

# INVENTORY OF EXISTING TECHNOLOGIES ON BIOMASS GASIFICATION

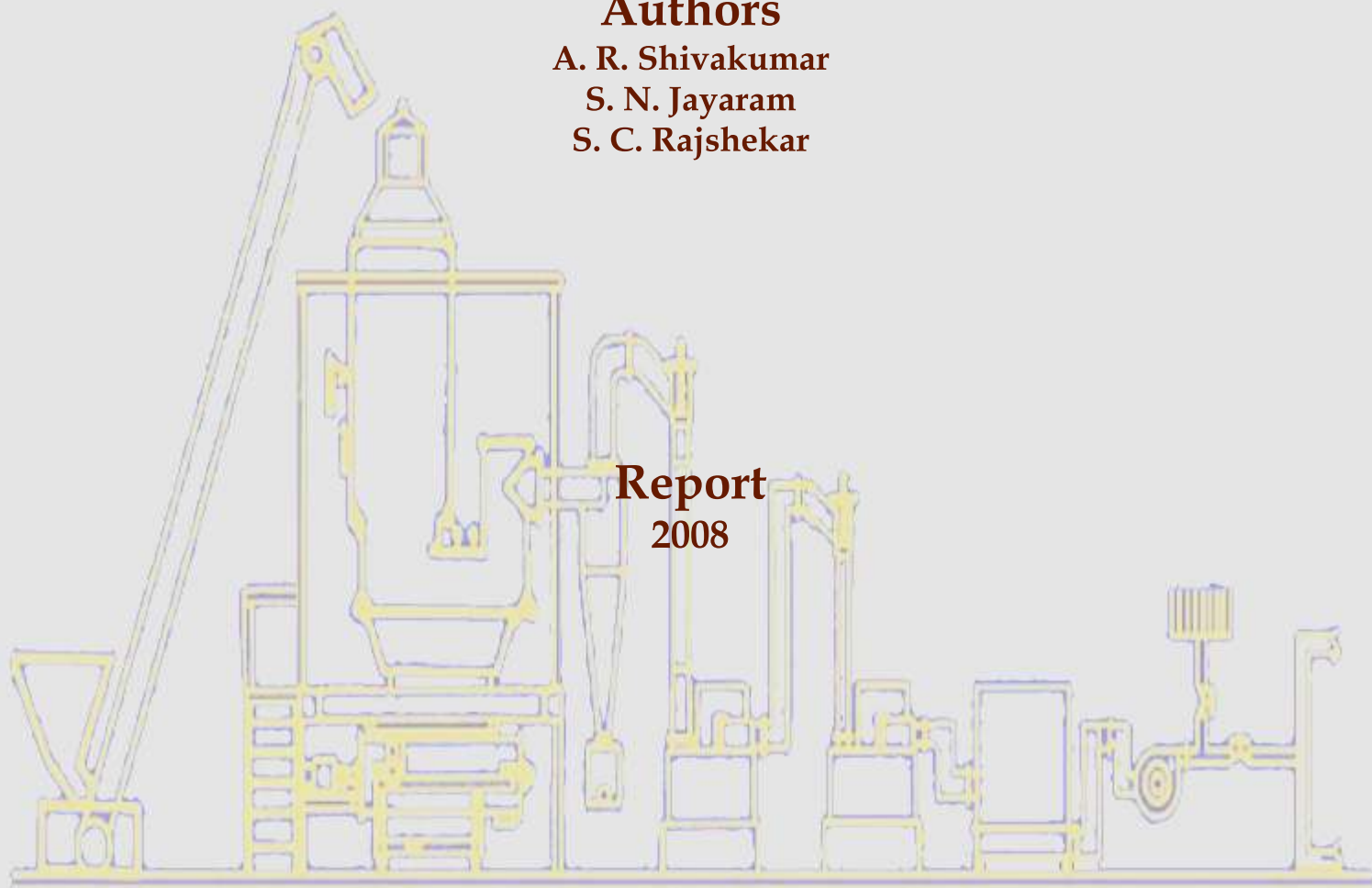
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# INVENTORY OF EXISTING TECHNOLOGIES ON BIOMASS GASIFICATION IN INDIA

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Sponsored by:

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Government of India, New Delhi

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## Foreword

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Rising fuel costs and climatic changes are making planners, policy makers to think about “alternative” scenario where power is produced locally from sun, water, e-waste, wind including biomass and utilized locally. Of these alternative sources of power, interest in the use of Biomass is growing all over the world. Biomass continues to be the main fuel for primary energy generation in India. It is used to produce both thermal and/or electrical energy either by direct combustion or by gasification.

Gasifiers come in many designs and there are many routes for gasification. At the request of DSIR, KSCST conducted the inventory of existing technologies in India for gasification of Biomass. This report provides description of Biomass gasification technologies that exists in India. The report also contains information about developers and suppliers of equipments for biomass gasification in India.

I hope this report will be useful to planners, decision makers and researchers in using Biomass gasification technologies.

I congratulate my colleagues Mr. A. R. Shivakumar and Mr. S.N. Jayaram in preparing this report.

**Prof. M.K. Surappa**

Secretary

Karnataka State Council for Science & Technology

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## 1.0 Background

Energy is the single most critical component that expedites the pace of growth and development and facilitates improvement in the quality of life for the rural masses. Decentralized Power Projects, which provide electrical energy to the households and thermal energy to institutions and industry, is, therefore, a significant step towards facilitating a better quality of life and development in the rural areas. Recognizing the energy needs of the rural population, the Central and State Governments have launched several programmes on non-conventional and renewable energy sources.

Power plays a crucial role in the economic development process. Nations try to ensure affordable and reliable electricity supply to its people. Strategies and policies are planned to design power projects based on the needs of the people and resources available.

The government has been working to take the electrical grid to the remote areas of the country. Yet, this is a slow process. Many households in the rural sector are not linked to the grid power, and in places where they are, the supply of grid electricity is often unpredictable. A large populace continues to depend upon kerosene and firewood for their energy needs.

There is a need to balance the increasing demands for the electricity while simultaneously avoiding the adverse impacts on the environment. Decentralized power projects, which do not cause major adverse effects on the environment and yet meet the power needs of small communities in rural areas can be one of the alternatives. Designed to be independent, reliable, user friendly and cost effective as compared to the long grid lines, decentralized power projects have many advantages.

Today the world thrives on power. Energy or power in its various forms permeates the modern society; urban and rural alike. However, while the uses that energy can be put to are endless, the conventional sources of energy are finite. There is a need to explore other sources of energy that are more sustainable and would complement or even supplement the existing sources.

One of the non-conventional sources of energy is bioresidue or biomass that is available mainly as a by-product of crop production, agro processing or the wood industry. Today, energy generated from biomass sources accounts for 12% of the energy consumed at a global level<sup>1</sup>, 3-5 % among the industrialized countries<sup>2</sup>, and 18-49% in developing countries. In India, it is estimated that biomass meets about 32% of the total energy needs<sup>3</sup>. Besides being the most commonly used fuel in the household sector, it is also extensively consumed in rural industries, such as brick and limekilns and roadside restaurants in rural areas as well as towns.

Biomass utilisation in India is characterised by a low efficiency of utilisation, drudgery associated with its collection and use, and negative environmental effects. India generates over 500 million tonnes of biomass every year<sup>4</sup>. In addition to the direct harvesting of biomass from plants, biomass is also produced as a by-product in many industries. Rice husk from rice mills, saw-dust from saw mills, sugarcane trash and leaves from sugar industries, coir pith, and groundnut shells from oil mills are some such sources of biomass. It has been estimated that in addition to the present usage as fuel in the domestic sector, India has a potential of about 16000 MW of power generation capacity from biomass sources<sup>5</sup>, excluding through cogeneration.

Of these technologies, biomass gasification is ideally suited for thermal energy applications replacing fossil fuels such as diesel and furnace oil. Further, it is also ideally suited for decentralized electricity generation from a capacity as low as 10kW to more than a MW. Indeed, although among the technologies available for using biomass for producing electricity, gasification is relatively new, its potential for meeting the growing needs of electricity in our country is enormous.

Since the early 1990's the Government of India through the Ministry for Non-conventional and Renewable Energy (MNRE) has been supporting research and development of biomass gasification technology in the country. It has

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<sup>1</sup> IEA Bioenergy ExCo:2007:02 "Potential Contribution of Bioenergy to the World's Future Energy Demand.

<sup>2</sup> International Conference for Renewable Energies, Bonn, Thematic Background Paper, 2004. <sup>3</sup> Ministry for New and Renewable Energy: Booklet on Biomass (mnes.nic.in) <sup>4</sup>Ibid <sup>5</sup>Ibid

supported 4 Action Research Centres (ARCs) to catalyze and coordinate R&D in various areas.

The areas of specialization of various ARCs are:

- Indian Institute of Technology, Delhi. (i) biomass characterization, and (ii) development of process technology packages.
- Indian Institute of Technology, 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.
- Indian Institute of Science, Bangalore. (i) basic research in biomass gasification for non woody biomass materials, and (ii) upgrading and upscaling wood based systems.
- Madurai Kamraj University. (i) Field evaluation and testing, (ii) monitoring revalidation and training, and (iii) development of application packages including implementation.

Today, the technology has come of age and there is growing interest among various Indian and multinational businesses to invest in this technology. This report is a compilation of information about developers and suppliers of biomass gasification equipment and packages in India and has been prepared for the Department of Scientific and Industrial Research, Government of India by the Karnataka State Council for Science and Technology, Bangalore.

## **2.0 Methodology**

Based on information available in the public domain, a list of biomass gasification technology developers and suppliers was prepared. A letter (See Annex 1) introducing the project and a format for collecting data was sent to all the organizations in the list. This was followed by a visit to their office/lab/factory (See Annex 2).

Information collected from these sources has been collated, compiled and presented in this report. Also accompanying this report is a portfolio of CDs provided by the various organizations contacted by KSCST.

## **3.0 Organization of the report**

The report is organized into the following sections:

- *Introduction to biomass gasification technology: This section presents information about biomass gasification technology in general.*
  - o *What is biomass and biomass gasification technology*
  - o *Types of biomass gasifiers*
  - o *Typical applications of biomass gasifiers*
- *Biomass gasification technology developers and suppliers: This section presents the following details for each developer/supplier of biomass gasification technology.*
  - o *Snap-shot of the developer /supplier*
  - o *Detailed information about each developer/supplier*
- *Introduction to the organization*
- *Type of biomass gasifiers*
- *Product description and range*
- *Key applications*
- *List of installations*
- *Case studies*

## 4.0 Introduction to biomass gasification technology

### 4.1 What is biomass?

Green plants capture solar energy and store it as chemical energy in the form of cell walls in the plants' stalks, stems and leaves and as oils or starch in the seed, fruits or roots. Both plants and the waste materials derived from them (such as sawdust, wood wastes, and agricultural wastes) are referred to as biomass. It chiefly contains cellulose, hemicellulose and lignin, with an average composition of  $C_6H_{10}O_5$ , with slight variations depending on the nature of the biomass.

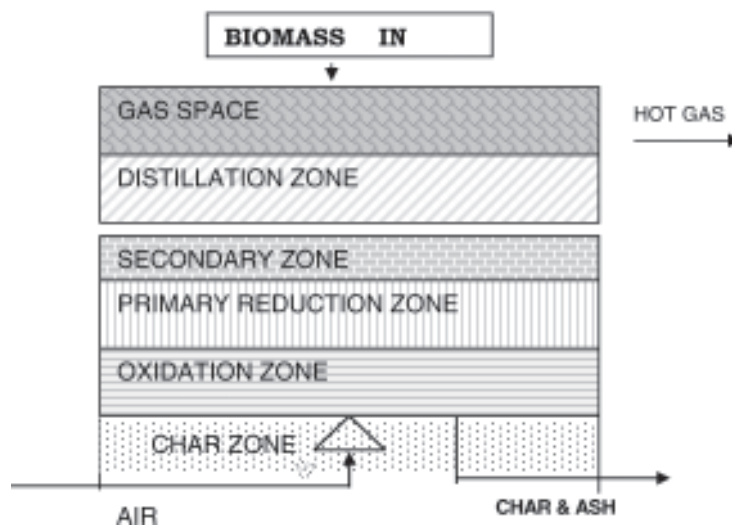
Unlike fossil fuels biomass does not add carbon dioxide to the atmosphere as it absorbs the same amount of carbon while growing. It is the cheapest, eco-friendly and renewable source of energy.

### 4.2 What is biomass gasification?

Biomass Gasification converts solid biomass into a more convenient gaseous form. The ratio of air-to-fuel required for complete combustion of biomass is 6:1 to 6.5:1, which defined as stoichiometric, combustion, the end products being  $CO_2$  and  $H_2O$ . In gasification, combustion is carried out at sub-stoichiometric conditions with air-to-fuel ratio being 1.5:1 to 1.8:1. The gas so obtained is called producer gas, which is combustible having a calorific value of 4.5-5.0 MJ/ $NM^3$ , with an average composition of  $CO$ : 20 +/- 1%;  $CH_4$ : 3 +/- 1%,  $H_2$ : 20 +/- 1%,  $CO_2$ : 12 +/- 1% and rest,  $N_2$ . This process is made possible in a device called gasifier<sup>6</sup>.

Gasification is a two-stage reaction consisting of oxidation and reduction processes. These processes occur under sub-stoichiometric conditions of air with biomass. The first part of sub-stoichiometric oxidation leads to the loss of volatiles from biomass and is exothermic; it results in peak temperatures of 1400 to 1500 K and generation of gaseous products like carbon monoxide, hydrogen in some proportions and carbon dioxide and water vapour which in turn are reduced in part to carbon monoxide and hydrogen by the hot bed of charcoal generated during the process of gasification. Reduction reaction is an endothermic reaction to generate combustible products like  $CO$ ,  $H_2$  and  $CH_4$ .

A number of chain chemical reactions are believed to go on inside a gasifier creating the following reactions zones:

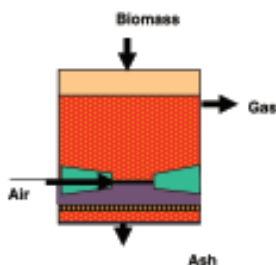


<sup>6</sup> Ministry for New and Renewable Energy: Booklet on Biomass (mnes.nic.in)

### 4.3 Types of gasifiers

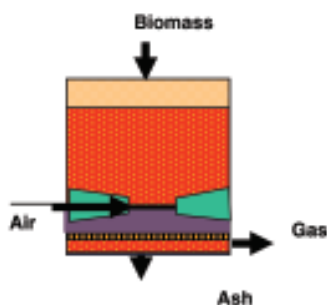
There are two major types of gasifiers, based on in which direction the producer gas moves within the gasifiers.

#### Updraft gasifier:



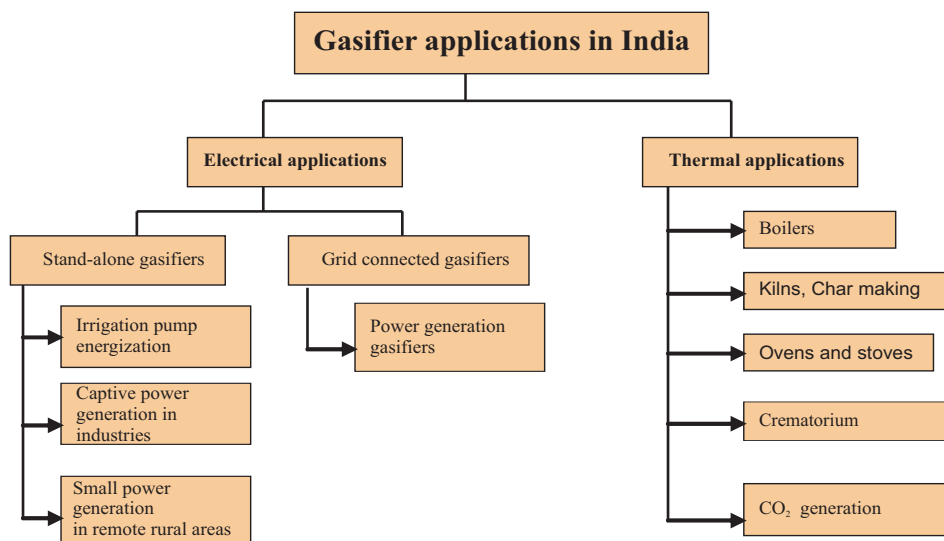
Here, the biomass moves down from the top of the gasifier while the gases released being light move up, resulting in a counter-current. The quality of producer gas obtained from the up-draft gasifier is fair since it has impurities like tar. However, this resultant producer gas has a higher capacity to generate heat on burning (due to the impurities) and can be used well for heat generation activities.

#### Downdraft gasifier:



Here the biomass moves down from the top of the gasifier and the resultant gas also moves downward – a co-current process. The gas quality is good though it generates less heat on burning. The gas released from such gasifiers is used mainly for electricity generation.

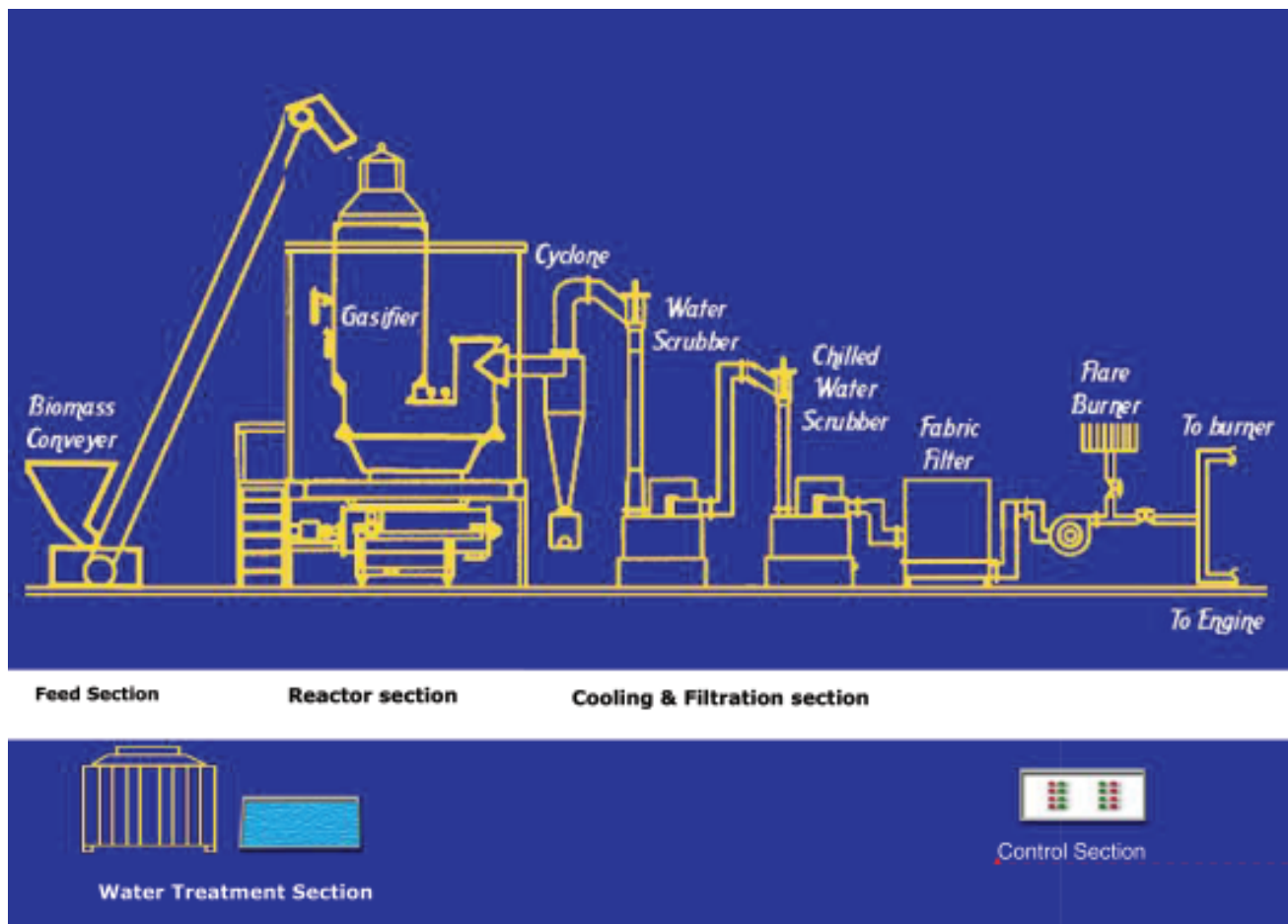
### 4.4 End-use applications of biomass gasifier





## 4.5 Typical components of a gasifier

A typical gasifier consists of a *biomass feeding mechanism*, the *gasifier reactor*, where the gasification takes place, a *cleaning & cooling train* to remove all particulate matter and tar and an *end-use system*, that could either be a furnace/kiln/oven/boiler if the application is *thermal* or an engine with an electricity generation system (now-a-days, the engine is usually a Gas engine) if the end-use is *generation of electricity*. To support the cleaning cooling train, a *water circulation and treatment system* is also provided.



## 5.0 Biomass gasification – R&D Institutions

A number of organizations in India are engaged in research and development of biomass gasification technologies. Some of them, such as the Indian Institute of Science (IISc.) and The Energy and Resources Institute (TERI) are by their mandate, research and development institutions. Many others are commercial organizations that have invested in research and development of biomass gasification technologies.

The following table gives a list of organization engaged in R&D in the field of biomass gasification in the country:

Sl. No.	Name of Institution	Address	Type of end-use
1	Associated Engineering Works, (AEW)	Gamini Compund, Main Road, Tanuku – 534211, Andhra Pradesh, INDIA +phone (91)8819-222950 & 223410, Fax +(91)8819-224801, Email: aewgamini@rediffmail.com	Thermal and electrical. Electrical running on both dual-fuel and gas engine
2	Ankur Scientific Energy Technologies Pvt. Ltd.	Ankur near Old Sama, Jakat Naka, Baroda 390 008Ph- 0265-2793098/ 2794021 Fax : 2794042 Website:www.ankurscientific.com, Email: info@ankurscientific.com	Thermal and electrical
3	Cosmo Powertech Pvt. Ltd.	Devpuri, Near Jain Public School, Dhamtari Road, Raipur 492015 Ph- 0771-4011262, Fax -0771-4010190	Thermal
4	Grain Processing Industries (India) Pvt. Ltd.,	# 29, Strand Road, Kolkatta 700 001. India Ph-091-33-22431639, 22101252 Email: grainpro@cal3.vsnl.net.in	<ul style="list-style-type: none"> <li>• Mainly thermal</li> <li>• Electrical also reported mainly dual-fuel</li> <li>• A few electrical re ported as under construction with 100% Gas engine</li> </ul>
5	Radhe Renewable Energy Development Pvt. Ltd	Plot No. 2621 /2622, Gate No. 1, Road D/2, Lodhika GIDC, Kalawad Road, Lodhika Taluk Rajkot District, Metoda Post 360 485, Gujarat Ph- 02827-287888/ 287289 Fax 02827-287887 Web site: www.radhegroup.com e-mail: info@radhegroup.com	Thermal
6	Southern Carbons (P) Ltd.,	Palackal Buildings, Premier Junction,Kalamassery, Cochin. Pincode: 683 104 Phone: 0091-484-2540158 Fax : 0091-484-2543739 E-mail : southcarb@gmail.com Website: southcarb.com	Thermal

*Inventory of existing technologies on biomass gasification in India*

7	The Energy & Resources Institute	Darbari Seth Block, Indian Habitat Centre, Lodhi Road, New Delhi 110 003 Tel: +91-11-24682100, 4150-4900 Email: mailbox@teri.res.in Website: www.teriin.org	Thermal & electrical, including on 100% Producer Gas Engine
8	ABETS at Combustion Gasification Propulsion Lab (CGPL),	Combustion Gasification & Propulsion Laboratory (CGPL) Department of Aerospace Engineering, Indian Institute of Science, Bangalore - 560 012, Karnataka, India Phone: +91-80-23600536, 22932338 Fax: 23601692 Website: www.cgpl.iisc.ernet.in, Email: gasification@cgpl.iisc.ernet.in	Thermal & electrical, including on 100% Producer Gas Engine
9	Rishipooja Energy & Engineering Company	M G College Road, Gorakhpur - 273001, Uttar Pradesh Telefax: 0551-220797 Mo:9415212901, 9415163792, Email: urjagen@hotmail.com, urjagen@rediffmail.com Website: www.urjagen.com	Thermal & electrical

## 6.0 Biomass gasification – Equipment Manufacturers

Excepting, the Indian Institute of Science (IISc.) and The Energy & Resources Institute (TERI), all other institutions that are listed in the above table are also manufacturers of biomass gasifiers themselves. In addition, several others, mostly, licensees of IISc. are also manufacturers of biomass gasifiers. The following table provides a list of biomass gasifier manufacturers in the country:

Sl. No.	Name of organisation	Address	Type of end-use
1	Associated Engineering Works, (AEW)	Gamini Compund, Main Road, Tanuku - 534211, Andhra Pradesh, INDIA +phone (91)8819-222950 & 223410, Fax +(91)8819-224801, Email: aewgamini@rediffmail.com	Thermal and electrical. Electrical running on both dual-fuel and gas engine
2	Ankur Scientific Energy Technologies Pvt. Ltd.	Ankur near Old Sama, Jakat Naka, Baroda- 390 008 Ph- 0265-2793098/ 2794021 Fax : 2794042 Website:www.ankurscientific.com, Email: info@ankurscientific.com	Thermal and electrical
3	Cosmo Powertech Pvt. Ltd.	Devpuri, Near Jain Public School, Dhamtari Road, Raipur 492015 Ph- 0771-4011262, Fax -0771-4010190	Thermal
4	Grain Processing Industries (India) Pvt. Ltd.,	# 29, Strand Road, Kolkatta 700 001. India Ph-091-33-22431639, 22101252 Email: grainpro@cal3.vsnl.net.in	Mainly thermal Electrical also reported mainly dual-fuel A few electrical reported as under construction with 100 % Gas engine
5	Radhe Renewable Energy Development Pvt. Ltd	Plot No. 2621 /2622, Gate No. 1, Road D/2, Lodhika GIDC, Kalawad Road, Lodhika Taluk Rajkot District, Metoda Post 360 485, Gujarat Ph- 02827-287888/ 287289 Fax 02827-287887 Web site: www.radhegroup.com e-mail: info@radhegroup.com	Thermal
6	Southern Carbons (P) Ltd.,	Palackal Buildings, Premier Junction, Kalamassery, Cochin. Pincode: 683 104 Phone: 0091-484-2540158 Fax :0091-484-2543739 E-mail : southcarb@gmail.com Website: southcarb.com	Thermal

*Inventory of existing technologies on biomass gasification in India*

7	Rishipooja Energy & Engineering Company	M G College Road, Gorakhpur - 273001, Uttar Pradesh Telefax: 0551-220797 Mo:9415212901, 9415163792, Email: urjagen@hotmail.com, urjagen@rediffmail.com Website: www.urjagen.com	Thermal & electrical
8	Netpro Renewable Energy (India) Pvt. Ltd.	No.4, 2nd Floor, Above Amanath Cooperative Bank 4th Main, KHM Block, R.T.Nagar Main Road, Bangalore - 32 Ph.:080- 41328160/23431346/23431348 Fax: 080 - 23431353 Web: www.netprorenewable.com Email: netpro1@vsnl.com	Thermal & electrical, including 100% producer gas engine
9	Energreen Power Ltd	# 6, Third Street, Nandanam Extension, Chennai-600035 Tel: 044-24321339, 24962663 Fax: 044-24321339 Email: energreenpower@lycos.com	Thermal & electrical, including 100% producer gas engine
10	Bioresidue Energy Technology Private Limited	S-2, Digvijay Apartment, 1 <sup>st</sup> Cross Ganesha Block, Sultanpalya, R.T. Nagar P.O. Bangalore 560 032 Tel. 080-23431533 Fax: 080-23534503 Email: betpl@sify.com	Thermal & electrical, including 100% producer gas engine
11	M/s Aruna Electricals Works Pvt. Ltd.,	Komgampattu, Rampakkam Post, Villupuram District, Pin - 605105. Tel: 0413-2699485 Fax: 2699547 Email: arunabiomass@rediffmail.com	Thermal & electrical, including 100% producer gas engine
12	Synergy Renewable Energy (P) Ltd.	"Trishul", Ground Floor 35 Rowland Road, Kolkata 700020 (W.B) Tel: 033-24745146, 24851362 Email: ranjitc@group-synergy.net	Thermal & electrical, including 100% producer gas engine
13	OVN BIO ENERGY PRIVATE LTD.	BT 1/90, Mangolpuri Industrial Area, Phase I Delhi - 110083 Tel: 011-27911596, 27911603 Fax: 010-27916379 Email: navinraheja@ovntep.com	Thermal & electrical, including 100% producer gas engine
14	Arrya Hi-tech Energy	76 Patel Road, Ram Nagar, Coimbatore 641009 Tel: 0422-2232897, 2236558 Fax: 0422-2233755 arrya_cbe@yahoo.co.in website: www.arrya.net	Thermal & electrical, including 100% producer gas engine
15	SunTechnics Energy Systems Pvt. Ltd.	660/1, 100 ft. Road, Indiranagar Bangalore 560 038 Tel: 080-25207191 Fax: 080-25207090 Email: r.bhat@SunTechnics.com	Thermal & electrical, including 100% producer gas engine



## 7.0 Biomass gasification technology suppliers

### 7.1 Associated Engineering Works (AEW)

Name	Associated Engineering Works, (AEW)
Contact	G. M. Satyanarayana
Address	Gamini Compound, Main Road, Tanuku - 534211, Andhra Pradesh, INDIA +phone (91)8819-222950 & 223410, Fax +(91) 8819-224801, Email: aewgamini@rediffmail.com
Technology developer / supplier	Developer, manufacturer and supplier
Type of gasifier	Downdraft with throat
Highlights of technology	Can use both powdery and woody biomass
	
	

Product range and models	Woody Biomass Based Thermal Gasifiers	GT-400/GT-600/GT-700
	Woody Biomass Based Electrical Gasifiers	GE-100/GE-350/GE-600
	Rice Husk Based Thermal Mode Gasifiers	GT-650H/GT-750H
	Rice Husk Based Electrical Mode Gasifiers	GE-600H
	Multipurpose Gasifiers	GE-100-MP
	Gasifier Based Crematorium	GT-600-CR
	Wood Chip Cutter	BC-350
	Coconut Shell Breaker	
	Gasifier Based Charcoal Producer	GT-600-CCM
	Gasifier Based Incinerator	GT-600-INC
Type of end-use	Thermal and electrical. Electrical running on both dual-fuel and gas engine	
Typical applications	<ul style="list-style-type: none"> <li>• Coconut drying</li> <li>• Dal roasting,</li> <li>• Calcinations furnace</li> <li>• Crematorium and cooking.</li> <li>• Paddy drying, Boilers</li> <li>• Refractory</li> <li>• Kilns</li> <li>• Evaporators,</li> <li>• Aluminum Melting</li> <li>• Glass melting</li> <li>• Tunnel furnaces</li> <li>• Ceramic industries</li> <li>• Incineration of industrial effluents,</li> <li>• Hot air generators industrial dryers etc.</li> <li>• A few electrical applications have also been reported</li> </ul>	
Case studies	Not available	

## 7.2 Ankur Scientific Energy Technologies Pvt. Ltd. (ASCENT)



Name	Ankur Scientific Energy Technologies Pvt. Ltd.
Contact	Dr. B C Jain
Address	Ankur near Old Sama, Jakat Naka, Baroda 390 008 Ph- 0265-2793098/ 2794021 Fax : 2794042 Website:www.ankurscientific.com, Email: info@ankurscientific.com
Technology developer / supplier	Developer, manufacturer and supplier
Type of gasifier	Downdraft with closed top
Highlights of technology	<ul style="list-style-type: none"> <li>• One of the few companies with an in-house R&amp;D.</li> <li>• Regional offices in Chennai, Kolkata and Indore and associates all over the country helps provide better after-sales service.</li> <li>• Very wide range of gasifier systems in terms of feedstocks that can be used.</li> <li>• We offer gasifiers that can work on multiple feedstocks also. This takes care of availability issues of biomass.</li> <li>• The gas from 'Ankur' gasifiers is extremely clean. This is partly because of our gasifier design and also because of our patented cooling and cleaning system.</li> <li>• Our gasifiers have a wide turn down ratio. They can easily run on 50% of rated output.</li> </ul>
	





<p>Product range and models</p>	<ul style="list-style-type: none"> <li>• WBG series - Uses woody biomass</li> <li>• FBG series - Uses powdery biomass such as rice husk</li> <li>• Combo series – Uses both powdery and woody biomass</li> </ul> <p>All these series are available for thermal and electrical applications (with gas engine also)</p>
<p>Type of end-use</p>	<ul style="list-style-type: none"> <li>• Thermal and Electrical</li> </ul>
<p>Typical applications</p>	<p>Thermal Applications</p> <ul style="list-style-type: none"> <li>• Hot air generators</li> <li>• Boilers</li> <li>• Thermic fluid heaters</li> <li>• Ovens</li> <li>• Furnaces and kilns</li> <li>• Dryers</li> </ul> <p>Electrical applications</p> <ul style="list-style-type: none"> <li>• Diesel gensets (here the diesel/F.O is replaced upto a maximum of 70-80%)</li> <li>• Natural gas gensets (these are modified to work on producer gas alone)</li> <li>• Micro turbines</li> </ul>
<p>Case studies</p>	<ul style="list-style-type: none"> <li>• Dal Drying - SS Industries, Jalagaon</li> <li>• Steel Tubes Annealing - Patson Industries</li> </ul>

### 7.3 Cosmo Powertech Pvt. Ltd.

Name	Cosmo Powertech Pvt. Ltd.
Contact	Mr. B V Ravi Kumar
Address	Devpuri, Near Jain Public School, Dhamtari Road, Raipur 492015 Ph- 0771-4011262, Fax -0771-4010190
Technology developer / supplier	Developer / manufacturer / supplier
Type of gasifier	<ul style="list-style-type: none"> <li>• Updraft • Downdraft</li> </ul>
Highlights of technology	<ul style="list-style-type: none"> <li>• Solid fuel to gas conversion efficiency of 70-85%</li> <li>• Offers choice of updraft or downdraft depending on application</li> </ul>
	



Product range and models	Updraft Multi-Fuel Gasifiers	
	Capacity Range	: 600-12000 kWh output (Equivalent to 50-1000 litre/hr oil substitution)
	Fuel	: Biomass or coal with ash content upto 28%
	Efficiency	: 75-85%
	Gas Calorific value	: 1100-1300 kcal/Nm <sup>3</sup> (4.6-5.4 MJ/Nm <sup>3</sup> )
	Downdraft Wood Gasifiers	
	Capacity Range	: 120-1500 kWh output (Equivalent to 10-125 liter /hr oil substitution)
	Fuel	: wood chips, biomass briquettes, wood like agro residues with ash content upto 5%
	Efficiency	: 70-75% Gas
	Calorific Value	: 1000-1200 kcal/Nm <sup>3</sup> (4.2-5.0 MJ/Nm <sup>3</sup> )
Type of end-use	<ul style="list-style-type: none"> <li>• Mainly thermal.</li> <li>• Substituting Petroleum based Fuels (FO / LDO / LPG / HSD) in Furnaces, Kilns, Boilers, etc</li> <li>• Reducing Stack Emissions from Solid Fuel firing</li> </ul>	
Typical applications	<ul style="list-style-type: none"> <li style="width: 50%;">• Steel re-rolling</li> <li style="width: 50%;">• Chemical</li> <li style="width: 50%;">• Steel wires</li> <li style="width: 50%;">• Ceramics</li> <li style="width: 50%;">• Refractories</li> <li style="width: 50%;">• Aluminium extrusion</li> <li style="width: 50%;">• Welding fluxes</li> <li style="width: 50%;">• CO<sub>2</sub> manufacturing</li> </ul>	
Case studies	Not available	

## 7.4 Grain Processing Industries (India) Pvt. Ltd. (GPI)

Name	Grain Processing Industries (India) Pvt. Ltd.,
Contact	Mr. N. D. Mukherjee
Address	# 29, Strand Road, Kolkatta 700 001. India Ph-091-33-22431639, 22101252 Email: grainpro@cal3.vsnl.net.in
Technology developer / supplier	Developer / manufacturer / supplier
Type of gasifier	Updraft gasifier with provision to inject steam
Highlights of technology	<ul style="list-style-type: none"> <li>• Continuous operations 24hrs/day for 350 days in a year</li> <li>• Multi-fuel ability, including same plant accepting powdery as well as woody biomass</li> <li>• Unique 10 stage gas cleaning system</li> </ul>
	
	
Product range and models	50kW to 500 kW, all updraft gasifiers with complete set of biomass feeding mechanism, cleaning system, etc.
Type of end-use	<ul style="list-style-type: none"> <li>• Mainly thermal</li> <li>• Electrical also reported mainly dual-fuel</li> <li>• A few electrical reported as under construction with 100% Gas engine</li> </ul>
Typical applications	<ul style="list-style-type: none"> <li>• Thermal • Electrical</li> <li>• Combined power and heat applications</li> </ul>
Case studies	Not available

## 7.5 Radhe Renewable Energy Development Pvt. Ltd (RREDL)

Name	Radhe Renewable Energy Development Pvt. Ltd															
Contact	Dr. S. V. Makadia															
Address	Plot No. 2621 / 2622, Gate No. 1, Road D/2, Lodhika GIDC, Kalawad Road, Lodhika Taluk Rajkot District, Metoda Post 360 485, Gujarat Ph- 02827-287888/ 287289 Fax 02827-287887 Web site: www.radhegroup.com e-mail: info@radhegroup.com															
Technology developer / supplier	Developer / Manufacturer / Supplier															
Type of gasifier	Updraft gasifiers, mainly for thermal use															
Highlights of technology	<p>Quantity of fuel required in gasifier to replace one liter of liquid fuel</p> <table> <tr> <td>Steam Coal B Grade</td> <td>2 - 2.50 kg</td> </tr> <tr> <td>Fuels Steam Coal C&amp;D Grade</td> <td>2.5 - 3 kg</td> </tr> <tr> <td>Steam coal imported</td> <td>1.75 - 2 kg</td> </tr> <tr> <td>Bio-coal / Briquette</td> <td>3 - 3.5 kg</td> </tr> <tr> <td>Wood coal / charcoa</td> <td>11.5 - 1.75 kg</td> </tr> <tr> <td>Wood</td> <td>3.5 - 4 kg</td> </tr> <tr> <td>Lignite</td> <td>3 - 4 kg</td> </tr> </table>		Steam Coal B Grade	2 - 2.50 kg	Fuels Steam Coal C&D Grade	2.5 - 3 kg	Steam coal imported	1.75 - 2 kg	Bio-coal / Briquette	3 - 3.5 kg	Wood coal / charcoa	11.5 - 1.75 kg	Wood	3.5 - 4 kg	Lignite	3 - 4 kg
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Lignite	3 - 4 kg															
<b>See CD for pictures, movies as well as process animation</b>																
Product range and models	<table> <tr> <td>Biomass briquetting plant</td> <td>750, 1000 and 1500 kg/hr</td> </tr> <tr> <td>Biomass updraft gasification plant</td> <td>10,00,000 to 60,00,000 kcal/hr</td> </tr> <tr> <td>Biomass fluidized bed gasifier/furnace</td> <td>10,00,000 to 1,00,000 kcal/hr</td> </tr> </table>		Biomass briquetting plant	750, 1000 and 1500 kg/hr	Biomass updraft gasification plant	10,00,000 to 60,00,000 kcal/hr	Biomass fluidized bed gasifier/furnace	10,00,000 to 1,00,000 kcal/hr								
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Biomass fluidized bed gasifier/furnace	10,00,000 to 1,00,000 kcal/hr															
Type of end-use	Mainly thermal only															
Typical applications	<ul style="list-style-type: none"> <li>• Ceramic biscuit kiln</li> <li>• Ceramic glaze kiln</li> <li>• Ceramic roller kiln for* Luster tiles</li> <li>• Porcelino tiles</li> <li>• Billet preheating kilns</li> <li>• Forgings pre-heating furnace</li> <li>• Aluminum / brass melting furnace</li> <li>• Calcination kiln - Rotary kiln</li> <li>• Hot air generator (direct / indirect)</li> <li>• Continuous lime kilns (VSK)</li> <li>• Refractory tunnel kiln</li> <li>• Annealing kilns</li> <li>• Various types of Dryers, Ovens and Furnaces</li> <li>• Ion ore kiln</li> <li>• Continuous heat treatment kiln</li> <li>• Sodium silicate furnace</li> <li>• Spray dryer</li> <li>• Glass kiln</li> <li>• Granito tiles</li> <li>• Vitrified tiles</li> <li>• Boiler</li> <li>• Cement kiln</li> <li>• Incinerator</li> </ul>															
Case studies	<ul style="list-style-type: none"> <li>• Kaveri Ceramics - Morbi - Tunnel Kiln</li> <li>• Sanvijay Rolling Mills &amp; Industries Ltd. - Nagpur</li> <li>• Billet Pre- heating Kiln</li> </ul>															





## 7.6 Southern Carbons (P) Ltd. (SCL)

Name	<b>Southern Carbons (P) Ltd.,</b>
Contact	Mr. K J Haris
Address	Palackal Buildings, Premier Junction, Kalamassery, Cochin. Pincode: 683 104 Phone: 0091-484-2540158 Fax :0091-484-2543739 E-mail : southcarb@gmail.com Website: southcarb.com
Technology developer / supplier	Developer / Manufacturer / Supplier
Type of gasifier	Updraft gasifier with and without coolers and biomass feeders
Highlights of technology	<ul style="list-style-type: none"> <li>• Pre-drying of biomass to reduce the moisture level is not required as compared to other gasifiers in the market.</li> <li>• Efficiency of gasification is around 75% to 80%.</li> <li>• SCL gasifiers consume coconut hemispheres without crushing which makes this process so simple and more efficient.</li> <li>• SCL gasifier is the only one in which any biomass can be gasified without modifications.</li> <li>• Cooling and cleaning systems in a SCL gasifier are simple and cost effective.</li> <li>• Metallurgy specifications adapted in SCL gasifiers are unique.</li> <li>• 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.</li> <li>• 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.</li> <li>• 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.</li> <li>• The biomass charger, an attachment in the gasifier efficiently recharges the biomass and eliminates extra labour</li> </ul>
Product range and models	<ul style="list-style-type: none"> <li>• Universal Gasifier (with coolers)</li> <li>• Universal Gasifier ( without coolers)</li> <li>• Coconut Gasifier (with and without coolers)Size of the gasifiers depends on the application and its need</li> </ul>



	
<p>Type of end-use</p>	<p>Thermal only.</p>
<p>Typical applications</p>	<ul style="list-style-type: none"> <li>• Drying crumb rubber</li> <li>• Bakeries</li> <li>• Drying of chemicals</li> <li>• Drying of spices and flowers</li> </ul>
<p>Case studies</p>	<ul style="list-style-type: none"> <li>• AVT Natural Products</li> <li>• Eastern Condiments (P) Ltd.,</li> <li>• Palappillil Specified Block Rubbers (P) Ltd</li> </ul>

## 7.7 The Energy & Research Institute, TERI

Name	The Energy & Research Institute
Contact	Mr. Sunil Dhingra
Address	Darbari Seth Block, Indian Habitat Centre, Lodhi Road, New Delhi 110 003 Tel: +91-11-24682100, 4150-4900 Email: mailbox@teri.res.in Website: www.teriin.org
Technology developer / supplier	Technology developer and supplier. Does not manufacture the systems itself
Type of gasifier	Closed top, downdraft throat-less gasifier
Highlights of technology	<ul style="list-style-type: none"> <li>• Has a product range for both thermal and electrical applications</li> <li>• Has developed industry-specific end-use systems for use with TERI gasifiers</li> </ul>
	
	
Product range and models	From 3 kWe to 100 kWe
Type of end-use	Thermal and electrical (dual-fuel and 100% gas engine)
Typical applications	<ul style="list-style-type: none"> <li>• Electricity generation for small communities</li> <li>• Thermal applications in silk reeling, namkeen industry, Magnesium Chloride production, cardamom drying etc.</li> </ul>
Case studies	Not available



## 7.8 Advanced Bio-residues Energy Technologies Society, ABETS

Name	ABETS at Combustion Gasification Propulsion Lab (CGPL),
Contact	Prof. P J Paul
Address	Combustion Gasification & Propulsion Laboratory (CGPL) Department of Aerospace Engineering, Indian Institute of Science, Bangalore - 560 012, Phone: +91-80-23600536, 22932338 Fax: 23601692 www.cgpl.iisc.ernet.in, Email: gasification@cgpl.iisc.ernet.in
Technology developer / supplier	<ul style="list-style-type: none"> <li>• One of the Action Research Centres set up by the MNRE to undertake research in developing and upscaling woody and non-woody biomass gasifiers.</li> <li>• It has several licensees who have paid a fee and acquired the technology from CGPL.</li> <li>• List of licensees is given in the next section</li> </ul>
Type of gasifier	Open top re-burn down draft gasifier
Highlights of technology	<ul style="list-style-type: none"> <li>• Open top, twin air entry, re-burn gasifier</li> <li>• Longer residence time in the reduction zone at higher temperatures results in the cracking of higher molecular weight products, leading to a gas that is very clean and low on tar</li> <li>• Gasification efficiency is in the range of 75-85%</li> <li>• The patented clean system is capable of reducing the particulate matter from 1000 mg/Nm<sup>3</sup> to just 5 mg/Nm<sup>3</sup></li> <li>• The gas can be used for thermal and electrical applications including 100% Gas engines.</li> </ul>
No pictures available for ABETS / CGPL, see for their licensees	
Product range and models	From 5 kWe to 1.2 MWe in electrical range and equivalent range in thermal applications
Type of end-use	Both thermal and electricity generation, including grid-connected versions
Typical applications	<ul style="list-style-type: none"> <li>• Thermal <ul style="list-style-type: none"> <li>o Dryers o Kilns o Furnaces o Boilers o Hot Air Generators</li> </ul> </li> <li>• Electricity generation <ul style="list-style-type: none"> <li>o Stand-alone o Grid-interactive o Captive power</li> </ul> </li> </ul>
Case studies	<ul style="list-style-type: none"> <li>• Arashi Hitech Biopower Ltd, Coimbatore</li> <li>• TANFAC Industries Ltd., Cuddalore</li> </ul>

## 7.9 IISc Gasifier Licensees

A list of all licensees of IISc Gasifier technology is given below. Details of the technology are not being provided since they are all licensed from ABETS, CGPL, IISc. However, a manufacturer-wise list of installations is provided in Annex 3.

1.	Mr. Aklavya Sharan Chief Executive Officer Netpro Renewable Energy (India) Pvt. Ltd. No.4, 2nd Floor, Above Amanath Cooperative Bank 4th Main, KHM Block, R.T.Nagar Main Road, Bangalore - 32	Ph.:080- 41328160/ 23431346 / 23431348 Fax: 080 - 23431353 Web: www.netprorenewable.com Email: netpro1@vsnl.com
2.	Mr. T.R. Krishnaswamy Energreen Power Ltd# 6, Third Street, Nandanam Extension, Chennai-600035	Tel: 044-24321339, 24962663 Fax: 044-24321339 Email: energreenpower@lycos.com
3.	Mr. Amar Kumar Bioresidue Energy Technology Private Limited S-2, Digvijay Apartment, 1 <sup>st</sup> Cross Ganesha Block, Sultanpalya, R.T. Nagar P.O. Bangalore 560 032	Tel. 080-23431533 Fax: 080-23534503 Email: betpl@sify.com
4.	Mr. Tamil Selvam / Mr. Adhavan Aruna Electricals Works Pvt. Ltd., Kongampattu, Rampakkam Post, Villupuram District, Pin - 605105.	Tel: 0413-2699485 Fax: 2699547 Email: arunabiomass@rediffmail.com
5.	Mr. Cecil Antony / Mr. Ranjit Chakraborty Managing Director Synergy Renewable Energy (P) Ltd. "Trishul", Ground Floor 35 Rowland Road, Kolkata 700020 (W.B)	Tel: 033-24745146, 24851362 Email: ranjitc@group-synergy.net
6.	Mr. Navin Raheja / Mr. Hemant Bajaj Director, OVN BIO ENERGY PRIVATE LTD . BT 1/90, Mangolpuri Industrial Area, Phase I Delhi - 110083	Tel: 011-27911596, 27911603 Fax: 010-27916379 Email: navinraheja@ovntempl.com
7.	Mr. V. S. Prakasam Kumar Managing Partner Arrya Hi-tech Energy 76 Patel Road, Ram Nagar, Coimbatore 641009	Tel: 0422-2232897, 2236558 Fax: 0422-2233755 arrya_cbe@yahoo.co.in website:www.arrya.net
8.	Mr. Rajesh Bhat Vice President - Sales & Marketing SunTechnics Energy Systems Pvt. Ltd. 660/1, 100 ft. Road, Indiranagar Bangalore 560 038	Tel: 080-25207191 Fax: 080-25207090 Email: r.bhat@SunTechnics.com
9.	Mr. Haruo Tarui General Manager, Marketing Department Overseas Division Satake Corporation 4-7-2 Sotokanda, Chiyoda - KU Tokyo, Japan 101 0021	TARUIH@aol.com

## 7.10 Rishipooja Energy & Engineering Company

Name	Rishipooja Energy & Engineering Company
Contact	Mr. H R Jaiswal
Address	M G College Road, Gorakhpur - 273001, Uttar Pradesh Telefax: 0551-220797 Mo:9415212901, 9415163792, Email: urjagen@hotmail.com, urjagen@rediffmail.com Website: www.urjagen.com
Technology developer / supplier	Developer / manufacturer / supplier
Type of gasifier	Both Updraft and Downdraft
Highlights of technology	No information is available
	
	
Product range and models	<ul style="list-style-type: none"> <li>• Rice husk based downdraft gasifier - 40kWe to 500kWe</li> <li>• Woody biomass based downdraft gasifier - 10kWe to 500kWe</li> <li>• Woody biomass based updraft gasifier - 10kW to 500kW</li> </ul>
Type of end-use	Thermal and electrical
Typical applications	<ul style="list-style-type: none"> <li>• Namkeen industry</li> <li>• Annealing furnace</li> <li>• Re-rolling mill</li> <li>• Captive power generation</li> </ul>
Case studies	Not available

## 8.0 Biomass gasification – Users / Beneficiaries

Biomass gasifiers are used for thermal applications and for electricity generation. Most of the electricity generation applications are for captive or decentralized electricity generation and distribution. A few, are however grid-connected and supplies power to the electricity distribution companies under a power purchase agreement.

Among thermal uses, gasifiers have found a wide variety of applications. It is used in chemical, food processing, ceramics, CO<sub>2</sub> generation, aluminium melting, etc.

Of the 428 installations of gasifiers in the country<sup>7</sup>, nearly 67% is accounted for by thermal applications, while 33% is for electricity generation. The complete list of supplier-wise installations of gasifiers in the country is given in Annex 4.

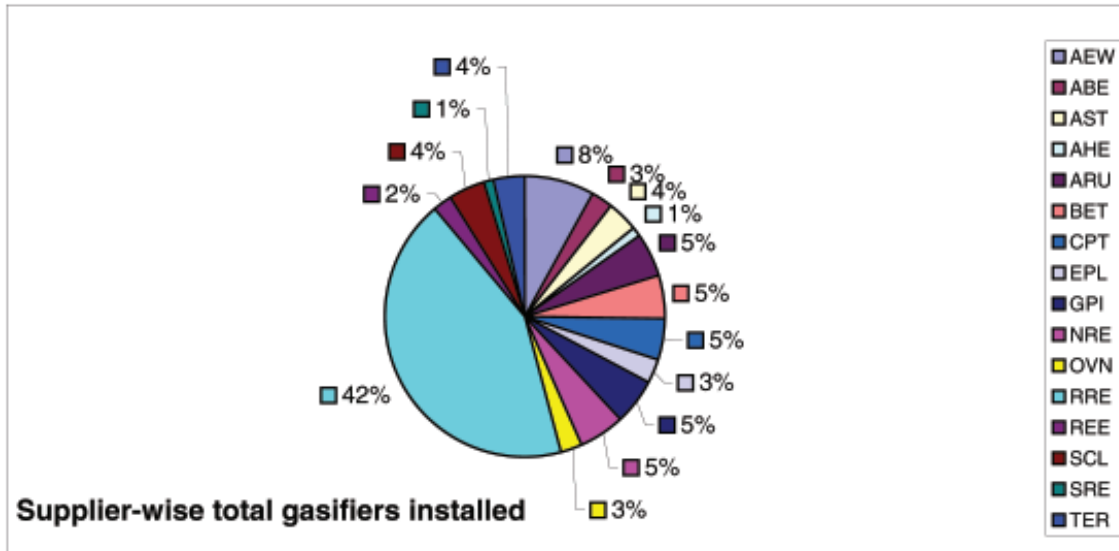
The following table shows, supplier-wise installations of thermal and electric gasifiers in the country:

Sl. No.	Supplier Code	Name of Supplier	Thermal	Electrical	Total
1	AEW	Associated Engineering Works	28	6	34
2	ABE	Advanced Bio-residues Energy Technologies Society	5	6	11
3	AST	Ankur Scientific Technologies Pvt. Ltd.,	7	9	16
4	AHE	Arrya Hi-tech Energy	3	1	4
5	ARU	Aruna Electrical Works Pvt. Ltd.	3	19	22
6	BET	Bioresidue Energy Technology Pvt. Ltd.	9	12	21
7	CPT	Cosmo Powertech Pvt. Ltd.	20	0	20
8	EPL	Energreen Power Ltd.	1	11	12
9	GPI	Grain Processing Industries (India) Pvt. Ltd.	1	22	23
10	NRE	Netpro Renewable Energy (India) Pvt. Ltd.	0	22	22
11	OVN	OVN Bioenergy Pvt. Ltd.	0	11	11
12	RRE	Radhe Renewable Energy Development, Pvt. Ltd.	184	0	184
13	REE	Rishipooja Energy & Engineering Company	4	6	10
14	SCL	Southern Carbons (P) Ltd.	18	0	18
15	SRE	Synergy Renewable Energy (P) Ltd.		4	4
16	TER	The Energy & Resources Institute	5	11	16
		<b>Total</b>	<b>288</b>	<b>140</b>	<b>428</b>

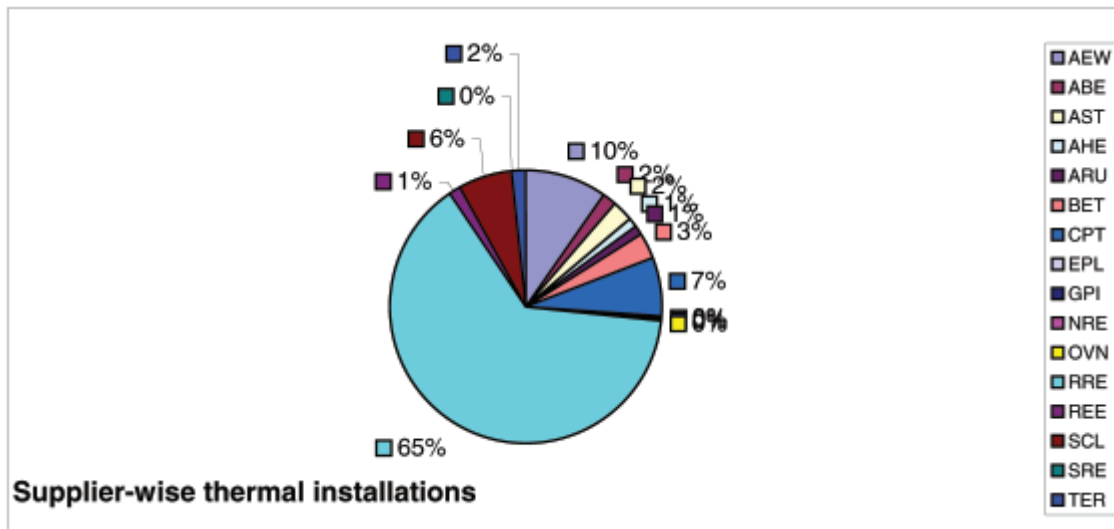
<sup>7</sup>This is not an exhaustive list, but is based on information provided by various suppliers who responded to our questionnaire

## 8.1 Supplier-wise installations

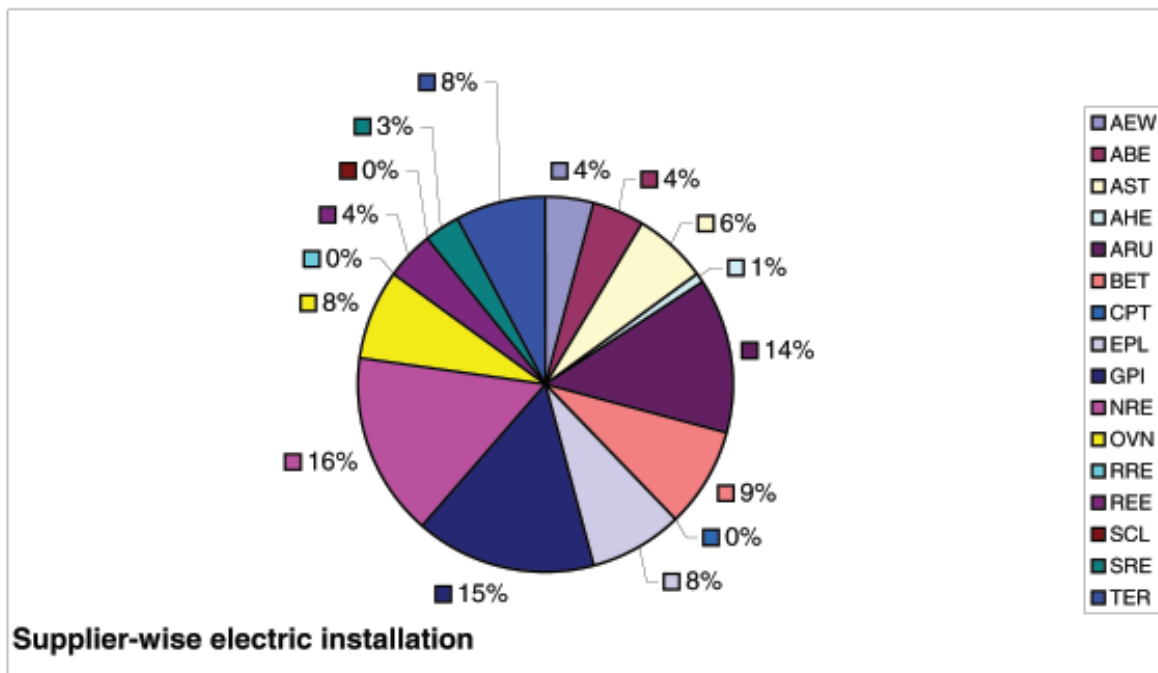
Of the 16 suppliers, Radhe Renewable Energy Development, Pvt. Ltd. alone accounted for 184 installations (42%).



Of the thermal installations, Radhe Renewable Energy Development, Pvt. Ltd. accounted for 65%.



Of the electricity generation application, Netpro Renewable Energy (India) Pvt. Ltd. had the maximum installation of 22 systems accounting for 16% of total installations in this category.

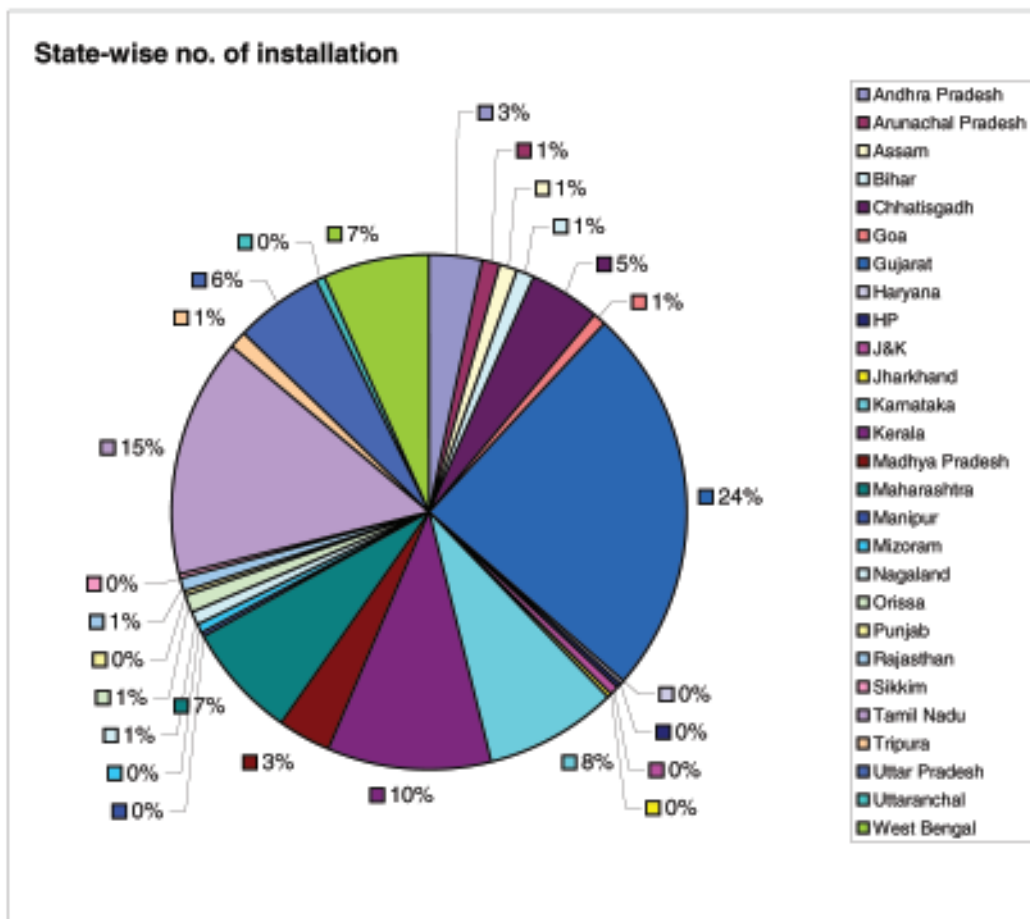


## 8.2 State-wise installations

Gasifiers have been installed in a total of 27 states in the country. Of these, Gujarat with 24% and Tamil Nadu with 15% top the list. In Gujarat, of the 101 installations reported, 96 were accounted for by Radhe Renewable Energy Development, Pvt. Ltd alone.

The following table shows, state-wise and supplier-wise installations of gasifiers in the country:

Sl. No.	State	AEW	ABE	AST	AHE	ARU	BET	CPT	EPL	GPI	NRE	OVN	RRE	REE	SCL	SRE	TER	Total
1	Andhra Pradesh	7				1	2		1			3						14
2	Arunachal Pradesh		1							1		2						4
3	Assam		1			2						1	1					5
4	Bihar										1	1		2				4
5	Chhatisgadh							8					10	1				19
6	Goa												3					3
7	Gujarat			4									96				1	101
8	Haryana							1									1	2
9	HP																1	1
10	J&K						2											2
11	Jharkhand									1								1
12	Karnataka	1	4	1		1	6	1	3	2	9		5		1			34
13	Kerala	7			4		9						6		17			43
14	Madhya Pradesh					4		5			1		2				2	14
15	Maharashtra			1				1					26				1	29
16	Manipur		1									1						2
17	Mizoram		1									1						2
18	Nagaland									2		1						3
19	Orissa												2				3	5
20	Punjab												1					1
21	Rajasthan										1		2				1	4
22	Sikkim																1	1
23	Tamil Nadu	19	2			13	1	1	8	7	6		5					62
24	Tripura											4						4
25	Uttar Pradesh			1		1		1		3			11	6				23
26	Uttaranchal												1				1	2
27	West Bengal			9			1			6			8	1		3		28
	<b>Total</b>	<b>34</b>	<b>10</b>	<b>16</b>	<b>4</b>	<b>22</b>	<b>19</b>	<b>20</b>	<b>11</b>	<b>23</b>	<b>18</b>	<b>11</b>	<b>182</b>	<b>10</b>	<b>18</b>	<b>3</b>	<b>12</b>	<b>413</b>





## **Annex 1:**

### **Letter sent seeking information**

A. R. Shivakumar  
Executive Secretary I/c

No. 6.2.41/IETBG/

September 10, 2007

Dr. Kurchania  
Head of the Department  
College of Technology & Engineering  
Udaipur 313 001  
Rajasthan

Dear Sir,

Sub: Information about bio-mass gasifier.

The Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Government of India, New Delhi has initiated a project "Inventory of Existing Technologies" to collect the information of various rural oriented technologies carried out in the country and to prepare a database of these technologies. They propose to host these information in their website for free public dissemination. In this regard, DSIR has approached Karnataka State Council for Science and Technology (KSCST) to make an inventory of technologies in the field of Biomass gasification.

KSCST has been active for more than 30 years in promoting the use of Science and Technology for the developmental process of the state. We have successfully executed several projects in the areas of Housing, Energy, Education, Health, Water supply, Industry, Urban planning, Natural Resource Management, etc., which has helped the rural community to improve their quality of life. Some of the success stories arising from the activities of the Council include Design of Novel Biogas plants, Solar Collectors, Solar Pond, Gasifiers, Design of High Efficiency Cooking Stoves, etc. We are keen to compile the database in the field of biomass gasification for DSIR.

In this connection, we plan to collect the publishable contents and photographs including following details from the industry who are engaged in the field of R&D and manufacturing of biomass gasification plants.

- Technological details
- Number of operational installations and their location
- Power rating of the installation
- Raw material / fuel used in these installations
- Purpose - Heating or electricity
- Operational data if any
- Whether installations are for demonstration / community benefit / commercial use
- Name and address of the scientists involved

We would be highly obliged if you as one of the important agency in the field of biomass gasification, help us in this endeavor by providing us these details.

We would also request you to send us your written permission to collate your information for submission to DSIR for hosting onto DSIR's Website. If you are not willing for free dissemination of any specific portion of the data provided by you, this may be clearly indicated.

The web portal data would be very much useful to the industries and it is planned to be a one point information source for anyone who wishes to explore the field for biomass gasification whether as a scientist or as a consumer or even as an entrepreneur.

It is also hoped that this database can be the first step towards standardization of plants / equipments and this may give a further impetus for wider acceptance of the technology.

We shall be thankful to you, if you could send the above said details with few photographs including details about commercial installations / demonstrations sets if available. If photographs / video clippings are not available and if your institution is willing to permit us to take the video clippings or photographs, we will be happy to send our project team to the location specified by you for such activities. It would be desirable, if you are willing, for this compilation to include discussions with the innovators and users and also record the shortcomings in the technologies if any.

We will appreciate your early response.

Thanking you,

Yours sincerely,

(A. R. Shivakumar)

## Annex - 2

## List of Gasifier Technology Developers / Suppliers Visited

The project team has visited the following manufacturer/supplier/developer

Manufacturer/supplier/developer	Date of site visit
Arrya Hi-tech Energy, 76 Patel Road, Ram Nagar, Coimbatore 641009	14 <sup>th</sup> & 15 <sup>th</sup> Nov 2007
Southern Carbons (P) Ltd. Palakal Building, Premier Junction Kalamassery - 683104, Cochin, Kerala State.	16 <sup>th</sup> & 17 <sup>th</sup> Nov 2007
Advanced Bio-residues Energy Technologies Society (ABETS), CGPL, Indian Institute of Science Bangalore 560 012	23 <sup>rd</sup> Nov 2007
Ankur Scientific Energy Technologies Pvt. Ltd Near Old Sama Jakat Naka, Vadodara - 390008	4 <sup>th</sup> & 5 <sup>th</sup> Dec 2007
Radhe Renewable Energy Development Pvt.Ltd. D/2, Lodhika G.I.D.C, Kalawad Road, Rajkot Dist - 360 485, Gujarat	6 <sup>th</sup> Dec 2007
Department of Renewable Energy Sources, College of Technology and Engineering, Maharana Pratap University of Agriculture Technology, Udaypur, Rajasthan	7 <sup>th</sup> & 8 <sup>th</sup> Dec 2007
The Energy and Research Institute TERI, India Habitat Centre, Lodi Road, New Delhi- 110003	10 <sup>th</sup> & 12 <sup>th</sup> Dec 2007
Managing Director OVN Bio Energy Private Ltd. BT 1/90, Mangolpuri Industrial Area, Phase I, Delhi - 110083	11 <sup>th</sup> Dec 2007
ElectrotechE61, Industrial Area, Phase VIII, SAS Nagar, Mohalli 160066, Chandigarh	13 <sup>th</sup> Dec 2007
Grain Processing Industries (I) Pvt. Ltd., 29, Strand Road Calcutta - 700001 West Bengal	4 <sup>th</sup> & 7 <sup>th</sup> Feb 2008
Synergy Renewable Energy (P) Ltd. "Trishul", Ground Floor, 35 Rowland Road, Kolkata 700020 (W.B)	5 <sup>th</sup> Feb 2008

**Manufacturer/supplier/developer from whom information was collected by mail**

Manufacturer/supplier/developer	Manufacturer/supplier/developer
Cosmo Powertech Pvt. Ltd. Devpuri, Near Jain Public School, Dhamtari Road, Raipur - 492015	Netpro Renewable Energy (India) Pvt. Ltd. # 139/B, 10 <sup>th</sup> Main, RMV Extension, Bangalore 560 080
Rishipooja Energy & Engineering Co. M.G. College Road, Gorakhpur - 273001, Uttar Pradesh	Aruna Electricals Works Pvt. Ltd., Komgampattu, Rampakkam Post, Villupuram District, Pin - 605105.
Associated Engineering Works, P.B No. 17, Gamini Compound, Chivatam Road, Tanuku - 534211, Andhra Pradesh	Energreen Power Ltd # 6, Third Street, Nandanam Extension, Chennai-600035
Bioresidue Energy Technology Private Limited S-2, Digvijay Apartment, 1 <sup>st</sup> Cross Ganesha Block, Sultanpalya, R.T. Nagar P.O. Bangalore 560 032	

## Case studies

### 3.1 'Ankur' Biomass Gasifier Case Studies

#### Dal Drying - S S Industries, Jalagaon

**Company:** SS Industries is established in 1993 it is engaged in manufacturing of quality 'Mung Dal' and has a good market share in the region.

**Need:** The process of manufacturing 'Mung' dal involves sorting, cleaning, splitting, drying, soaking, peeling, polishing and packaging. In this process, drying of 'Mung' grain is very important. It is actually heating the grain to desired temperature of around 90° C so that when these hot grains are subsequently soaked in water, they can be easily peeled. The quality of grain (i.e. desired yellow colour) depends on this peeling process. For this drying process, they have installed Hot Air Generators. These generators were initially using LPG as a fuel (the cost per kg of LPG is Rs. 27-30). They wanted to replace this costly LPG gas with any cheap fuel without disturbing their Hot Air Generator set up.

**Need Analysis:** Engineers of Ankur Scientific, Baroda visited the factory and made the following observations about the installed Hot Air Generators (HAG):

- They have simple four Hot Air Generators where in LPG is fired in a simple manually controlled burner. Behind this, they have a blower which carries hot air over the flame of these burners. This hot air then goes into a large drying chamber where dal is kept on a perforated sheet. Through the holes of this perforated sheet, hot air come in contact with Dal and dries it.
- Their average monthly LPG consumption was 100 cylinders (of 19 kg each) for the four HAGs.
- Their daily working hours are 16 hours and the process is batch type. Dal is dried for approximately two to three hours. Thus, in the total 16 hours operating period, the actual burner 'ON' period is around 12 hours.



- The maximum consumption of each burner was estimated as 1.5 kg/hr. Thus, the total LPG consumption for four HAGs was around 6.0 kg/hr. However, looking to their future need, Mr. Baldi asked us to have some additional capacity in the gasifier and accordingly, asked us to design the gasifier.

**Solution:** Based on the above information, 'Ankur's R & D cell has considered 9 kg of LPG consumption/hr and suggested to install WBG-80 gasifier in Ultra clean gas mode with a producer gas burner in each HAG. Accordingly, the WBG-80 gasifier was installed in April 05 with a manually controlled burner in each HAG. The producer gas burners are mounted in the same place as the earlier LPG burners.

The installation of gasifier has totally replaced costly LPG gas and they can now run five HAGs on this gasifier. The customer is very satisfied with the system. The detailed economic analysis is given below.

### Economic Analysis

<b>Before 'Ankur' Biomass Gasifier Installation</b>	
LPG consumption of total five HAGs	1900 kg/month (100 cylinders/month)
Hot Air Temperature	90° C
Fuel cost (LPG @ Rs.35 per kg)	Rs.66500/ month
<b>After Installation of 'Ankur' WBG-80</b>	
Hot Air Temperature	90° C
LPG consumption	Nil
Wood consumption	14560 kg/ month
Biomass cost	Rs.21840/month
<b>Overall Savings</b>	
LPG savings	1900 kg/month
Monetary savings	Rs.44660/ month
Capital Investment (Without subsidy & depreciation benefit)	Rs.7.00 Lakhs
Payback Period	Just 15 months

**Note :** With subsidy & depreciation benefit and addition of dryers, this can be very low

## **Steel Tubes Annealing - Patson Industries**

**Profile:** Company is established in July 1996 it is manufacturing high quality carbon steel seamless tubes of various sizes ( $\text{Ø } \frac{1}{4}''$  to  $\text{Ø } 2 \frac{1}{2}''$  and max. pressure up to 2500 psi.) Their current production is 35 to 40 tons of seamless tubes per month. The tubes are used in heat exchangers, boilers, auto-parts, gas pipelines etc.

**Need :** In the process of manufacturing seamless tubes, there is an important process called annealing of tubes. Annealing is a heat treatment process where tubes are subjected to very high temp ( $950 -1000^{\circ}\text{C}$ ) and then cooled down in controlled manner thereby relieving the stress in tubes. The process is very essential and crucial for high quality seamless tubes. Patson had installed an oil-fired furnace for carrying out annealing process. Previously, the company was using LDO or FO through an oil fired burner. But operation cost was very high due to high cost of liquid fuels and also they were not satisfied with logistics & quality of fuel. The poor quality of fuel led to frequent choking of fuel ducts, black smoke from Chimney etc. Hence, the company was looking for low cost fuel and hassle-free operation of Annealing furnace. Having come to know about the possibility of using Biomass Gasification Technology, the company approached M/s. Ankur Scientific , Vadodara for an appropriate solution.



**Analysis:** Engineers of Ankur Scientific Co studied the furnace. The brief details of furnace are as under: The annealing furnace at Patson is about 2.5 m long and about 1 m wide. It has an insulating refractory lining on all sides. The total height is about 1.2 m and a refractory partition separates the top and the bottom half.

A single burner is located at the bottom half and the heat generated directly heats up the refractory partition. In addition the flue gases enter the top half through channels provided in the partition thus heating up the entire furnace. Pipes to be annealed are pushed through one end of the top half of the furnace and allowed to heat up to  $950^{\circ}\text{C}$  and then withdrawn from the other end. The temperature is controlled manually by increasing or decreasing the oil flow rate.

**Solution:** The furnace was consuming about 12-15 litres of furnace oil per hour. 'Ankur' gasifier model WBG-60 in hot gas mode was installed and the existing oil burner was replaced by an appropriate gas burner. Combustion air was provided by a new combustion air blower. After initial trials to establish the gasifier parameters, burner flame length, establishment of baffles inside the furnace to ensure proper distribution of flue gases in the furnace, gasifier based steel tubes annealing was commissioned on 3/1/2002. The furnace has since operated at its rated capacity and there has been 100% replacement of furnace oil with the use of about 48-60 kg of wood per hour. The gasifier is run round the clock. Additional details and particularly Economic Analysis have been enclosed sheet.



### Benefits

- 55% reduction in fuel costs.
- Pollution of black smoke from Chimney is eliminated.
- Relieved from hassles of poor quality of fuel (kerosene / FO)
- Operations become clean.
- Semi skilled labour can operate the gasifier.
- By-products like charcoal become fuel for local labor and can also be sold in open market.

### Economic Analysis of Patson Biomass Project

<b>Before to Installation of Gasifier</b>	
Furnace Oil Consumption	12-15 liter/hour
Furnace Temp	1000° C approx
Fuel Costs	Rs.120-150 per hour
<b>After installation of Gasifier</b>	
Gasifier Model	WBG -60 in hot gas mode
Furnace Oil Consumption	Nil
Wood Consumption	60 kg/hr
Furnace Temp	1000° C approx
<b>Overall Savings</b>	
Furnace Oil Saving	90 kl/annum
Monetary Savings	Rs.4.0 lakhs/ annum
Capital Investment	Rs.3.75 lakhs
Payback Period	One Year



## 3.2 Radhe Biomass Gasifier - Case Studies

### Case Study - Tunnel Kiln - Ceramic

Client	Kaveri Ceramics - Morbi
Product	Wall Tiles
Application	Tunnel Kiln
Solid Fuel	Charcoal

#### Producer Gas Plant & other Details

Gasifier Model	RREDA-1500
Capacity	13,00,000 kcal/hr
Fuel Used	Charcoal
Calorific Value of Fuel	6200-6500 kcal/kg
Charcoal Rate/Kg	Rs.4.00

#### Tunnel Kiln Prior to Gasifier Installation

Production of Wall Tiles/day	2000 sqm/day
Average Kerosene Consumption/sqm	2 liters/sqm
Total Kerosene Consumption/day (2X2000)	4000 liter
Tiles Rate/sqm	Rs.90/-
Daily Turn over (Rs.90 X 2000)	Rs.1,80,000/-
Rate of Kerosene	Rs.20/liter
Before Gasifier Installation Kerosene Cost/day	Rs.80,000/-
% Fuel cost of total Production Cost	44.5 %

#### Tunnel Kiln after Gasifier Installation

Production of Wall Tiles/day	2000 sqm
Maximum Charcoal Cons. to Replace 1 liter Kerosene	1.75 kg/liter
Charcoal Consumption/day ( 4000 X 1.75 kg)	7,000 kg
Charcoal Cost/day (7000 kg x Rs.4)	Rs.28,000/-
Operating & Maintenance Cost of Gasifier (Electricity + Labor + Maintenance)	Rs.2000/day
Total Fuel Cost/day	Rs.30,000/-
% Fuel cost of Total Production Cost	17 %
% of fuel cost saving compare to liquid fuel	62.5 %

#### Over all Saving

Net Saving/day	Rs.50,000/-
Net Saving/months (20 working days)	Rs.10,00,000/-
Net Saving/year (240 working days)	Rs.1,20,00,000/-
Pay back period of Equipment	< 3 months



**Case Study - Tunnel Kiln - Ceramics**

<b>Client</b>	Vikas Sanitary Weares - Morbi
Product	Wall Tiles
Application	Tunnel Kiln
Solid Fuel	Briquettes

**Case Studies - Producer Gas Plant & Other Details**

Gasifier Model:	RREDA-2000
Capacity	17,20,000 kcal/hr
Fuel Used	Briquette
Calorific Value of Fuel	3800-4000 kcal/kg
Briquette Rate/kg	Rs.2.00

**Tunnel kiln prior to Gasifier Installation**

Production of Wall Tiles/day	2500 sqm/day
Average Kerosene Consumption/sqm	2 Liters/sqm
Total Kerosene Consumption/day (2 X 2500 )	5000 liter
Tiles Rate/sqm	Rs.90/-
Daily Turn over (Rs. 90 X 2500)	Rs.2,25,000/-
Rate of Kerosene	Rs.20/liter
Before Gasifier Installation Kerosene Cost/day	Rs.1,00,000/-
% Fuel cost of total Production Cost	44.5 %

**Tunnel kiln after Gasifier Installation**

Production of Wall Tiles/day	2500 sq.
Meter Maximum Briquette Cons. to Replace 1 Liter Kerosene	3.25 kg/liter
Briquette Consumption/day ( 5000 X 3.25 kg)	16,250 kg
Briquette Cost/day (16250 kg x Rs.2)	Rs.32,500/-
Operating & Maintenance Cost of Gasifier (Electricity + Labor + Maintenance)	Rs.2,000/
DayTotal Fuel Cost/day	Rs.34,500/-
% Fuel cost of Total Production Cost	15.5 %
% of fuel cost saving compare to liquid fuel	65.5 %

**Over all Saving**

Net Saving/day	Rs.65,500/-
Net Saving/months (20 working days)	Rs.13,10,000/-
Net Saving/year (240 working days)	Rs.1,57,20,000/-
Pay back period of Equipment	< 3 months

**Case Study - Billet Pre-heating Kiln**

<b>Client</b>	<b>Sanvijay Rolling Mills &amp; Industries Ltd. - Nagpur</b>
Product	Rolling Mills
Application	Billet Pre-heating Kiln
Solid Fuel	Steam Coal - B Grade

**Billet Pre-heating Kiln Prior To Producer Gas Plant Installation**

Production Capacity of Billet Pre-Heating Kiln	12 MT/hr.
Average Furnace Oil Consumption	40 liter/MT
Size of Billets (Regularly Pre-Heating)	100 x 100 mm, 125 x 125 mm, 150 x 150 mm
Temperature of Kiln (Maximum)	1350 C
Running Hours/ day	17 hrs
Fuel consumption/hr. (12 MT X 40 liter)	480 liter/hr
Fuel consumption/ day (17 hrs)	8,160 liter
Rate of F.O.	Rs.11/liter
F.O. Cost/day	Rs.89,760.00

**Billet Pre-heating Kiln After Producer Gas Plant Installation**

Production Capacity of Billet Pre-Heating Kiln	12 MT/hr
Coal Consumption	2.5-3. kg/liter
Maximum Coal Consumption/ MT ( 12 MT X 3 kg x 40 liter)	1440 kg
Size of Billets	100 x 100 mm, 125 x 125 mm, 150 x 150 mm
Temperature of Kiln (Without Pre-Heating Air)	1350 C
Running Hours/ day	17 hrs
Coal consumption/hr.(12 MT X 40 liter)	1,440 kg/hr
Coal consumption/ day (17 hr/ day)	24,480 kg/ day
Rate of Coal (Landing Rate).	Rs.1.50/kg
Coal Cost/ day	Rs.36,720.00

**Operating & Maintenance Cost**

Power cost (15 H.P. Continuous Running Load)	Rs.850/ day
Labor Cost (1 Supervisor & 4 Labour in 2 Shifts)	Rs.1,400/ day
Maintenance Cost *	Rs.2,000/ day

(\*Generally maintenance is not arriving, but we calculate on the annual base)

**Overall Saving/day**

Net Saving/ day (17 hrs/ day)	Rs.48,790/-
Net Saving/ month (20 Working days)	Rs.9,75,800/-
Net Saving/ year (240 working days)	Rs.1,17,09,600/-

**Other Advantages**

Prior to installation of our Producer Gas plant they have max capacity of production was 12 MT/hr, but after installation of our Producer Gas Plant, if they require Higher Production, they can simultaneously start their existing F.O. Fired Burner and can achieve 15 MT/hr. Production. Further, as per the client's observation, they have observe that the due to the Producer Gas fired Burner, the surface scaling of Billet is reduce from 3% to 1.5% compare to F.O. Fired Burner. This is not our commitment, but extra In-direct benefits can be achieved.

### 3.3 Southern Carbons (P) Ltd.,

#### Case Study - 1

<b>Client</b>	<b>AVT Natural Products Ltd.</b>		
Address Head Office	Vazhakulam, Marampilly P.O., Aluva-683 107 Cochin, Kerala, India Ph: +91 484 2677262, 2677263		
Site	HL.No.1182, Halkurke Village Honnavali Hobli, Tiptur, Tumkur Dist, Karnataka - 572 202, Ph: +91 0816 2464177		
Product	Merry gold flower drying.		
Application	Fluidised bed dryer.		
<b>Fluidised bed dryer.</b>			
Fuel used in the dryer	Furnace oil.		
Average consumption of furnace oil	100-150 liter/hr		
Average consumption per day for 22 hours operation	2400 liter/day		
Cost of furnace oil	Rs.24/liter		
Cost of furnace oil per day	Rs.57,600		
<b>Producer Gas Plant</b>			
Gasifier Model	SC-1500		
Installed Capacity	1750 kW		
Thermal Output	15,00,000 kcal		
Biomass used	Coconut shell		
Quantity of coconut shell required to replace one Litre of furnace oil	3.5 kg		
Quantity of biomass required per day (2400 liter x 3.5 kg)	8,400 kg		
Cost of coconut shell required per day (8400 kg x Rs.3)	Rs.25,200		
Operation and maintenance cost per day	Rs.1000/-		
Total biomass and operational cost	Rs.26,200/-		
<b>Savings per day (C)</b>			
Furnace oil cost (A) - Biomass and operational cost (B)	(A) Rs.57,600	(B) Rs.26,200	(C) Rs.31,400
Pay Back Period	Pay back period is less than 150 working days of 22 hours operation.		

## Case Study - 2

Name and Address of the user	<b>Eastern Condiments (P) Ltd</b> Eastern Valley Adimaly - 685 561
Phone No. Email and Website	Office Ph No: 0484-2395510, 2393550 Factory : 04864 -222765 Email: easterngroup@sanchernet.in Website: www.easterngroup.com
Contact Person (Phone no. email)	Mr. Varghese Philip Factory Manager Eastern Condiments (P) Ltd Adimaly Email: varghesep@eastern.in
Location of installation	Adimaly- Idukky District
Manufacturer name and address	Southern Carbons (P) Ltd VI/590 B, Development Area, Edayar, Binanipuram Cochin, Kerala - 683 502
Power rating/capacity	300 kW
Type of fuel using	Coconut shell
Application	Thermal
Technology type storing facility in a gas holder	Forced Up draught cold gas gasifier with 100 Nm <sup>3</sup>
Number of hours used	2800 hrs
Savings in terms of fuel	LPG is replaced with producer gas from coconut shell
Actual Operation Data	Consumption of LPG/hour - 20 kg Cost of LPG @ Rs.43/kg (20x43) - Rs.860/- Quantity of coconut shell required to replace 20 kg of LPG @ 3.5 kg/liter - 70 kg Cost of coconut shell @Rs.2.75/kg - Rs.192.5 Savings /hour taking labour, Power and capital investment - Rs.520/hr
Year of installation	2006 November
Subsidy/support received	Applied for subsidy
Limitations and drawbacks	Savings can be improved only if the machine works for 24 hours. Our machine works only for 10 hours in a day and we have only one shift.
Expansion program (if any)	Planning to run 2 shifts from next financial year onwards and improve production
User remarks (if any)	Our machine is PLC controlled and the machine is sophisticated.

### Case Study - 3

Name and Address of the user	<b>Palappillil Specified Block Rubbers (P)Ltd</b> Karukadam, Kothamangalam
Phone No. Email and Website	Office Ph No: 0485-2822349 Factory : 0485-2822003 Email: pcrumb@rediffmail.com
Contact Person (Phone no. email)	Mr. Varghese Director Palappillil Specified Block Rubbers Kothamangalam, Ph: 098460 22384
Location of installation	Kothamangalam - Palappillil Factory
Manufacturer name and address	Southern Carbons (P) Ltd VI/590 B, Development Area, Edayar, Binanipuram, Cochin, Kerala - 683 502
Power rating/capacity	300 kW
Type of fuel using	Coconut shell or wood used to replace diesel
Application	Thermal
Technology type	Forced Up draught hot gas gasifier
Number of hours used	40000 hrs
Savings in terms of fuel	Diesel is replaced with producer gas from coconut shell or wood
Actual Operation Data	Consumption of Diesel/hour - 25 liter Cost of diesel @ Rs.34/liter (25x34) - Rs.850/- Quantity of coconut shell required to replace 25 liter of diesel (25x3) - 75 kg Cost of coconut shell @Rs.2.75/kg - Rs.206.25 Savings /hour taking labour, power and capital investment - Rs.550/hr
Year of installation	2001 March
Subsidy/support received	Subsidy from Rubber Board
Limitations and drawbacks	Servicing is done every 21 <sup>st</sup> day of continuous operation.
Expansion program (if any)	New 600 kW gasifier is already working in our new Company , Palappillil Rubber Industries, Thattekad, Kothamangalam from 2005
User remarks (if any)	User friendly and low maintenance cost. Tar is generated but consumption of biomass to diesel is very low when compared to other gasifiers.

### 3.4 Advanced Bio-residues Energy Technologies Society, ABETS

#### Power Plant

Arashi Hitech Biopower  
 Near EB Sub Station, Sultanpet, Coimbatore  
 Tamilnadu

This is installed as an Independent Power Producer (IPP), which is one of the largest fixed bed gasification system in the country. The system comprises of two reactors of 2 X750 kg/hr each coupled to five engines of 250 kWe each. The net power generated (which would be around 1 MWe) is grid linked with a substation that is beside the plant. The grid linked power plant operates on a range of feed stocks such as coconut shell, Julifora Prosopis and converts into electricity. The specific biomass consumption is measured to be within  $1.05 \pm 1.1$  kg/kWh with an overall efficiency of 24-26%. It is also found to be environmentally benign in terms of emissions; NOx and CO levels are found to be much lower than most of the existing emissions norms of various countries. The engines have crossed more than 20,000 hrs of operation. Apart from electricity the plant also generates value added product namely partially activated carbon. This carbon is being utilized by waste water treatment industries which offsets the input biomass cost by 30 - 50 % depending on the fuel cost. The power generation cost would be around Rs. 2.50 to 2.80 per kWh at a fuel price of around Rs. 1200 to 1500 per ton of the fuel. The other benefit is use of the exhaust heat from the engine for chilling application.



IISc Biomass Gasifier.



Gas Engines coupled to IISc Biomass Gasifier.

Rated Capacity	2 X 750 kg/hr Gasifier Coupled To 5x250 kWe Producer Gas Engines
Application	Independent Power Producer Linked To State Grid.
Feed Stock	Coconut Shell & Prosopis Julifora
Nominal Output	1000 kWe
Specific Biomass Consumption	1.05 - 1.1 kg/kWh
Typical Duty Cycle	24 hr X 7 days in a week
Plant Availability	> 85%
Cumulative Run, hr	Over 15000
Value Added Product	Partial Activated Carbon ~ Iodine No. 450-500

## Thermal Plant

TANFAC Industries Limited  
SIPCOT Industrial Complex  
Cuddalore, Tamilnadu

This is the largest gasification plant with a single reactor that has been built for a biomass feed rate of 1100 kg/hr. The plant is set up for Adithya Birla Group which is a chemical industry. This plant substitutes the furnace oil required to the tune of around 280 liters/hr. The plant operates on a wide range of feedstock but mainly with *Prosopis juliflora* and coconut shell. The plant provides the heat required in a kiln at around 660 °C for the production of hydrofluoric acid. The gas quality requirement is as stringent as required for power generation. The plant has operated for around 40,000 hrs after its installation. The plant operates continuously around 2000 to 3000 hrs and is shut down for routine maintenance only when the main plant is shut down for maintenance.



### Tanfac, Cuddalore, Pondichery

Rated Capacity	1100 kg/hr
Application	Captive Thermal (Drying of aluminum fluoride)
Year Of Installation	2003
Feed Stock	Coconut Shells, Prosopis Juliflora
Nominal Output	1000-1100 kg/hr to replace 280 liter/hr furnace oil
Typical Duty Cycle	24 hr X 7 days in a week
Plant Availability	> 85%
Cumulative Run, hr	40000
Value Added Product	Partial Activated Carbon~Iodine No. 450-500

## Annex - 4

## Supplier-wise list of installation

This section provides supplier-wise list of installations.

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
1	AEW001	Associated Engineering Works	Periyar Mamiammai College of Technology for Women ( PMCTW),	Periyar Nagar, Vallam, THANJAVUR - 613 403. (Tamilnadu) India	Tamilnadu	100	kWe	Captive Power	Electrical	
2	AEW002	Associated Engineering Works	Telangana Rice Mills Pvt.Ltd,	Industrial Estate, SURYAPET 508 214. Nalgonda Dist (A.P) India.	Andhra Pradesh	100	kWe	Captive Power	Electrical	
3	AEW003	Associated Engineering Works	Sri Pavan Traders, Industrial Estate	SURYAPET - 508 214. Nal	Andhra Pradesh	100	kWe	Captive Power	Electrical	
4	AEW004	Associated Engineering Works	Sri Aravinda Nilaya Paraboiled Modern Rice Mill.,	Khammam Road, Bibigudem, Suryapet Taluk, Nalgonda Dist. (A.P) India.	Andhra Pradesh	100	kWe	Captive Power	Electrical	
5	AEW005	Associated Engineering Works	The Kerala Malanadu Karshaka Produce Co-Operative Marketing Society Ltd,	Thiruvambady 673603 Kozhikkode Dist. Kerala State, India.	Kerala	100	kWe	Coconut drying	Thermal	
6	AEW006	Associated Engineering Works	Kavanan Latex Ltd,	Vakkkadu, Moonnillavu Post Kerala State, India	Kerala	100	kWe	Rubber drying	Thermal	
7	AEW007	Associated Engineering Works	M/ s.TVS Srichakra Ltd,	Perumalpatti Road, Vellarippati 625122 Macturai Dist. Tamilnadu, India	Tamilnadu	100	kWe	Steam generation	Thermal	
8	AEW008	Associated Engineering Works	M/ s.MRM Crumb Rubber Factory,	Southmarady, Muvattupuzha- 686 676. Kerala State. India.	Kerala	100	kWe	Rubber drying	Thermal	



*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
9	AEW009	Associated Engineering Works	Rotary Moksha Bhoomi,	Sajapuram Cremation Ground, TANUKU - 534 211 (A.P) India.	Andhra Pradesh	100	kWe	Crema-torium	Thermal	
10	AEW010	Associated Engineering Works	The Municipal Commissioner,	Karaikal Municipality, KARAIKAL - 609 602, Pondicherry State. India.\	Tamilnadu	100	kWe	Crema-torium	Thermal	
11	AEW011	Associated Engineering Works	The Project Director,	District Rural Development Agency, PONDICHERRY - 605 005. Pondicherry State. India.	Tamilnadu	100	kWe	Crema-torium	Thermal	
12	AEW012	Associated Engineering Works	The Kerala Malanadu Karshaka Produce Co-Operative Marketing Society Ltd,	Thiruvambady - 673 603. Kozhikkode Dist. Kerala State, India.	Kerala	100	kWe	Coconut drying	Thermal	
13	AEW013	Associated Engineering Works	M/ s.Krishnaswami Chemicals,	Shed No.9, APIC, Behind Andhra Jyothi, Settipalli, Tirupati-517 506. (A.P) India	Andhra Pradesh	20	kWe	Chemicals evaporation	Thermal	
14	AEW014	Associated Engineering Works	M/ s.Sri Krishna Chemical Industries,	3, North Car Street, SIVAKASI - 626 123. Tamilnadu, India.	Tamilnadu	20	kWe	Chemicals evaporation	Thermal	
15	AEW015	Associated Engineering Works	The Periyar Maniammai College of Technology for Women,	Periyar Nagar, Vallam, THANJAVUR - 613 403. Tamilnadu, India.	Tamilnadu	20	kWe	Cooking	Thermal	

Inventory of existing technologies on biomass gasification in India

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
9	AEW009	Associated Engineering Works	Rotary Moksha Bhoomi,	Sajjapuram Cremation Ground, TANUKU - 534 211 (A.P) India.	Andhra Pradesh	100	kWe	Crema-torium	Thermal	
10	AEW010	Associated Engineering Works	The Municipal Commissioner,	Karaikal Municipality, KARAIKAL - 609 602, Pondicherry State. India.\	Tamilnadu	100	kWe	Crema-torium	Thermal	
11	AEW011	Associated Engineering Works	The Project Director,	District Rural Development Agency, PONDICHERRY - 605 005. Pondicherry State. India.	Tamilnadu	100	kWe	Crema-torium	Thermal	
12	AEW012	Associated Engineering Works	The Kerala Malanadu Karshaka Produce Co-Operative Marketing Society Ltd,	Thiruvambady - 673 603. Kozhikkode Dist. Kerala State, India.	Kerala	100	kWe	Coconut drying	Thermal	
13	AEW013	Associated Engineering Works	M/ s.Krishnaswami Chemicals,	Shed No.9, APIIC, Behind Settupalli, Tirupati-517 506. (A.P) India	Andhra Pradesh	20	kWe	Chemicals evaporation	Thermal	
14	AEW014	Associated Engineering Works	M/ s.Sri Krishna Chemical Industries,	3, North Car Street, SIVAKASI - 626 123. Tamilnadu, India.	Tamilnadu	20	kWe	Chemicals evaporation	Thermal	
15	AEW015	Associated Engineering Works	The Periyar Maniammai College of Technology for Women,	Periyar Nagar, Vallam, THANJAVUR - 613 403. Tamilnadu, India.	Tamilnadu	20	kWe	Cooking	Thermal	

*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
28	AEW028	Associated Engineering Works		Melmaravathur	Tamilnadu	50	kWe	Cooking	Thermal	
29	AEW029	Associated Engineering Works		Salem	Tamilnadu	160	kWe	Dal roasting	Thermal	
30	AEW030	Associated Engineering Works		Shimoga	Karnataka	50	kWe	Heat treatment furnace	Thermal	
31	AEW031	Associated Engineering Works		Salem	Tamilnadu	160	kWe	Dal roasting	Thermal	
32	AEW032	Associated Engineering Works		Chennai	Tamilnadu	100	kWe	Crema-torium	Thermal	
33	AEW033	Associated Engineering Works		Hyderabad	Andhra Pradesh	160	kWe	Calcination furnace	Thermal	
34	AEW034	Associated Engineering Works		Salem	Tamilnadu	160	kWe	Dal roasting	Thermal	
35	AST001	Ankur Scientific Technologies Pvt. Ltd.,	Mahabhadra Industrial Gases	Plot No.329, GIDC, Por-Ramangamdi, Baroda (Gujarat)	Gujarat				Thermal	
36	AST002	Ankur Scientific Technologies Pvt. Ltd.,	Patson Industries	Plot No.375, GIDC Estate, Por-Ramangamdi, Baroda	Gujarat				Thermal	
37	AST003	Ankur Scientific Technologies Pvt. Ltd.,	Muni Seva Ashram	Goraj 391 760, Tal:Vaghodia, Dist:Baroda	Gujarat				Thermal	
38	AST004	Ankur Scientific Technologies Pvt. Ltd.,	Adichunchunagiri Institute of Medical Sciences,	Balagangadharanatha Nagar 571 448, Nagamangala Taluk, Mandya Dist, Karnataka	Karnataka				Electrical	
39	AST005	Ankur Scientific Technologies Pvt. Ltd.,	Saeplast (India) Pvt. Ltd.	urvey No.1658, S Mansa Gandhinagar Road, Mansa 382 845, Gujarat	Gujarat				Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
40	AST006	Ankur Scientific Technologies Pvt. Ltd.,	S S Industries	E-63, MIDC, Jalgaon 425 003, Maharashtra	Maharashtra			Thermal		
41	AST007	Ankur Scientific Technologies Pvt. Ltd.,	Hara Parbati Rice Mill (P) Ltd.	Baragopinathpur, PO Torkona713 423, Dist.Burdwan, West Bengal	West Bengal			Electrical		
42	AST008	Ankur Scientific Technologies Pvt. Ltd.,	Sree Bishnu Rice Mill	At & PO Sadarghat, Dist.Burdwan, West Bengal	West Bengal			Electrical		
43	AST009	Ankur Scientific Technologies Pvt. Ltd.,	Natraj Rice Mill	At & PO Sadarghat, Dist.Burdwan, West Bengal	West Bengal			Electrical		
44	AST010	Ankur Scientific Technologies Pvt. Ltd.,	Damodar Food Processing (P) Ltd,	Village Patulsara, PO, Mirgachatra, PS Goghhat Dist. Hooghly, West.Bengal	West Bengal			Electrical		
45	AST011	Ankur Scientific Technologies Pvt. Ltd.,	Mahamantra Mini Rice Mill	Badulia, Sagrai, Dist.Burdwan, West Bengal	West Bengal			Electrical		
46	AST012	Ankur Scientific Technologies Pvt. Ltd.,	Jaya Industries (P) Ltd.	5th Floor, Millenium Building, 235/2A, A/JC Bose Road, Kolkata	West Bengal			Thermal		
47	AST013	Ankur Scientific Technologies Pvt. Ltd.,	Supraba Industries Ltd.	Plot No.D-2, Upside Industrial Area, Deva Road, Chimhat, Lucknow 226019, U.P	Uttar Pradesh			Thermal		
48	AST014	Ankur Scientific Technologies Pvt. Ltd.,	Samrat Rice Mill Pvt. Ltd.	Vill. & PO Bhandardih, PS & Dist. Burdwan 713426, West Bengal	West Bengal			Electrical		
49	AST015	Ankur Scientific Technologies Pvt. Ltd.,	Laxmi Narayan Rice Mill	Vill. & PO, Galsi, Dist. Burdwan 713406 West Bengal	West Bengal			Electrical		
50	AST016	Ankur Scientific Technologies Pvt. Ltd.,	Vivekananda Rice Mills (P) Ltd.	VII, Sitanagar, PO Bajua, PS Goghhat, Dist.Hooghly	West Bengal			Electrical		

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
51	CPT001	Cosmo Powertech Pvt. Ltd.	Perfect Stoneware Pipes	Jabalpur	Madhya Pradesh	600	kWth	Baking of stoneware pipes	Thermal	1996
52	CPT002	Cosmo Powertech Pvt. Ltd.	Kesari Metals Ltd.,	Urla, Raipur	Chhatisgadh	120	kWth	Heating of aluminium ingots	Thermal	1998
53	CPT 003	Cosmo Powertech Pvt. Ltd.	Mahakoshal Potteries	Katni	Madhya Pradesh	300	kWth	Baking of refractory bricks	Thermal	1999
54	CPT 004	Cosmo Powertech Pvt. Ltd.	R.R.Ispat Ltd.	Urla, raipur	Chhatisgadh	6000	kWth	Re-heating of steel for hot rolling	Thermal	2001
55	CPT005	Cosmo Powertech Pvt. Ltd.	Unique Structures & Towers Ltd.	Urla, Raipur	Chhatisgadh	1500	kWth	Re-heating of steel for hot rolling	Thermal	2001
56	CPT006	Cosmo Powertech Pvt. Ltd.	Sunil Steel Wires	Bhanpuri, Raipur	Chhatisgadh	900	kWth	Annealing & galvanizing of steel wires	Thermal	2001
57	CPT007	Cosmo Powertech Pvt. Ltd.	Nahta Metals & Air Products	Urla, Raipur	Chhatisgadh	600	kWth	CO2 manu facturing	Thermal	2002
58	CPT008	Cosmo Powertech Pvt. Ltd.	Vijayalaxmi Steels	Vishakhapatnam	Andhra Pradesh	300	kWth	Annealing of MS binding wires	Thermal	2002
59	CPT009	Cosmo Powertech Pvt. Ltd.	Premier Refractories	Katni	Madhya Pradesh	600	kWth	Baking of refractory bricks	Thermal	2003
60	CPT010	Cosmo Powertech Pvt. Ltd.	Gita Refractories	Bangalore	Karnataka	600	kWth	Baking of refractory bricks	Thermal	2003
61	CPT011	Cosmo Powertech Pvt. Ltd.	Eshaditi Chem Pvt. Ltd.,	Sangli	Maharashtra	900	kWth	Heating of chemical reactors	Thermal	2005
62	CPT012	Cosmo Powertech Pvt. Ltd.	Sri Sarbati Steels Ltd.	Pondicherry	Tamilnadu	1200	kWth	Galvanizing	Thermal	2007
63	CPT013	Cosmo Powertech Pvt. Ltd.	Sree Balaji TMT Rod Mills Pvt. Ltd.	Kurnool	Andhra Pradesh	6000	kWth	Re-heating of steel for hot rolling	Thermal	2007

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
64	CPT014	Cosmo Powertech Pvt. Ltd.	Gangotri Aluminium & Alloys Ltd.	Raipur	Chhatisgadh	1200	kWth	Melting of aluminium and reheating of Albillets	Thermal	2007
65	CPT015	Cosmo Powertech Pvt. Ltd.	Mohan Steels Ltd.	Unnao	Uttar Pradesh	12000	kWth	Re-heating of steel for hot rolling	Thermal	
66	CPT016	Cosmo Powertech Pvt. Ltd.	Shreekant Industries	Bhilai Pradesh	Madhya	600	kWth	Baking of refractory bricks	Thermal	
67	CPT017	Cosmo Powertech Pvt. Ltd.	NGP Industries Ltd.	Bhilai	Madhya Pradesh	2000	kWth	Baking of rockwool pads	Thermal	
68	CPT018	Cosmo Powertech Pvt. Ltd.	R.R.Ispat Ltd.	Raipur	Chhatisgadh	7000	kWth	Re-heating of steel for hot rolling	Thermal	
69	CPT019	Cosmo Powertech Pvt. Ltd.	Karnal Agricultural Industries Ltd.	Karnal	Haryana	2000	kWth	Re-heating of steel for hot rolling	Thermal	
70	CPT020	Cosmo Powertech Pvt. Ltd.	Agrawal Structures	Raipur	Chhatisgadh	3500	kWth	Re-heating of steel for hot rolling	Thermal	
71	GPI001	Grain Processing Industries (India) Pvt. Ltd.	Dept. of Power, Govt. of Nagaland	Dimapur, Nagaland	Nagaland	200	kWe	Electrification of a residential colony	Electrical	
72	GPI002	Grain Processing Industries (India) Pvt. Ltd.	Bijoy Lakshmi Rice Mill,	Gangaramchak, Balichak, Midnapore, (W.B.)	West Bengal	500	kWe	Electrical power with thermal boiler and dryer	Electrical	
73	GPI003	Grain Processing Industries (India) Pvt. Ltd.	Harsha Power Projects (P) Ltd.,	1-9-52/E/8 Ramnagar, Hyderabad - 500 048 (A.P.)	Andhra Pradesh	700	kWe	Selling of power to the third party using national grid	Electrical	
74	GPI004	Grain Processing Industries (India) Pvt. Ltd.	Maa Tara Modern Mimi Rice Mill,	By-pass, G.T. Road, P.O.Natungani, PBurdwan - 713 102 (W.B.)	West Bengal	450	kWe	Electrical power for captive use	Electrical	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
75	GP1005	Grain Processing Industries (India) Pvt. Ltd.	Avon Organics Ltd.,	Medak Dist., (W.B.)	West Bengal	500	kWe	Thermal energy for furnace	Thermal	
76	GP1006	Grain Processing Industries (India) Pvt. Ltd.	Nivedita Rice Mill,	Vill. Rakona, P.O. Jharul, Dist. Burdwan (W. B.)	West Bengal	350	kWe	Electrical power for captive use	Electrical	
77	GP1007	Grain Processing Industries (India) Pvt. Ltd.	A. V. Patel Rice Mill,	Dist. Amberdkar Nagar (U.P.)	Uttar Pradesh	75	kWe	Electrical power for captive use	Electrical	
78	GP1008	Grain Processing Industries (India) Pvt. Ltd.	Jhunjhunwala Vanaspati Ltd.	Naurpur, Dist. Jaunpur (U.P.)	Uttar Pradesh	1000	kWe	Electrical power for captive use	Electrical	
79	GP1009	Grain Processing Industries (India) Pvt. Ltd.	Om Batteries Pvt. Ltd.	Plot No. C-7, Industrial Area, Mumtaz Nagar, Faizabad (U.P.)	Uttar Pradesh	250	kWe	Electrical power and thermal energy for smelting furnace and thermid fluid heater	Electrical	
80	GP1010	Grain Processing Industries (India) Pvt. Ltd.	Office of the Director,	Arunachal Pradesh Energy Dev. Agency, Land Survey, Bidg. (1st floor), Itanagar.	Arunachal Pradesh	20kw 2 nos 10kw 3 nos	kWe	Electrification of villages in hilly region	Electrical	
81	GP1011	Grain Processing Industries (India) Pvt. Ltd.	M/s. J.P. Boards Pvt. Ltd.	40 Ameer Sq. Building, Kailasapuram, Tirunelveli	Tamilnadu	450	kWe	Electrical power for captive use	Electrical	
82	GP1012	Grain Processing Industries (India) Pvt. Ltd.	M/s. Castral Extrusion Pvt. Ltd.,	25/27 Netaji Subhas Road, Kolkata.	West Bengal	450	kWe	Electrical power and thermal energy for aluminium melting furnace rerolling furnace	Electrical	
83	GP1013	Grain Processing Industries (India) Pvt. Ltd.	Karnataka Cleaner Production Centre,	No. 32nd ft. Miller Tank, Bangalore. (Under funding from Norway Govt.)	Karnataka	75	kWe	Electrical power for captive use as demonstration plant	Electrical	



*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
84	GPI014	Grain Processing Industries (India) Pvt. Ltd.	Bihar Raffia Pvt. Ltd.,	Adityapur, Jamshedpur, Jharkhand	Jharkhand	200	kWe	Electrical power for captive use	Electrical	
85	GPI015	Grain Processing Industries (India) Pvt. Ltd.	Department of Rural Developments	Govt. of Nagaland, Kohima, Nagaland	Nagaland	200 - 3 units	kWe	Electrification of villages in hilly region	Electrical	
86	GPI016	Grain Processing Industries (India) Pvt. Ltd.	M/s. Jiban Krishna Modern Mini Rice Mill,	Bagabari, Baligori, Hooghly,	West Bengal	150	kWe	Electrical power for captive use	Electrical (under construction)	
87	GPI017	Grain Processing Industries (India) Pvt. Ltd.	M/ s. Janaki Cotton Mills Pvt. Ltd.	Kalanthapanai, Tamil Nadu	Tamilnadu	150	kWe	Electrical power for captive use	Electrical (under construction)	
88	GPI018	Grain Processing Industries (India) Pvt. Ltd.	M/ s. Swastikha Agro Foods (P) Ltd.	Tirchy, Tamil Nadu	Tamilnadu	500	kWe	Electrical power for captive use	Electrical (under construction)	
89	GPI019	Grain Processing Industries (India) Pvt. Ltd.	M/s. Vishnu Paper Products (P) Ltd.	Semangalam Post, Vanur Taluk, Villupuram Dist., Tamil Nadu	Tamilnadu	750	kWe	Electrical power for captive use	Electrical (under construction)	
90	GPI020	Grain Processing Industries (India) Pvt. Ltd.	M/s. The Arasan Aluminium Industries (P) Ltd.,	Thiruthangal Road, Sivakasi.	Tamilnadu	250	kWe	Thermal energy for aluminium melting	Electrical	
91	GPI021	Grain Processing Industries (India) Pvt. Ltd.	M/ s. Durairaj Mills Ltd.	Coimbatore, Tamil Nadu.	Tamilnadu	1	MW	Electrical power for captive use	Electrical (under construction)	
92	GPI022	Grain Processing Industries (India) Pvt. Ltd.	M/s. White Lotus Agro Food (P) Ltd.	Coimbatore, Tamil Nadu.	Tamilnadu	500	kWe	Electrical power for captive use	Electrical (under construction)	
93	GPI023	Grain Processing Industries (India) Pvt. Ltd.	M/ s. Raitabandhu Aharodyama Pvt. Ltd.,	Maruthipura, Kaniyur Post-574 217, Belthangady Taluka. Karnataka State	Karnataka	200	kWe	Electrical power for captive use	Electrical (under construction)	

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
94	RRE001	Radhe Renewable Energy Development, Pvt. Ltd.	Sanvijay Rolling & Engg Ltd - I	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2003
95	RRE002	Radhe Renewable Energy Development, Pvt. Ltd.	Sanvijay Rolling & Engg Ltd - II	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2003
96	RRE003	Radhe Renewable Energy Development, Pvt. Ltd.	Sanvijay Rolling & Engg Ltd - III	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2004
97	RRE004	Radhe Renewable Energy Development, Pvt. Ltd.	Sanvijay Rolling & Engg Ltd - IV	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2006
98	RRE005	Radhe Renewable Energy Development, Pvt. Ltd.	Sri Om Rolling Mill	Jalna	Maharashtra			Billet preheating kiln	Thermal	2005
99	RRE006	Radhe Renewable Energy Development, Pvt. Ltd.	Kalika Re-Rollers	Jalna	Maharashtra			Billet preheating kiln	Thermal	2005
100	RRE007	Radhe Renewable Energy Development, Pvt. Ltd.	Roopam Steel Re-Rollers	Jalna	Maharashtra			Billet preheating kiln	Thermal	2005
101	RRE008	Radhe Renewable Energy Development, Pvt. Ltd.	Parvati Steels	Jalna	Maharashtra			Billet preheating kiln	Thermal	2007
102	RRE009	Radhe Renewable Energy Development, Pvt. Ltd.	ASR Multimetal I	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2005
103	RRE010	Radhe Renewable Energy Development, Pvt. Ltd.	ASR Multimetal II	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
104	RRE011	Radhe Renewable Energy Development, Pvt. Ltd.	Juhi Alloys I	Kanpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
105	RRE012	Radhe Renewable Energy Development, Pvt. Ltd.	Juhi Alloys II	Kanpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
106	RRE013	Radhe Renewable Energy Development, Pvt. Ltd.	Vinar Ispat Ltd.	Chandrapur	Maharashtra			Billet preheating kiln	Thermal	2005
107	RRE014	Radhe Renewable Energy Development, Pvt. Ltd.	Rana Sponge Ltd.	Talcher	Orissa			Billet preheating kiln	Thermal	2005
108	RRE015	Radhe Renewable Energy Development, Pvt. Ltd.	Rana Bar Ltd.	Roorkee	Uttaranchal			Billet preheating kiln	Thermal	2006
109	RRE016	Radhe Renewable Energy Development, Pvt. Ltd.	Goa Ispat Ltd.	Goa	Goa			Billet preheating kiln	Thermal	2006
110	RRE017	Radhe Renewable Energy Development, Pvt. Ltd.	Sonal Vyapar	Salem	Tamilnadu			Billet preheating kiln	Thermal	2006
111	RRE018	Radhe Renewable Energy Development, Pvt. Ltd.	Baranala Steel	Muzafarnagar	Uttar Pradesh			Billet preheating kiln	Thermal	2006
112	RRE019	Radhe Renewable Energy Development, Pvt. Ltd.	Guardian Steels	Mumbai	Maharashtra			Billet preheating kiln	Thermal	2006
113	RRE020	Radhe Renewable Energy Development, Pvt. Ltd.	Ganga Industries	Bhavnagar	Gujarat			Billet preheating kiln	Thermal	2003
114	RRE021	Radhe Renewable Energy Development, Pvt. Ltd.	Lucky steel	Bhavnagar	Gujarat			Billet preheating kiln	Thermal	2005

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
115	RRE022	Radhe Renewable Energy Development, Pvt. Ltd.	SRMB Srijan Ltd.	Durgapur	West Bengal			Billet preheating kiln	Thermal	2006
116	RRE023	Radhe Renewable Energy Development, Pvt. Ltd.	SRMB Udhयोग Ltd.	Kolkata	West Bengal			Billet preheating kiln	Thermal	2006
117	RRE024	Radhe Renewable Energy Development, Pvt. Ltd.	Gallant Multimetals Ltd.	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006
118	RRE025	Radhe Renewable Energy Development, Pvt. Ltd.	B.D. Casting	Kolkata	West Bengal			Billet preheating kiln	Thermal	2006
119	RRE026	Radhe Renewable Energy Development, Pvt. Ltd.	Shivali Udhयोग Ltd.	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
120	RRE027	Radhe Renewable Energy Development, Pvt. Ltd.	Adhumik Ispat Ltd.	Durgapur	West Bengal			Billet preheating kiln	Thermal	2006
121	RRE028	Radhe Renewable Energy Development, Pvt. Ltd.	Khatu Shyam Steel Re-rolling Mill	Nanded	Maharashtra			Billet preheating kiln	Thermal	2006
122	RRE029	Radhe Renewable Energy Development, Pvt. Ltd.	MITC Rolling Mill	Nasik	Maharashtra			Billet preheating kiln	Thermal	2006
123	RRE030	Radhe Renewable Energy Development, Pvt. Ltd.	Shree Sidhali Ispat Ltd.	Chandrapur	Maharashtra			Billet preheating kiln	Thermal	2006
124	RRE031	Radhe Renewable Energy Development, Pvt. Ltd.	Garg Industries Ltd.	Ludhiana	Punjab kiln			Billet preheating	Thermal	2006
125	RRE032	Radhe Renewable Energy Development, Pvt. Ltd.	Shree Vaishnav Ispat Ltd.	Thane	Maharashtra			Billet preheating kiln	Thermal	2006

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
126	RRE033	Radhe Renewable Energy Development, Pvt. Ltd.	Mahasati Rolling	Mill	Kolkata	West Bengal		Billet preheating kiln	Thermal	2006
127	RRE034	Radhe Renewable Energy Development, Pvt. Ltd.	Anjani Steel Pvt. Ltd. I	Jaunpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
128	RRE035	Radhe Renewable Energy Development, Pvt. Ltd.	Anjani Steel Pvt. Ltd. II	Jaunpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
129	RRE036	Radhe Renewable Energy Development, Pvt. Ltd.	Amba Steel	Muzaffarnagar	Uttar Pradesh			Billet preheating kiln	Thermal	2006
130	RRE037	Radhe Renewable Energy Development, Pvt. Ltd.	Giriraj Re	Rolling Mills	Jalna	Maha-rashtra		Billet preheating kiln	Thermal	2006
131	RRE038	Radhe Renewable Energy Development, Pvt. Ltd.	R.S.Ispat	Kolkata	West Bengal			Billet preheating kiln	Thermal	2006
132	RRE039	Radhe Renewable Energy Development, Pvt. Ltd.	I.C.Ispat	Siliguri	West Bengal			Billet preheating kiln	Thermal	2006
133	RRE040	Radhe Renewable Energy Development, Pvt. Ltd.	Welspun Power & Steel Ltd.,	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006
134	RRE041	Radhe Renewable Energy Development, Pvt. Ltd.	Sunrise Electromelt	Goa	Goa			Billet preheating kiln	Thermal	2006
135	RRE042	Radhe Renewable Energy Development, Pvt. Ltd.	Varsana Ispat Ltd. I	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006
136	RRE043	Radhe Renewable Energy Development, Pvt. Ltd.	Varsana Ispat Ltd. II	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
137	RRE044	Radhe Renewable Energy Development, Pvt. Ltd.	Saraswati Steel Ltd.	Jalna	Maharashtra			Billet preheating kiln	Thermal	2006
138	RRE045	Radhe Renewable Energy Development, Pvt. Ltd.	Electrotherm (I) Ltd.	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006
139	RRE046	Radhe Renewable Energy Development, Pvt. Ltd.	Nilkanth Concast	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2006
140	RRE047	Radhe Renewable Energy Development, Pvt. Ltd.	Premier Alloys - I	Kanpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
141	RRE048	Radhe Renewable Energy Development, Pvt. Ltd.	Premier Alloys - II	Jainpur	Uttar Pradesh			Billet preheating kiln	Thermal	2007
142	RRE049	Radhe Renewable Energy Development, Pvt. Ltd.	Bhagwati Steel	Nasik	Maharashtra			Billet preheating kiln	Thermal	2006
143	RRE050	Radhe Renewable Energy Development, Pvt. Ltd.	Sharda Steel	Kanpur	Uttar Pradesh			Billet preheating kiln	Thermal	2006
144	RRE051	Radhe Renewable Energy Development, Pvt. Ltd.	Bhuleshwar Steel	Pune	Maharashtra			Billet preheating kiln	Thermal	2006
145	RRE052	Radhe Renewable Energy Development, Pvt. Ltd.	Sirdi Steels Ltd.	Goa	Goa			Billet preheating kiln	Thermal	2006
146	RRE053	Radhe Renewable Energy Development, Pvt. Ltd.	Prakash Industries Ltd. I	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2006
147	RRE054	Radhe Renewable Energy Development, Pvt. Ltd.	Prakash Industries Ltd. II	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
148	RRE055	Radhe Renewable Energy Development, Pvt. Ltd.	Prakash Industries Ltd.III	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
149	RRE056	Radhe Renewable Energy Development, Pvt. Ltd.	Prakash Industries Ltd. IV	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
150	RRE057	Radhe Renewable Energy Development, Pvt. Ltd.	Meenakshi Steel	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2006
151	RRE058	Radhe Renewable Energy Development, Pvt. Ltd.	VRKP Steel	Bangalore	Karnataka			Billet preheating kiln	Thermal	2006
152	RRE059	Radhe Renewable Energy Development, Pvt. Ltd.	MSP Steel	Raigarh	Chhatisgadh			Billet preheating kiln	Thermal	2006
153	RRE060	Radhe Renewable Energy Development, Pvt. Ltd.	Kamdhenu Ispat Ltd.	Bhiwadi	Rajasthan			Billet preheating kiln	Thermal	2006
154	RRE061	Radhe Renewable Energy Development, Pvt. Ltd.	Bhuwalka Steel I	Wada	Maharashtra			Billet preheating kiln	Thermal	2006
155	RRE062	Radhe Renewable Energy Development, Pvt. Ltd.	Bhuwalka Steel II	Bellary	Karnataka			Billet preheating kiln	Thermal	2007
156	RRE063	Radhe Renewable Energy Development, Pvt. Ltd.	Mahalaxmi Rolling Mills Ltd.,	Jalna	Maharashtra			Billet preheating kiln	Thermal	2007
157	RRE064	Radhe Renewable Energy Development, Pvt. Ltd.	Tulsyan Nec Ltd.	Gumidipoondi	Tamilnadu			Billet preheating kiln	Thermal	2007
158	RRE065	Radhe Renewable Energy Development, Pvt. Ltd.	Tulsyan Nec Ltd.	Gumidipoondi	Tamilnadu			Billet preheating kiln	Thermal	2007



Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
159	RRE066	Radhe Renewable Energy Development, Pvt. Ltd.	Shiv Shakti Steel	Jalna	Maharashtra			Billet preheating kiln	Thermal	2007
160	RRE067	Radhe Renewable Energy Development, Pvt. Ltd.	Venus Rolling Mill	Nagpur	Maharashtra			Billet preheating kiln	Thermal	2007
161	RRE068	Radhe Renewable Energy Development, Pvt. Ltd.	Hari Om Steel Ltd.	Jhansi	Uttar Pradesh			Billet preheating kiln	Thermal	2007
162	RRE069	Radhe Renewable Energy Development, Pvt. Ltd.	Tirupati Udhayog	Hyderabad	Andhra Pradesh			Billet preheating kiln	Thermal	2007
163	RRE070	Radhe Renewable Energy Development, Pvt. Ltd.	Vinayak Steel	Hyderabad	Andhra Pradesh			Billet preheating kiln	Thermal	2007
164	RRE071	Radhe Renewable Energy Development, Pvt. Ltd.	Shree Om Rolling Mills	Jalna	Maharashtra			Billet preheating kiln	Thermal	2007
165	RRE072	Radhe Renewable Energy Development, Pvt. Ltd.	Panem Steel Pvt. Ltd.	Kanpur	Uttar Pradesh			Billet preheating kiln	Thermal	2007
166	RRE073	Radhe Renewable Energy Development, Pvt. Ltd.	Mid India Engg. Lted.	Gandhidham	Gujarat			Billet preheating kiln	Thermal	2007
167	RRE074	Radhe Renewable Energy Development, Pvt. Ltd.	Ashiana Steel Ltd.	Ahmedabad	Gujarat			Billet preheating kiln	Thermal	2007
168	RRE075	Radhe Renewable Energy Development, Pvt. Ltd.	Shyam DRI Power Ltd.	Sambalpur	Orissa			Billet preheating kiln	Thermal	2007
169	RRE076	Radhe Renewable Energy Development, Pvt. Ltd.	Gaurva Krishna Ispat Pvt. Ltd.	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
170	RRE077	Radhe Renewable Energy Development, Pvt. Ltd.	A.C. Strips Pvt. Ltd.	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
171	RRE078	Radhe Renewable Energy Development, Pvt. Ltd.	Shri Bajrang Metallics Pvt Ltd.	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
172	RRE079	Radhe Renewable Energy Development, Pvt. Ltd.	Shri Bajrang Metallics Pvt Ltd.	Raipur	Chhatisgadh			Billet preheating kiln	Thermal	2007
173	RRE080	Radhe Renewable Energy Development, Pvt. Ltd.	S.P.Renewable Energy Research Instt.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
174	RRE081	Radhe Renewable Energy Development, Pvt. Ltd.	Hem Ceramic I	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
175	RRE082	Radhe Renewable Energy Development, Pvt. Ltd.	Patidar Cerami I	Shapar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
176	RRE083	Radhe Renewable Energy Development, Pvt. Ltd.	Soni Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
177	RRE084	Radhe Renewable Energy Development, Pvt. Ltd.	Deep Ceramic	Thangadh	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
178	RRE085	Radhe Renewable Energy Development, Pvt. Ltd.	Astron Ceramic I	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
179	RRE086	Radhe Renewable Energy Development, Pvt. Ltd.	Bhimani Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
180	RRE087	Radhe Renewable Energy Development, Pvt. Ltd.	Evershine Cera Pvt. Ltd.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
181	RRE088	Radhe Renewable Energy Development, Pvt. Ltd.	Sigma Gold Ceramic Industries	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
182	RRE089	Radhe Renewable Energy Development, Pvt. Ltd.	Kavery Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
183	RRE090	Radhe Renewable Energy Development, Pvt. Ltd.	Kavery Ceramic II	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
184	RRE091	Radhe Renewable Energy Development, Pvt. Ltd.	Citizen Ceramic I	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
185	RRE092	Radhe Renewable Energy Development, Pvt. Ltd.	Kores Tiles	Thangadh	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
186	RRE093	Radhe Renewable Energy Development, Pvt. Ltd.	Kores Tiles	Thangadh	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
187	RRE094	Radhe Renewable Energy Development, Pvt. Ltd.	Sunlight Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
188	RRE095	Radhe Renewable Energy Development, Pvt. Ltd.	Surya Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
189	RRE096	Radhe Renewable Energy Development, Pvt. Ltd.	Unique Ceracoats Industries	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
190	RRE097	Radhe Renewable Energy Development, Pvt. Ltd.	Ambani Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
191	RRE098	Radhe Renewable Energy Development, Pvt. Ltd.	Apex Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
192	RRE099	Radhe Renewable Energy Development, Pvt. Ltd.	Aastraon Ceramic I	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
193	RRE100	Radhe Renewable Energy Development, Pvt. Ltd.	Yashika Ceramics	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
194	RRE101	Radhe Renewable Energy Development, Pvt. Ltd.	Smart Ceramic	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
195	RRE102	Radhe Renewable Energy Development, Pvt. Ltd.	Sigma Gold Ceramic Industries	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
196	RRE103	Radhe Renewable Energy Development, Pvt. Ltd.	Asian Tiles Ltd.	Idar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
197	RRE104	Radhe Renewable Energy Development, Pvt. Ltd.	Asian Tiles Ltd	Idar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
198	RRE105	Radhe Renewable Energy Development, Pvt. Ltd.	Victor Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
199	RRE106	Radhe Renewable Energy Development, Pvt. Ltd.	Akash Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
200	RRE107	Radhe Renewable Energy Development, Pvt. Ltd.	Bhavani Tiles	Thangadh	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
201	RRE108	Radhe Renewable Energy Development, Pvt. Ltd.	Gujarat Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
202	RRE109	Radhe Renewable Energy Development, Pvt. Ltd.	Fine Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
203	RRE110	Radhe Renewable Energy Development, Pvt. Ltd.	Star Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
204	RRE111	Radhe Renewable Energy Development, Pvt. Ltd.	Sigma Ceramic	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
205	RRE112	Radhe Renewable Energy Development, Pvt. Ltd.	Surya Ceramic II	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
206	RRE113	Radhe Renewable Energy Development, Pvt. Ltd.	Patidar Ceramic - I	Shapar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
207	RRE114	Radhe Renewable Energy Development, Pvt. Ltd.	Astron Ceramic I	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
208	RRE115	Radhe Renewable Energy Development, Pvt. Ltd.	Cosmo Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
209	RRE116	Radhe Renewable Energy Development, Pvt. Ltd.	Simco Tiles	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
210	RRE117	Radhe Renewable Energy Development, Pvt. Ltd.	While Silco Pvt. Ltd.	Bhavnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
211	RRE118	Radhe Renewable Energy Development, Pvt. Ltd.	Rainbow Ceramic	Mangalore	Karnataka			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
212	RRE119	Radhe Renewable Energy Development, Pvt. Ltd.	Potdar Chemicals	Sangali	Maharashtra			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
213	RRE120	Radhe Renewable Energy Development, Pvt. Ltd.	Bhimani Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
214	RRE121	Radhe Renewable Energy Development, Pvt. Ltd.	Nova Tiles Pvt. Ltd.	Muli	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
215	RRE122	Radhe Renewable Energy Development, Pvt. Ltd.	Luxure Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
216	RRE123	Radhe Renewable Energy Development, Pvt. Ltd.	Metro Ceramic Pvt. Ltd.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
217	RRE124	Radhe Renewable Energy Development, Pvt. Ltd.	Refoil Earth Pvt. Ltd.	Baroda	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
218	RRE125	Radhe Renewable Energy Development, Pvt. Ltd.	Manek Minerals	Mehsana	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
219	RRE126	Radhe Renewable Energy Development, Pvt. Ltd.	Mesha Engg. Ind. Pvt. Ltd.	Bangalore	Karnataka			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
220	RRE127	Radhe Renewable Energy Development, Pvt. Ltd.	Citizen Ceramics II	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
221	RRE128	Radhe Renewable Energy Development, Pvt. Ltd.	Regent Granito (India) Ltd.	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
222	RRE129	Radhe Renewable Energy Development, Pvt. Ltd.	Varmora Tiles	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
223	RRE130	Radhe Renewable Energy Development, Pvt. Ltd.	Hiltop Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
224	RRE131	Radhe Renewable Energy Development, Pvt. Ltd.	Face Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
225	RRE132	Radhe Renewable Energy Development, Pvt. Ltd.	Unique Cera Coat Industries	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
226	RRE133	Radhe Renewable Energy Development, Pvt. Ltd.	Tansilica Ltd.	Tanzania	Tanzania			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
227	RRE134	Radhe Renewable Energy Development, Pvt. Ltd.	Shimba Lime Factory Ltd.	Tanzania	Tanzania			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
228	RRE135	Radhe Renewable Energy Development, Pvt. Ltd.	Asian Granito (India) Ltd.	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
229	RRE136	Radhe Renewable Energy Development, Pvt. Ltd.	Oracle Granito Ltd.	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
230	RRE137	Radhe Renewable Energy Development, Pvt. Ltd.	Regent Granito (India) Ltd.II	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
231	RRE138	Radhe Renewable Energy Development, Pvt. Ltd.	Spark Ceramic	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
232	RRE139	Radhe Renewable Energy Development, Pvt. Ltd.	Sonex Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
233	RRE140	Radhe Renewable Energy Development, Pvt. Ltd.	Sogo Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
234	RRE141	Radhe Renewable Energy Development, Pvt. Ltd.	Sogo Ceramics	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
235	RRE142	Radhe Renewable Energy Development, Pvt. Ltd.	Max Granito Ltd.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	



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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
236	RRE143	Radhe Renewable Energy Development, Pvt. Ltd.	Major Ceramics Ltd.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
237	RRE144	Radhe Renewable Energy Development, Pvt. Ltd.	Speciality Silica Pvt. Ltd.	Alwar	Rajasthan			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
238	RRE145	Radhe Renewable Energy Development, Pvt. Ltd.	Regent Granito	Himatnagar	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
239	RRE146	Radhe Renewable Energy Development, Pvt. Ltd.	Ashapura Minechem Ltd.	Tiruvanthpuram	Kerala			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
240	RRE147	Radhe Renewable Energy Development, Pvt. Ltd.	Ashapura Minechem Ltd.	Tiruvanthpuram	Kerala			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
241	RRE148	Radhe Renewable Energy Development, Pvt. Ltd.	Ashapura Minechem Ltd.	Tiruvanthpuram	Kerala			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
242	RRE149	Radhe Renewable Energy Development, Pvt. Ltd.	Ashapura Minechem Ltd.	Tiruvanthpuram	Kerala			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
243	RRE150	Radhe Renewable Energy Development, Pvt. Ltd.	Ashapura Minechem Ltd.	Tiruvanthpuram	Kerala			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
244	RRE151	Radhe Renewable Energy Development, Pvt. Ltd.	Krishna Ceramics Pvt. Ltd.	Morbi	Gujarat			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
245	RRE152	Radhe Renewable Energy Development, Pvt. Ltd.	Arvind Ceramics Pvt. Ltd.	Chennai	Tamilnadu			Furnace/Tunnel/Roller Kiln/Spray Dryer	Thermal	
246	RRE153	Radhe Renewable Energy Development, Pvt. Ltd.	Angel Ceramics	Morbi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
247	RRE154	Radhe Renewable Energy Development, Pvt. Ltd.	Sonata Ceramics Pvt. Ltd.	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
248	RRE155	Radhe Renewable Energy Development, Pvt. Ltd.	Crystal Ceramics	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
249	RRE156	Radhe Renewable Energy Development, Pvt. Ltd.	Cello Ceramics	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
250	RRE157	Radhe Renewable Energy Development, Pvt. Ltd.	H&R Johnson (India) Ltd.	Dewas	Madhya Pradesh			Direct Hag - furnace/hot air generator	Thermal	
251	RRE158	Radhe Renewable Energy Development, Pvt. Ltd.	H&R Johnson (India) Ltd.	Kunigal	Karnataka			Direct Hag - furnace/hot air generator	Thermal	
252	RRE159	Radhe Renewable Energy Development, Pvt. Ltd.	Santro Ceramics	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
253	RRE160	Radhe Renewable Energy Development, Pvt. Ltd.	Akik Tiles Ltd.	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
254	RRE161	Radhe Renewable Energy Development, Pvt. Ltd.	Jalaram Ceramic	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
255	RRE162	Radhe Renewable Energy Development, Pvt. Ltd.	Gladder Ceramics Ltd.	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
256	RRE163	Radhe Renewable Energy Development, Pvt. Ltd.	Hem Ceramics	Morbi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
257	RRE164	Radhe Renewable Energy Development, Pvt. Ltd.	City Tiles	Himatnagar	Gujarat			Direct Hag - furnace/hot air generator	Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
258	RRE165	Radhe Renewable Energy Development, Pvt. Ltd.	Vrundavan Ceramics Ltd.,	Morbi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
259	RRE166	Radhe Renewable Energy Development, Pvt. Ltd.	Vrundavan Ceramics Ltd.,	Morbi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
260	RRE167	Radhe Renewable Energy Development, Pvt. Ltd.	Ornato Ceramics	Morbi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
261	RRE168	Radhe Renewable Energy Development, Pvt. Ltd.	Tata Chemicals Ltd.	Haldia	West Bengal			Direct Hag - furnace/hot air generator	Thermal	
262	RRE169	Radhe Renewable Energy Development, Pvt. Ltd.	Star Clays	Trissur	Kerala			Direct Hag - furnace/hot air generator	Thermal	
263	RRE170	Radhe Renewable Energy Development, Pvt. Ltd.	Advatech Cera Tiles Ltd.	Kadi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
264	RRE171	Radhe Renewable Energy Development, Pvt. Ltd.	SPL Limited	Kadi	Gujarat			Direct Hag - furnace/hot air generator	Thermal	
265	RRE172	Radhe Renewable Energy Development, Pvt. Ltd.	H&R Johnson (India) Ltd.	Dewas	Madhya Pradesh				Thermal	
266	RRE173	Radhe Renewable Energy Development, Pvt. Ltd.	H&R Johnson (India) Ltd.	Pen	Maharashtra				Thermal	
267	RRE174	Radhe Renewable Energy Development, Pvt. Ltd.	Vrundavan Ceramics Ltd.	Morbi	Gujarat				Thermal	
268	RRE175	Radhe Renewable Energy Development, Pvt. Ltd.	Icon House Hold	Coimbatore	Tamilnadu				Thermal	

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
269	RRE176	Radhe Renewable Energy Development, Pvt. Ltd.	Icon House Hold	Gauhati	Assam				Thermal	
270	RRE177	Radhe Renewable Energy Development, Pvt. Ltd.	Ornato Ceramics	Morbi	Gujarat				Thermal	
271	RRE178	Radhe Renewable Energy Development, Pvt. Ltd.	Hindustan Gum	Viramgam	Gujarat				Thermal	
272	RRE179	Radhe Renewable Energy Development, Pvt. Ltd.	City Tiles	Himmatnagar	Gujarat				Thermal	
273	RRE180	Radhe Renewable Energy Development, Pvt. Ltd.	Asian Tiles	Ider	Gujarat				Thermal	
274	RRE181	Radhe Renewable Energy Development, Pvt. Ltd.	Sonata Ceramics	Himmatnagar	Gujarat				Thermal	
275	RRE182	Radhe Renewable Energy Development, Pvt. Ltd.	Century Ceramics	Himmatnagar	Gujarat				Thermal	
276	RRE183	Radhe Renewable Energy Development, Pvt. Ltd.	Sentiny Ceramic	Gudiwada	Andhra Pradesh				Thermal	
277	RRE184	Radhe Renewable Energy Development, Pvt. Ltd.	Terapanth Foods	Gandhidham	Gujarat				Thermal	
278	SCL001	Southern Carbons (P) Ltd.	M/s Edathala Polymers Private Ltd	South Edathala, Aluva Ph:0091484-2637302	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2001
279	SCL002	Southern Carbons (P) Ltd.	M/s Palappillil Specified Block Rubber Pvt. Ltd.	Kothamangalam Ph:0091 485 2822003	Kerala	2 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2001

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
280	SCL003	Southern Carbons (P) Ltd.	M/s Basil Rubber Factory Pvt. Ltd.	Pothupara, Kothamangalam Ph:0091 485-2822130	Kerala	2 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2002
281	SCL004	Southern Carbons (P) Ltd.	M/s Ponnudi Rubbers Ltd,	Thycaadu, Trivandrum Ph :0091 4712323233.	Kerala	2 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2002
282	SCL005	Southern Carbons (P) Ltd.	M/s West Coast Rubbers India Pvt. Ltd.	West hill, Calicut. Ph:0091 495 2380486	Kerala	2 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2002
283	SCL006	Southern Carbons (P) Ltd.	Harisree Specified Block Crumb RubberPvt. Ltd.	Edayar, Aluva. Ph:0091484 2541155	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2003
284	SCL007	Southern Carbons (P) Ltd.	M/ s. Mamparambil Rubber Industries Pvt Ltd,	Pizhaku P.O.,Pala, Kottayam Ph:0091 482-260360, 260686	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2004
285	SCL008	Southern Carbons (P) Ltd.	M/s. Crescent Crumbs Pvt. Ltd.	Peringottussery, Edathala, Aluva, Ph: 0091 484 2638952	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2004
286	SCL009	Southern Carbons (P) Ltd.	M/s. Mount Velour Rubber Works,	Nilampathy, Amarambalam Post, Nilambur Ph:0091 4931 260373	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2005
287	SCL010	Southern Carbons (P) Ltd.	M/s. Kerala State Agro Co-Operative Ltd.,	Abna Complex, Pallikkunnu, Kannur Ph:0091 497 2765115	Kerala	2 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2005
288	SCL011	Southern Carbons (P) Ltd.	Elite Foods (P) Ltd	Industrial DevelopmentArea Aroor-688534 Ph:0091 478 2872162, 2872149	Kerala	5 lakh	kcal /hr	For baking breads	Thermal	2005
289	SCL012	Southern Carbons (P) Ltd.	Sud-Chemie India (P)Ltd	Edayar Industrial Development Area Binanipuram,Cochin Ph:0091 484 2540481	Kerala	7 lakh	kcal /h	For drying of chemical catalyst	Thermal	2005
290	SCL013	Southern Carbons (P) Ltd.	Hi-Tech Spice Dryers	Mavadi Kalkunthall Road Nedumkandam Idukky District Ph:00914868 233909	Kerala	4 lakh	kcal /hr	Spice processing	Thermal	2005

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
291	SCL014	Southern Carbons (P) Ltd.	Palappillil Rubber Industries	Thattakad Kothamangalam Ph:0485-2822349	Kerala	4 lakh	kcal /hr	Drying of block crumb rubber	Thermal	2006
292	SCL015	Southern Carbons (P) Ltd.	Eastern Condiments Private Ltd	Eastern Valley Adimali- 685 561 Ph: 00914864 222765	Kerala	4 lakh	kcal /hr	Cooking and baking purposes	Thermal	Under construction
293	SCL016	Southern Carbons (P) Ltd.	Elite Breads (P) Ltd	Athani, Thrissur Ph:0091 487 2204305	Kerala	5 lakh	kcal /hr	For baking breads	Thermal	2006
294	SCL017	Southern Carbons (P) Ltd.	AVT Natural Products Ltd	Halkurke Village, Honnavalli hobli, Tiptur, Tumkur (Dist),Karnataka, Ph: 08134 264177	Karnataka	15 lakh	kcal /hr	Merry gold drying	Thermal	2006
295	SCL018	Southern Carbons (P) Ltd.	Sud-Chemie India (P)Ltd	Edayar Industrial Development AreaBinanipuram, Cochin Ph:0091 484-2540481	Kerala	12 lakh	kcal /hr	For drying of chemical catalyst	Thermal	
296	TER001	The Energy & Resources Institute	Village Khaneiput	Orissa	Orissa	10	kWe	Community electrification	Electrical	
297	TER002	The Energy & Resources Institute	Nuapara	Orissa	Orissa	10	kWe	Community electrification	Electrical	
298	TER003	The Energy & Resources Institute	Jemara	Orissa	Orissa	10	kWe	Community electrification	Electrical	
299	TER004	The Energy & Resources Institute	Anta	Rajasthan	Rajasthan	10	kWe	Community electrification	Electrical	
300	TER005	The Energy & Resources Institute	Khandwa	Madhya Pradesh	Madhya Pradesh	10	kWe	Community electrification	Electrical	
301	TER006	The Energy & Resources Institute	Burhanpur	Madhya Pradesh	Madhya Pradesh	10	kWe	Community electrification	Electrical	
302	TER007	The Energy & Resources Institute	Myanmar	Myanmar		20	kWe	Community electrification	Electrical	
303	TER008	The Energy & Resources Institute	Gurgaon	Haryana	Haryana	40	kWe	Community electrification	Electrical	
304	TER009	The Energy & Resources Institute	Rani Pokhri	Uttaranchal	Uttaranchal	50	kWe	Community electrification	Electrical	
305	TER010	The Energy & Resources Institute	Thailand	Thailand		100	kWe	Community electrification	Electrical	
306	TER011	The Energy & Resources Institute	Sri Lanka	Sri Lanka		150	kWe	Community electrification	Electrical	

*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
307	TER012	The Energy & Resources Institute	Sikkim	Sikkim	Sikkim	25000	kcal/hr	Community electrification	Thermal	
308	TER013	The Energy & Resources Institute	Ambernath	Maharashtra	Maharashtra	250000	kcal/hr	Community electrification	Thermal	
309	TER014	The Energy & Resources Institute	Sanjauli & Sundernagar	Himachal Pradesh	Himachal Pradesh	100000	kcal/hr	Demonstration and utilisation	Thermal	
310	TER015	The Energy & Resources Institute	Swiss Agency for Dev. & Co-operation					Community electrification	Thermal	
311	TER016	The Energy & Resources Institute	Pioneer Magnesia Works Ltd.		Gujarat	750000	kcal/hr	MgCl <sub>2</sub> production	Thermal	
312	ABE001	Advanced Bio-residues Energy Technologies Society	Village Hosahalli	Karnataka	Karnataka	20	kWe	Community electrification	Electrical	1999
313	ABE002	Advanced Bio-residues Energy Technologies Society	Coonur	Tamilnadu	Tamilnadu	250	kg/hr	Community electrification	Thermal	1995
314	ABE003	Advanced Bio-residues Energy Technologies Society	Harihar		Karnataka	200	kg/hr	Community electrification	Thermal	1995
315	ABE004	Advanced Bio-residues Energy Technologies Society	Ramanagar	Karnataka	Karnataka	500	kw/e	Community electrification	Thermal	1996/7
316	ABE005	Advanced Bio-residues Energy Technologies Society	Tamilnadu	Tamilnadu	Tamilnadu	500	kg/hr	Community electrification	Thermal	1998
317	ABE006	Advanced Bio-residues Energy Technologies Society	Harihar		Karnataka	500	kg/hr	Community electrification	Thermal	2001

*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
318	ABE007	Advanced Bio-residues Energy Technologies Society	Chile	Chile		50	kWe	Community electrification	Electrical	1999
319	ABE008	Advanced Bio-residues Energy Technologies Society	Guwahati	Assam	Assam	25	kWe	Community electrification	Electrical	2007
320	ABE009	Advanced Bio-residues Energy Technologies Society	Tamenglong	Manipur	Manipur	25	kWe	Community electrification	Electrical	
321	ABE010	Advanced Bio-residues Energy Technologies Society	Bairabi	Mizoram	Mizoram	75	kWe	Community electrification	Electrical	
322	ABE011	Advanced Bio-residues Energy Technologies Society	Arunachal Pradesh	Arunachal Pradesh	Arunachal Pradesh	2 x 5	kg/hr	Community electrification	Electrical	2006
323	NRE001	Netpro Renewable Energy (India) Pvt. Ltd.	Chatel St. Denis	Switzerland		100	kg/hr		Electrical	1995
324	NRE002	Netpro Renewable Energy (India) Pvt. Ltd.	Madhya Pradesh	Madhya Pradesh	Madhya Pradesh	120	kg/hr		Electrical	1996
325	NRE003	Netpro Renewable Energy (India) Pvt. Ltd.	Dewan Estate	Karnataka	Karnataka	65	kg/hr		Electrical	2000
326	NRE004	Netpro Renewable Energy (India) Pvt. Ltd.	Tamilnadu	Tamilnadu	Tamilnadu	135			Electrical	2001
327	NRE005	Netpro Renewable Energy (India) Pvt. Ltd.	Tamilnadu	Tamilnadu	Tamilnadu	135			Electrical	



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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
328	NRE006	Netpro Renewable Energy (India) Pvt. Ltd.	Bharbari	Bihar	Bihar	65			Electrical	2001
329	NRE007	Netpro Renewable Energy (India) Pvt. Ltd.	Synthite	Synthite		450			Electrical	2001
330	NRE008	Netpro Renewable Energy (India) Pvt. Ltd.	Agro	Agro		450			Electrical	2001
331	NRE009	Netpro Renewable Energy (India) Pvt. Ltd.	MVIT	Karnataka	Karnataka	135			Electrical	2002
332	NRE010	Netpro Renewable Energy (India) Pvt. Ltd.	MVIT II	Karnataka	Karnataka	135			Electrical	
333	NRE011	Netpro Renewable Energy (India) Pvt. Ltd.	VIT	Tamilnadu	Tamilnadu	130			Electrical	2002
334	NRE012	Netpro Renewable Energy (India) Pvt. Ltd.	Varlakonda	Karnataka	Karnataka	65			Electrical	2002
335	NRE013	Netpro Renewable Energy (India) Pvt. Ltd.	Tamilnadu	Tamilnadu	Tamilnadu	135			Electrical	2002
336	NRE014	Netpro Renewable Energy (India) Pvt. Ltd.	VIT	Tamilnadu	Tamilnadu	135			Electrical	2002
337	NRE015	Netpro Renewable Energy (India) Pvt. Ltd.	PSG College	Tamilnadu	Tamilnadu	135			Electrical	2004
338	NRE016	Netpro Renewable Energy (India) Pvt. Ltd.	Bangalore	Karnataka	Karnataka	135			Electrical	2005
339	NRE017	Netpro Renewable Energy (India) Pvt. Ltd.	KPCL	Kushalnagar	Karnataka	100			Electrical	2005
340	NRE018	Netpro Renewable Energy (India) Pvt. Ltd.	Hubli	Karnataka	Karnataka	135			Electrical	2005
341	NRE019	Netpro Renewable Energy (India) Pvt. Ltd.	Sankalp	Rajasthan	Rajasthan	35			Electrical	2006

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
342	NRE020	Netpro Renewable Energy (India) Pvt. Ltd.	Tumkur	Karnataka	Karnataka	135			Electrical	2006
343	NRE021	Netpro Renewable Energy (India) Pvt. Ltd.	Tumkur	Karnataka	Karnataka	270			Electrical	2007
344	NRE022	Netpro Renewable Energy (India) Pvt. Ltd.	Switzerland	Switzerland		425			Electrical	2007
345	EPL001	Energreen Power Ltd.	Tahafet	Tamil Nadu	Tamilnadu	300	kg/hr		Thermal	1998
346	EPL002	Energreen Power Ltd.	Mettupalyam	Tamil Nadu	Tamilnadu	100	kg/hr		Electrical	2003
347	EPL003	Energreen Power Ltd.	Arashi	Tamil Nadu	Tamilnadu	850	kg/hr		Electrical	2002, 2004
348	EPL004	Energreen Power Ltd.	NIE	Mysore	Karnataka	100	kg/hr		Electrical	2002
349	EPL005	Energreen Power Ltd.	Tanfac	Tamil Nadu	Tamilnadu	1100	kg/hr		Electrical	2003
350	EPL006	Energreen Power Ltd.	Bethmangala	Karnataka	Karnataka	600	kg/hr		Electrical	2005
351	EPL007	Energreen Power Ltd.	BERI	Karnataka	Karnataka	2x100	kg/hr		Electrical	2005
352	EPL008	Energreen Power Ltd.	Brazil	Brazil		20	kg/hr		Electrical	2004
353	EPL009	Energreen Power Ltd.	Kongu	Tamil Nadu	Tamilnadu	100	kg/hr		Electrical	2006
354	EPL010	Energreen Power Ltd.	Akavi	Tamil Nadu	Tamilnadu	250	kg/h		Electrical	2006
355	EPL011	Energreen Power Ltd.	Hatsun	Tamil Nadu	Tamilnadu	600	kg/hr		Electrical	2006
356	EPL012	Energreen Power Ltd.	Gomathy	Tamil Nadu	Tamilnadu	1600	kg/hr		Electrical	2006
357	BET001	Bioreidue Energy Technology Pvt. Ltd.	Ideal Crumb	Palakkad	Kerala	80	kg/hr		Thermal	2002

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
358	BET002	Bioresidue Energy Technology Pvt. Ltd.	Ideal Crumb	Palakkad	Kerala	100	kg/hr		Electrical	2002
359	BET003	Bioresidue Energy Technology Pvt. Ltd.	Comorin Polymers	Nagarcoil	Tamilnadu	100	kg/hr		Thermal	2002
360	BET004	Bioresidue Energy Technology Pvt. Ltd.	Hindustan Pencils Kashmir	Jammu	Jammu &	300	kg/hr		Electrical	2003
361	BET005	Bioresidue Energy Technology Pvt. Ltd.	Palakkad Rubber	Palakkad	Kerala	80	kg/hr		Thermal	2003
362	BET006	Bioresidue Energy Technology Pvt. Ltd.	Hindustan Pencils	Jammu	Jammu & Kashmir	250x2	kg/hr		Electrical	2003
363	BET007	Bioresidue Energy Technology Pvt. Ltd.	Sanghvi Woods			250x2	kg/hr		Electrical	2003
364	BET008	Bioresidue Energy Technology Pvt. Ltd.	Astra-IISc	Bangalore	Karnataka	30	kg/hr		Electrical	2004
365	BET009	Bioresidue Energy Technology Pvt. Ltd.	JNNCE, Shimoga	Shimoga	Karnataka	60	kg/hr		Electrical	2004
366	BET010	Bioresidue Energy Technology Pvt. Ltd.	Gem & Sons	Chitradurga	Karnataka	80	kg/hr		Electrical	2005
367	BET011	Bioresidue Energy Technology Pvt. Ltd.	Elite Crumb Rubber	Mangalore	Karnataka	120	kg/hr		Electrical	2006
368	BET012	Bioresidue Energy Technology Pvt. Ltd.	Green Valley	Alwaye	Kerala	120	kg/hr		Thermal	2005
369	BET013	Bioresidue Energy Technology Pvt. Ltd.	Synergy		Bengal West	120	kg/hr		Electrical	2007
370	BET014	Bioresidue Energy Technology Pvt. Ltd.	Malabar Crumb	Kozhikode	Kerala	100	kg/hr		Thermal	2007

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
371	BET015	Bioresidue Energy Technology Pvt. Ltd.	IISc - Cuba project	Bangalore	Karnataka	40	kg/hr		Thermal	2007
372	BET016	Bioresidue Energy Technology Pvt. Ltd.	Seyam Crumb		Kerala	80	kg/hr		Thermal	2007
373	BET017	Bioresidue Energy Technology Pvt. Ltd.	RUBCO Kannur	Kannur	Kerala	80	kg/hr		Electrical	2007
374	BET018	Bioresidue Energy Technology Pvt. Ltd.	Rubber Board Factory		Kerala	120	kg/hr		Thermal	2007
375	BET019	Bioresidue Energy Technology Pvt. Ltd.	IISc - Zambia Project	Bangalore	Karnataka	60	kg/hr		Electrical	2007
376	BET020	Bioresidue Energy Technology Pvt. Ltd.	Sud-Chemie			500	kg/hr		Thermal	2007
377	BET021	Bioresidue Energy Technology Pvt. Ltd.	Edathala Polymers	Kerala	Kerala	160	kg/hr		Electrical	2007
400	ARU004	Aruna Electrical Works Pvt. Ltd.	ISRO, Sriharikota	Andhra Pradesh	Andhra Pradesh	150	kWe		Thermal	2007
401	ARU005	Aruna Electrical Works Pvt. Ltd.	Green Paper Industries, Villupuram	Tamilnadu	Tamilnadu	100	kWe		Electrical	Proposed
402	ARU006	Aruna Electrical Works Pvt. Ltd.	APE P.Ltd, Villupuram	Tamilnadu	Tamilnadu	1	MWe		Electrical	Proposed
403	ARU007	Aruna Electrical Works Pvt. Ltd.	Aruna Electrical Works, Villupuram	Tamilnadu	Tamilnadu	100	kWe		Electrical	2004
404	ARU008	Aruna Electrical Works Pvt. Ltd.	MP Forest Department, Kasai Village	Madhya Pradesh	Madhya Pradesh	20	kWe		Electrical	2005
405	ARU009	Aruna Electrical Works Pvt. Ltd.	MP Forest Kasai Village	Madhya Pradesh	Madhya Pradesh	20	kWe		Electrical	2005

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Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
406	ARU010	Aruna Electrical Works Pvt. Ltd.	MP Forest Department, Barasel Village	Madhya Pradesh	Madhya Pradesh	20	kWe		Electrical	2006
407	ARU011	Aruna Electrical Works Pvt. Ltd.	MP Forest Department, Mana Village	Madhya Pradesh	Madhya Pradesh	20	kWe		Electrical	2006
408	ARU012	Aruna Electrical Works Pvt. Ltd.	DFO, Jawalagiri Village, Hosur	Tamilnadu	Tamilnadu	12	kWe		Electrical	2005
409	ARU013	Aruna Electrical Works Pvt. Ltd.	DRDA, Periyampatti, Dharmapuri	Tamilnadu	Tamilnadu	12	kWe		Electrical	2005
410	ARU014	Aruna Electrical Works Pvt. Ltd.	DRDA, Paalur, Nagarkoil	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
411	ARU015	Aruna Electrical Works Pvt. Ltd.	DRDA, Aathur, Tuticorin	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
412	ARU016	Aruna Electrical Works Pvt. Ltd.	Aurore Systems	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
413	ARU017	Aruna Electrical Works Pvt. Ltd.	Forest Department Research Wing	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
414	ARU018	Aruna Electrical Works Pvt. Ltd.	Biomass Energy for Rural India	Bangalore	Karnataka	12	kWe		Electrical	2006
415	ARU019	Aruna Electrical Works Pvt. Ltd.	DRDA, Kudalore, Pudukottai	Tamilnadu	Tamilnadu	10	kWe		Electrical	2007
416	ARU020	Aruna Electrical Works Pvt. Ltd.	DRDA, Kadaiyam Thirunelveli	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
417	ARU021	Aruna Electrical Works Pvt. Ltd.	DRDA, Irrukanthurai, Thirunelveli	Tamilnadu	Tamilnadu	12	kWe		Electrical	2007
418	ARU022	Aruna Electrical Works Pvt. Ltd.	DRDA Valuthavoor, Villupuram	Tamilnadu	Tamilnadu	12	kWe		Electrical	2006
419	REE001	Rishipooja Energy & Engineering Company	Nayak Industries Ltd.,	Gorakhpur, UP	Uttar Pradesh	500	kWe	Captive power in flour mill	Electrical	

*Inventory of existing technologies on biomass gasification in India*

Sl. No.	Supplier Code	Name of Supplier	User Name	Address	State	Capacity	Units	Used for	Mode (Electric / Thermal)	Year of installation
420	REE002	Rishipooja Energy & Engineering Company	G.Surgiwear Ltd.	Shahjahanpur, UP	Uttar Pradesh	150	kWe	Captive power in flour mill	Electrical	
421	REE003	Rishipooja Energy & Engineering Company	MN Agro Industries	Shahjahanpur, UP	Uttar Pradesh	150	kWe	Captive power in flour mill	Electrical	
422	REE004	Rishipooja Energy & Engineering Company	Gupta Re-rolling Mills	Aurangabad, Bihar	Bihar	500	kWe	Woody biomass	Thermal	
423	REE005	Rishipooja Energy & Engineering Company	Bombay Namkeen Bhandar, Manakput	Gonda, UP	Uttar Pradesh	100	kWe	Woody biomass	Thermal	
424	REE006	Rishipooja Energy & Engineering Company	Pappu Grih Udyog	Ambedkarnagar, UP	Uttar Pradesh	100	kWe	Woody biomass	Thermal	
425	REE007	Rishipooja Energy & Engineering Company	Flair Flux Pvt. Ltd.	Bhulai, Chhattisgarh	Chhattisgarh	250	kWe	Woody biomass	Thermal	
426	REE008	Rishipooja Energy & Engineering Company	Radha Krishna Mimi Rice Mill	Warsaliguni, Bihar	Bihar	60	kWe	Captive power in flour mill	Electrical	
427	REE009	Rishipooja Energy & Engineering Company	Kamla Rice Mill	Burdwan, West Bengal	West Bengal	250	kWe	Captive power in flour mill	Electrical	
428	REE010	Rishipooja Energy & Engineering Company	Glance Care P. Ltd.	Ambedkar Nagar, UP	Uttar Pradesh	60	kWe	Captive power in flour mill	Electrical	

# **Karnataka State Council for Science and Technology**

## **Indian Institute of Science, Bangalore - 560 012**

Karnataka State Council for Science and Technology (KSCST) was founded in the year 1975 to take up developmental issues of the poor and needy, especially in the rural sector. The KSCST is an independent autonomous organization with fifty-four-member council headed by the Chief Minister of the state.

The main objective is to identify areas for application of science and technology to the developmental needs relevant to prevailing conditions of backwardness - rural unemployment and poverty, to advise the government in the formulation of science and technology policies etc. In order to achieve these objectives, KSCST has chosen many areas like Industry, Agriculture, Water, Health and Education etc. Over years, the Council has translated number of projects from research and demonstration phase to the implementation and/or operational phase. The Council's great degree of success in taking S & T to the people of the State could be partly attributed to its location in the Indian Institute of Science campus and its interaction with science and technology personnel in other premier R&D institutions in Bangalore and other parts of the state. KSCST is the first state council to be set up in the country. Department of Science and Technology, Government of India, recommended this as a model to all states to set up their state councils.

Some of the key areas in which the Council has been very active are –

- Energy Sector : Solar PV,- Wind Power, Wood gassifier, Domestic stoves, / Chualas, Biogas, Micro-hydel projects.
- Water Sector : Rainwater harvesting, Fluoride removal from drinking water.
- Education Sector : Student Project Programme for engineering students, Students Scientists Interaction Programme for high school students
- Environment Sector : Solid waste management, Mapping of S&T interventions in the State
- Information Sector : Natural Resources Data Management System.
- Housing Sector : Alternate building technologies.
- Patent Information Cell

## **Department of Scientific and Industrial Research (DSIR)**

### **Government of India New Delhi**

The Department of Scientific and Industrial Research (DSIR) is a part of the Ministry of Science and Technology, Government of India. DSIR is carrying out the activities relating to indigenous technology promotion, development, utilization and transfer. The primary endeavour of DSIR is –

- To promote R&D by the industries
- To support a larger cross section of small and medium industrial units to develop state-of-the art globally competitive technologies of high commercial potential
- To catalyze faster commercialization of lab-scale R&D
- To enhance the share of technology intensive exports in overall exports
- To strengthen industrial consultancy & technology management capabilities and
- To establish user friendly information network to facilitate scientific and industrial research in the country

It also provides a link between scientific laboratories and industrial establishments for transfer of technologies through National Research Development Corporation (NRDC) and facilitates investment in R&D through Central Electronics Limited (CEL). These objectives are sought to be achieved through various promotion programmes and institutions like CSIR, CDC, NRDC, CEL etc. Some of the areas in which programmes and activities considered are - Industrial R&D Promotion, Technology Development and Innovation, Technology Management, International Technology Transfer, Consultancy Promotion, Technology Information Facilitation, Technology Development and Utilization for Women.