine plants for reliablity has continued over the years with the help of engine suppliers and has now reached a status where continuous commercial operation in pure gas mode can be assured. Evolving since inception, the company now covers a wide range of services including:

- Complete plant design, fabrication and supply of gasifier island including gas cooling & cleaning system, water treatment plant and waste heat utilisation systems

- Interface engineering for all civil works and assistance for purchasing engine alternator unit, power evacuation system and automation
- Supervision during construction
- Commissioning and O&M support
- Design and training for biomass management system.
- Training of operators and O&M support services.
- Supporting the customer in project development and power plant engineering.

Overall, NETPRO aims to make new and renewable energy technologies commercially viable and contribute towards faster changeover from dependence on fossil fuels.

Salient Features of NETPRO Gasifiers

NETPRO designs the plants for long life and long hours of annual operation with low maintenance. Furthermore, the company stresses on stringent quality norms on all aspects. NETPRO additionally provides solutions for Combined Heat and Power schemes through overall system engineering and technical assistance for procurement of various sub-systems for Waste Heat Recovery.

Case Studies

- The first power plant at Orchha is in operation for over 14 years and bears a testimony for the long life of the gasification system supplied by NETPRO.
- Power plant at MVIT College, Bangalore operated round the clock and crossed over 20000 hrs of operation in 3 years
- Village plant at Baharbari village of DESI Power is being operated and managed by the local youths trained by NETPRO/DESI Power. After success of Baharbari project, DESI Power has launched a 100-Village program, where 100 gasifier plants of 75/120 kWe range with gas engine are being be setup.
- DESI Power has already setup 3 power plants out of 100-Village projects and NETPRO has supplied the systems.
- Supplied a fully automated plant of 350/400 kWe capacity in Switzerland through Dasagren which meets all European standards. The gasifier plant is skid mounted and is in regular operation with a pure gas engine.
- NETPRO has supplied and commissioned 3 grid connected power plants in the range of 100kWe to 240kWe in Karnataka.
- Presently involved in commissioning of a 1.5 MWe electrical power plant using German gas engine near Calcutta. The waste heat of the engines will be used in a VAM for air-conditioning purpose.

Looking Ahead

Having built many projects successfully in India and abroad, the focus is on:

- Small, stand-alone plants for village applications.
- Larger (250 – 500 kW) plants for supplying local grids which suffer from lack of power supply.
- 1-2 MW gird connected end-of-the-line plants to stabilise the 11kV network and thus improve grid reliability and reduce line losses.
- 1-2 MW co-generation plants.
- Export of power plants.

Address
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75kWe Gasifier plant 100% gas engine at DESI Power site - Supplied by NETPRO

Radhe Renewable Energy Development Pvt. Ltd

Technology
Updraft gasification

End-uses
Electrical and Thermal applications

Product Range
500 kW – 3000 kW

Facilities
- R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile
Radhe Renewable Energy Development Pvt. Ltd. is a flagship company of Radhe Group of Energy founded in 1998 with headquarter in Rajkot, Gujarat, India. The company engaged in development, designing, supplying, installing and serving turnkey energy projects that integrate seamlessly with our customers' operations. RREDPL has an In-house R&D Centre recognized by Government of India which is developing new applications that will continue to increase the value of the customer's. the biomass gasifiers developed in the company are applicable to both electrical and thermal end uses.

Salient Features of Radhe Gasifiers
- Acceptability of range of carboneous material
- Flexibility in terms of raw material availability at various periods of the year with changes in atmospheric & market position.
- No emission of air from the Gasifier Environmentally friendly equipment, which produces cleaner energy thus permitting is simplified & lower cost of operation.
- Flexibility in operation capacity The feature offers optimum capacity of utilization on variation of requirements.
- Low temperature & pressure during operation Result is lower capital cost as well as operation cost.
- Automatic changing & ash removal system (Optional) Equipment operates with accuracy & reduces the cost of operation.
- Replaces fossil fuel Environment friendly equipment helpful in reduction of

pollutant emission. Also offer the saving of redundant fossil fuel which again reduces import bill for nation.

- Robust construction & simple operation Maximum continuous operation & minimum shutdown time.

Case Studies

- Kaveri Ceramics – Morbi – Tunnel Kiln
- Sanvijay Rolling Mills & Industries Ltd. – Nagpur

Looking Ahead

The R&D Center is furthering research in latest technology including:

- Solid Fuel to Liquid
- Fluidized Bed gasifier
- Algae to Liquid Fuel
- Efficient Dryers
- Other Renewable Technology

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Rishipooja Energy and Engineering Company

Technology

URJA throat-less biomass duel fuel gasifier – updraft and downdraft

- Downdraft gasifier (10–300kg/hr)
- Updraft gasifier: Natural draft mode (5–20kg/hr)and Forced draft mode (5–100kg/hr)

End-uses

Electrical and Thermal applications

Product Range

10 kW to 500 kW

Facilities

- Extensive R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

RishiPooja Energy & Engineering Company was formed by a group of highly experienced, dedicated engineers and technocrats. The company is committed to developing renewable energy systems to provide a cheap and clean source of electrical and thermal energy especially to small and medium scale industries. The company has established a solid reputation for design, manufacturing and servicing in a short span of time.

The technology and basic design/drawing has been developed based on continuous R&D both in-house and using field trials and technical assistance from various consultants and technocrats. The following types of gasifiers are currently being manufactured by the company:

Critically, while designing and manufacturing all necessary care has been taken to avoid any operational hazards. This is keeping in mind that the plant may be operated by comparatively less educated workers.

Salient Features of Rishipooja Gasifers

- Patented design
- Multi-fuel capability which can accommodate pruned lops and tops of trees, rubber wood, gliricidia; Wood wastes from timber harvesting and saw mill

operations; Coconut shells, areca nut shells, cashewnut shells, agri stalk, lantana; Briquettes of agricultural residue and sawdust

- Better conversion (solid to gas) efficiency (>75%)
- Better control on burning
- Production of clean flue gases in the exhaust
- Can be tailor-made for a range of output ratings and used for variety of applications such as thermal applications to meet process heat requirement, power application for rural electrification and captive use
- Substantial reduction in diesel/kerosene/furnace oil cost (3–4 kg of biomass can replace 1 litre of petroleum fuel)
- Use of castable insulation material in the fire box capable of withstanding high temperatures (upto 1860 C).

Case Studies

- 100 kWe power gasifier (dual fuel mode), Thailand
- 10 kWe power gasifier (100% gas mode), India
- 150 kWe power gasifier (100% gas mode), Sri Lanka

Looking Ahead

The company has a vision to further diversify its activities in the field of Bio-diesel and other Liquid Gaseous fuels from agro-waste. Biomass Gasifier based improved Stoves etc in association with National / International agencies. For International activities the Company has established a liaison office in Pittsburgh City of United States of America.

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The Energy and Research Institute (TERI)

Technology

Closed top, downdraft throat-less gasifier

End-uses

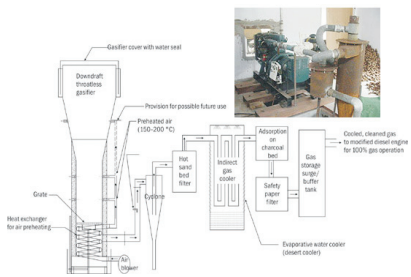
Electrical and Thermal applications

Product Range

3 kW to 100 kW

Facilities

- R&D
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation



Profile

TERI was formally established in 1974 with an aim to work towards issues concerning global sustainable development. Among a large gamut of topics covered by TERI, biotechnology and bio-resources are of relevance.

Over the years TERI has established itself as a leading biotechnology developer and supplier. The institute however does not manufacture the systems itself

TERI's biomass gasifier system optimally utilizes biomass for power generation. It consists of a downdraft gasifier, a gas-cleaning train, and an engine. The technological innovation provided users with the option of dual-fuel operation. The existing diesel genset could run on both diesel and producer gas, instead of running only on diesel. The producer gas is fed into the diesel engine to let the engine operate in a dual-fuel mode, thereby reducing diesel consumption by more than 70%.

TERI has a product range for both thermal and electrical applications. The institute has developed industry-specific end-use systems for use with TERI gasifiers

Salient features of TERI Gasifiers

- TERI's gasifier system comprises a downdraft throat-less gasifier. The design makes for smooth fuel movement, with the gasifier allowing comparatively larger pieces of wood or fuel briquettes
- It has multi-fuel capability and end-use flexibility. Fuelwood or briquettes produced from agricultural residues can be used in this gasifier.
- Water seal arrangement with continuous grate-shaking mechanism simplifies ash and char removal without shutting down the system, thus enabling long uninterrupted operation.

- Entry of preheated air at two levels helps obtain good quality gas, with low impurities in raw gas. This also reduces the load on the gas-cleaning system.
- Induction of a cooling tower minimizes water requirement for gas cleaning and also reduces the quantities of tar-laden water to be disposed of.

Case Studies

- 50 kWe Biomass gasifier dual fuel System in Uttaranchal
- 40 kWe duel fuel power plant at TERI's Gual Pahari campus
- 50kWe 100% producer gas system in Guwahati
- 100kWe 100% producer gas system in Yamunagar, Haryana
- 10 kWe 100% producer village electrification system in Deodhara, Orissa

Looking Ahead

TERI has a number of plans for further optimising biomass gasification systems in India. Plans include advancing R&D in:

- Optimization of engine performance, reduction of CO emissions and for rugged speed control. Servicing of engines and gasifier systems is a major cost item at present
- Reducing tars in raw gas substantially (e.g. through two-stage gasification) for reducing costs both for engine maintenance and for gas cleaning
- Treating gas cleaning wastewater and for providing value added products (e.g. low cost membranes from biomass ash)
- Bringing about the social mobilization needed for running rural power plants sustainably.

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Southern Carbons (P) Ltd

Technology

Updraft and downdraft gasifiers

End-use

Thermal applications

Product Range

- Universal Gasifier (with coolers)
- Universal Gasifier (without coolers)
- Coconut Gasifier (with and without coolers)

Size of the gasifiers depends on the application and its need

Facilities

- R&D
- Manufacturing
- Marketing/Sales
- O&M/Servicing
- Monitoring and Evaluation

Profile

Southern Carbons (P) Ltd (SCPL) is a Privately Managed Enterprise, led by Mr. K. J. Haris – an eminent Mechanical Engineer who has got around 40 years experience in various engineering fields. It is mainly engaged in Research and Development, Design, manufacture, Sales and Services of Biomass Gasifiers and optimum utilization of producer gas in various applications.

Technology used by Southern Carbons (P) Ltd for gasification is a technology, developed by Mr. K. J. Haris without any assistance from any premier institutions or other establishments in India or Abroad. Few of the technologies used by SCPL are being patented.

Most of the gasifiers are tailor made depending upon the end application and the mode of operation. Southern Carbons (P) Ltd manufactures gasifiers from the rating of 2 lakh K.Cals/hour onwards. The company specializes in both up draught and down draught gasifiers. The up draught gasifiers are used for thermal application and down draught gasifiers are mainly used for power generation.

Salient Features of the Gasifiers

- Pre-drying of biomass to reduce the moisture level is not required as compared to other gasifiers in the market.
- Efficiency of gasification is around 75% to 80%.

- SCL gasifiers consume coconut hemispheres without crushing which makes this process so simple and more efficient.
- SCL gasifier is the only one in which any biomass can be gasified without modifications.
- Cooling and cleaning systems in a SCL gasifier are simple and cost effective.
- Metallurgy specifications adapted in SCL gasifiers are unique.
- SCL has given special priorities on safety of the people and the surroundings thus using only the advanced electro-pneumatic safety gadgets in our gasifiers.
- Moving grate for discharge of ash/charcoal is with a timer for different biomass inputs. This can also be used as a carbonizer unit to produce fine quality charcoal.
- SCL gasifier is with a dual burner that provides required amount of heat independently or in tandem. This ensures uninterrupted supply of heat energy and prevents production loss.
- The biomass charger, an attachment in the gasifier efficiently recharges the biomass and eliminates extra labour.

Case Studies

- AVT Natural Products Ltd.
- Sud- Chemie (India) Pvt Ltd, Cochin

Looking Ahead

N/A

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Producer gas replacing LPG in a food industry.

List of Institutions and Activities

Name of Institution	Supply Chain Activities					
	R & D	Manufacturing	Marketing /sales	Project Development	Operations & Maintenance	Monitoring & Evaluation
Ankur Scientific Energy	✓	✓	✓		✓	
Associated Engineering Works	✓	✓	✓	-	✓	✓
Chanderpur Works Pvt. Ltd.	✓	✓	✓	-	✓	✓
Cosmo Powertech	✓	✓	✓	-	✓	✓
Combustion Gasification Propulsion Lab (CGPL)	✓	-	✓	✓	✓	✓
Grain Processing Pvt. Ltd.,	✓	✓	✓	-	✓	✓
Infinite Energy Pvt. Ltd.	✓	✓	✓	-	✓	✓
NETPRO Renewable Energy (India) Pvt. Ltd	✓	✓	✓	✓	✓	✓
Radhe Renewable Pvt. Ltd	✓	✓	✓	-	✓	✓
Rishipooja Energy and Engineering Company	✓	✓	✓	-	✓	✓
The Energy Resources Institute (TERI)	✓	✓	-	✓	-	-
Southern Carbons (P) Ltd	✓	✓	✓	-	✓	✓