

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none">• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at http://cdm.unfccc.int/Reference/Documents.
03	22 December 2006	<ul style="list-style-type: none">• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

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SECTION A. General description of small-scale project activity
A.1 Title of the small-scale project activity:

Biomass Gasifier for Thermal Energy generation

Version: 06

Date : 26/05/2008

A.2. Description of the small-scale project activity:

This project is being developed by acclaim technology services with the association of TANFAC. TANFAC is a Limited company which manufacturing chemicals like Hydrofluoric acid, Aluminium Fluoride and Sulphuric acid and is located in SIPCOT industrial complex, Cuddalore District, Tamilnadu in India. The thermal energy required for this chemical manufacturing process was generated using carbon emissions intensive Furnace Oil (FO). TANFAC implemented a biomass gasifier project to replace the fossil fuel consumed for generating thermal energy. The capacity of the biomass gasifier is 1100 kg/hr. The major biomass used for this project activity is Prosopis Juliflora and Coconut Shell. This is the first single largest gasifier plant of 1100 kg/hr installed in India¹ for thermal energy applications.

¹ http://mnes.nic.in/annualreport/2003_2004_English/ch5_pg7.htm

The following are the main purpose of this project activity:

- Contribute to the Sustainable Development through the effective utilization of biomass available in the project region for thermal energy generation, thereby enhancing additional income through rural employment opportunities in the region.
- Climate Change mitigation through the generation of eco-friendly thermal energy and reduce the dependence on fossil fuel based thermal energy generation.

The main objective of project activity is to achieve sustainable development in the rural region by enhancing four pillars of sustainable development such as:

- Social and Economic well being
- Environmental well being
- Technological well being

Social-Economic well being:

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- After the implementation of this project activity, the thermal energy is generated by the biomass based gasifier. The biomass required for this project activity is collected and transported from the near by area thereby creating opportunities for the local people to find a new source of employment. This project activity created the new rural income resulting from the sale of biomass fuels.
- This project activity is a leading example for effective utilisation of biomass for thermal energy generation and implementation of this project activity will result in replication of renewable energy utilisation technology which will improve the eco-friendly approach of India.

Environmental well being:

In this project activity, the thermal energy is generated by the biomass based gasification process which replaces carbon emission intensive fossil fuels. As biomass is a CO₂ neutral fuel, combustion of biomass in this project activity does not result in net increase of CO₂ which is the major constituent in GHG emissions.

Technological well being:

- The technology used for this project activity is of indigenous type and is based on downdraft gasification as the air flow is in the downward direction. The decomposition products from the pyrolysis and drying pass through the oxidation zone. This leads to thermal cracking of the volatiles resulting in reduced tar content in the producer gas and it thus environmentally benign.
- The gasification technology can achieve the maximum thermal efficiency thereby minimising and avoiding the use of fossil fuels.

A.3. Project participants:

Name of party involved ((host) indicates a host party)	Private and/or Public entity (ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
Government of India (Host Country)	ACCLAIM TECHNOLOGY SERVICES (ATS)	No

A.4. Technical description of the small-scale project activity:

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A.4.1. Location of the small-scale project activity:
A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

Tamilnadu

A.4.1.3. City/Town/Community etc:

SIPCOT Industrial Complex

Cuddalore Taluka

Cuddalore District

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located at SIPCOT Industrial Complex in Cuddalore Taluka of Cuddalore District, Tamilnadu. The SIPCOT Industrial Complex is 6 km away from Cuddalore Taluka. The nearest Railway Station and seaport is at Cuddalore about 5 km from site. The nearest air port is at Pondicherry about 40 kms from site. The project site is located within 15° 5'11 11' to 12° 35'N latitude and 77° 09'E - 78 ° 38' to 80° E longitude respectively.

A.4.2. Type and category (ies) and technology/measure of the small-scale project activity:

The project falls under the UNFCCC small-scale CDM project activity categories under **Type-I** with project activity being Thermal energy generation for a system.

Type I : Renewable Energy project
Category : I.C Thermal energy for the user with or without electricity
Version : 13
Date : 28 March 2008

TANFAC is a chemical manufacturing unit which is located in SIPCOT industrial complex, Cuddalore District. TANFAC installed a biomass gasifier of 1100 kg/hr capacity for their thermal energy requirement which replaces the fossil fuel based thermal energy generation. The major biomass used for this project

activities are Prosopis Juliflora and Coconut Shell. The technology involved in this project activities is biomass gasification technology. The biomass gasification is a process by which biomass is converted by a thermo-chemical process into clean gaseous form. The technology is explained below.

Gasification Technology:

Gasification is a process that converts carbonaceous materials into combustible gases. The resulting gas is called producer gas. Gasification relies on chemical processes at elevated temperatures $>700^{\circ}\text{C}$. The substance of a solid fuel is usually composed of the elements carbon, hydrogen and oxygen. In the gasifiers the biomass is heated by combustion. Four different processes can be distinguished in gasification: drying, pyrolysis, oxidation and reduction

Drying:

The first stage of gasification is drying. Usually air-dried biomass contains moisture in the range of 13-15 % .The moisture content of biomass in the upper most layers is removed by evaporation using the radiation heat from oxidation zone .The temperature in this zone remains less than 120°C .

Pyrolysis:

The process by which biomass loses all its volatiles in the presence of air and gets converted to char is called pyrolysis. At temperature above 200°C , biomass starts losing its volatiles. Liberation of volatiles continues as the biomass travels almost until it reaches the oxidation zone. Once the temperature of the biomass reaches 400°C , a self-sustained exothermic reaction takes place in which the natural structure of the wood breaks down. The products of pyrolysis process are char, water vapour, Methanol, Acetic acid and considerable quantity of heavy hydrocarbon tars.

Oxidation:

The moisture vaporised in the drying zone and the volatiles released in the pyrolysis zone travels down towards oxidation zone. In this zone a calculated quantity of air drawn through the nozzles provided for the purpose. The pyrolysis gases, char and the water vapour all have to pass through this zone and combustion similar to normal stove /furnace takes place. A portion of the pyrolysis gases and char burns here and the temperature rises to about $900 - 1200^{\circ}\text{C}$. The main product of oxidation process is CO_2 .

Reduction:

The products of oxidation zone then pass through the reduction zone. Reduction zone is packed with a bed of charcoal. This charcoal is initially supplied from external sources. Later it is in the continuous

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process of being consumed by the reduction reaction and being simultaneously replenished by the char produced in the pyrolysis zone. The temperature in this zone is maintained at 600 – 900° C.

The producer gas generated in the gasifier is passed through a main gas line then supplied to the gas burners. The ash is periodically drawn from the bottom of the reactor by means of a screw extractor.

The main auxiliary equipment for the gasification plant consist of a i) gas cooling system, ii) gas cleaning systems

- i. The gas cooling system consists of a two coolers having swirl sprayer arrangement for cooling the gas by direct impingent. The producer gas leaving from gasifier is at a temperature of 550-750° K which is reduced to ambient temperature by this cooling system.
- ii. The gas filtering system consist of sand bed filters to reduce the quantity of tar and particulate matter in the gas to levels that are acceptable for direct admission into the burner.

A.4.3 Estimated amount of emission reductions over the chosen <u>crediting period</u>:

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Years	Annual estimation of emission reduction in tons of CO ₂
2008	4,434
2009	7,602
2010	7,602
2011	7,602
2012	7,602
2013	7,602
2014	7,602
Total estimated reductions (tons of CO ₂)	50,046
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO ₂)	7,149

A.4.4. Public funding of the small-scale project activity:

There is no public funding involved in this project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The proposed project activity is a small-scale project activity and it is not a debundled component of a larger project activity:

SECTION B. Application of a baseline and monitoring methodology
B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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The methodology applied for this project activity is

Type : I. Renewable Energy Projects
 Category : I.C. Thermal energy for the user with or without electricity
 Version : 13
 Date : 28 March 2008

B.2 Justification of the choice of the project category:

The justification of the choice of the project category is explained below:

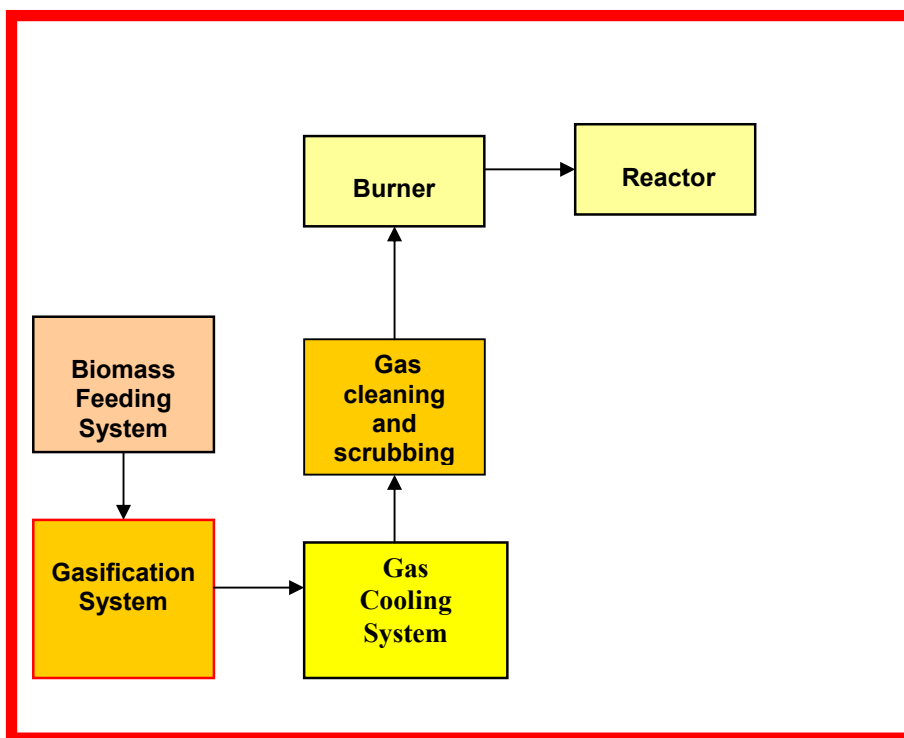
As per the Methodology	As per the Project Activity
This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Examples include solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass for water heating, space heating, or drying, and other technologies that provide thermal energy that displaces fossil fuel. Biomass-based co-generating systems that produce heat and electricity for use on-site are included in this category.	This is a biomass based gasification project used for thermal energy generation which replaces fossil fuel like furnace oil, hence the methodology is applicable for this project activity.
The thermal generation capacity is specified by the manufacturer, it shall be less than 45 MW	The total capacity of the project activity is 3.3 MW _{thermal} it is less than 45 MW _{thermal} , hence the methodology is applicable for this project activity.
For co-fired ₁ systems the aggregate installed capacity (specified for fossil fuel use) of all systems affected by the project activity shall not exceed 45 MW _{th} . Cogeneration projects that displace/avoid fossil fuel consumption in the production of thermal energy (e.g. steam or process heat) and/or electricity shall use this methodology. The capacity of the project in this case shall be the thermal energy production capacity i.e., 45 MW _{th} .	This is a biomass gasifier system. There is no fossil fuel co-fired in this system.
In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the added capacity of the units added by the project should be lower	This is a new biomass gasification project, which generates thermal energy and replaces the existing fossil fuel oil

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than 45 MW_{thermal} and should be physically distinct from the existing units. system.

B.3. Description of the project boundary:

The flow chart of the project and its boundaries is shown in the figure below. The project boundary encompasses the physical, geographical site of the gasification plant.



 Project Boundary

B.4. Description of baseline and its development:

As per the paragraph no. 6 of methodology AMS.I.C version 13 *For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies*

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that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used.

This project activity is a biomass based gasification project used for thermal energy generation which replaces fossil fuels used for thermal energy generation before the implementation of this project activity. Hence the baseline for this project activity is generation of thermal energy by fossil fuels. Baseline emission is calculated based on the fossil fuels replacement by biomass. IPCC default emission coefficients value for fossil fuels is used for baseline emission calculation. The fossil fuels Consumption in the absence of this project activity is calculated by amount of biomass consumed by the gasifier. The baseline emission for this project activity is explained detail in the Annex-3.

Date of completing the final draft of this baseline section (DD/MM/YYYY): 28/02/2007

The baseline calculations have been done by:

Asia Carbon Emission Management India P Ltd.,
167, Kodambakkam High Road,
Nungambakkam, Chennai,
Tamilnadu - 600 024.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Among the barriers suggested in the Attachment A to Appendix B of the simplified modalities and procedures for Small Scale CDM project activities, the following barriers have been identified for this biomass thermal gasification project.

- a. Technological barrier
- b. Barrier due to prevailing practice
- c. Other barriers

TANFAC during their Board of Directors' meeting held on 10th January 2003 decided to implement the Project Activity under the CDM. The extracts of the minutes of this meeting has been duly recorded and officially executed. Subsequently TANFAC invited Acclaim Technology Services to present about the details of the CDM and the eligibility of the Project Activity under the same. Acclaim Technology Services provided a detailed presentation which was duly acknowledged by TANFAC. However TANFAC was closely analyzing the transaction costs involved in the CDM and were also coping up with

the problems with their gasification plant and attempts were being made to stabilize its performance. Due to the high transaction costs, TANFAC requested officially the Acclaim Technology Services to explore avenues to reduce the transaction costs by bundling similar gasification based CDM projects. Acclaim Technology try to bundle this TANFAC project but that time clear bundling procedure was not available. The Subsequent meetings and discussions on this subject were sought by TANFAC with Acclaim Technology Services. This led to considerable delay in developing the CDM project documentation.

a. Technological barrier

A less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.

This Project Activity is located in industrial complex in Cuddalore district. Before implementation of this project activity, carbon emissions intensive furnace oil have been utilized by TANFAC for thermal energy generation. In order to reduce the GHG emissions from furnace oil combustion, this project promoters installed a new biomass gasification technology for their thermal application. The less technologically advanced alternative to the project activity is continuation of the baseline scenario i.e utilization of furnace oil for thermal energy generation, involving lower risk compared with the new biomass gasification technology. The biomass based thermal energy gasifiers carries more risks than the conventional furnace oil based thermal energy system. The various risks involved in this project activity are listed below:

Fuel Risk:

- Escalation in the price of biomass has always been historically high due to the perception of the farmers on its demand. Erratic increase in the price of biomass is highly prevalent, even in case of pre-signed contracts with biomass suppliers for a fixed price over a period of time. The project has already witnessed hike in the price of biomass by 2 to 3 times since its inception. One of the other reasons for an increase in the biomass price is also attributed to the expected increase in price of biomass transportation cost due to increase in the cost of diesel.

Technological Risk:

- The technology used in this project activity is down draft gasification. The biomass used for the project activity is prosopis juliflora and coconut shell. The major risk for this technology is tar formation due to the pyrolysis of biomass. The increase in moisture content of the biomass

would increase the tar formation. If the moisture is less than 15 % the tar content will be in the range of 50-250 mg/Nm³ and the increase in moisture level will increase the tar content to 700 mg/Nm³. Hence the moisture content of the biomass has to be maintained in the desired range which is difficult. Tar formation will affect the overall performance of the gasifier as well. Compared to up draft gasification the tar formation level is very low in down draft gasifier, but requires fine cooling and cleaning system to reduce the quantity of tar and particulate matter.

- There is always a constriction at the level of the oxidation zone to force the pyrolysis products through a concentrated high temperature zone to achieve complete decomposition. This concentrated oxidation zone can cause sintering or slagging of ash resulting in clinker formation and consequent blocking of the constricted area and /or channel formation. Continuous rotating ash grates or other mechanical shaking may be required to avoid this problem.

b Barrier due to prevailing practice

TANFAC is using biomass gasification technology for their thermal energy generation. The capacity of the TANFAC gasifier is 1100 kg/hr located in SIPCOT, Cuddalore district of Tamilnadu and this is the first single largest gasifier plant in India. The biomass gasification systems installed in TANFAC is a new technology in India and it is not in prevailing practice.

The small and medium scale industries hesitate to invest in new technologies such as gasification due to the risks involved in modification, installation, operation and maintenance of the gasifier system². According to the Policy Note 2005-2006 of Tamilnadu Energy Development agency the total capacity of biomass gasification system installed for thermal energy usage in Tamilnadu was 3,400 kW_e as on 31.12.2004³. The gasifier technology has good potential to replace fossil fuels, it is not easy to install in a specific industry. Thus, the lack of improvement in the gasification technology would have led to implementation of technology based on fossil fuel with higher emissions.

² www.teriin.org/opet/reports/smecau.pdf (Page No 4, Barriers to biomass gasification Technology)

³ <http://www.tn.gov.in/policynotes/archives/policy2005-06/energy.htm#TAMIL%20NADU%20ENERGY%20DEVELOPMENT%20AGENCY> (Section 3.3 Biomass Gasifiers)

c. Other Barriers

The fossil fuel based thermal energy generation system is replaced by new biomass gasification Technology. Due to the replacement, the Industries faced the following barriers :

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- The operating Personnel in this industry are already experienced in the conventional furnace oil system for several years. Thus implementation of new technology requires **additional training** for the operators in the biomass gasification process.
- Operating the biomass gasification system is very difficult than conventional fossil fuel system and requires **additional manpower** for biomass transportation and handling and ensuring consistent feeding the right quality and quantity of biomass for gasification.
- The producer gas generated in the gasifier having high inflammability range, and hence any leakage will lead to **higher operational risk**.

Conclusions

Thus the barrier analysis as carried out above clearly indicates that in the absence of the CDM project activity the baseline scenario would have been continuation of utilization of GHG intensive furnace oil based thermal energy generation. Further the CDM revenues are critical since such revenues will be used to mitigate various risks as mentioned above.

B.6. Emission reductions:

B.6.1.Explanation of methodological choices:

This project activity is a renewable energy technology and in the absence of this project activity the thermal energy is produced by the fossil fuel. Hence the baseline emission is calculated based on the emission coefficient of the furnace oil used in the absence of this project activity. The FO Consumption in the absence of this project activity is calculated by amount of biomass consumed by the gasifier. IPCC default emission coefficients value for FO and LDO was used for baseline emission calculation.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	η_{Gasifier}
Data unit:	%
Description:	Gasifier Efficiency
Source of data used:	Certified data from Technology Provider (Indian Institute of Technology Bangalore.)
Value applied:	83 %
Justification of the choice of data or description of	The gasifier efficiency will be calculated once in two years by the supplier.



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measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	EF _{furnace oil}
Data unit:	TCO ₂ /Tj
Description:	Emission factor for furnace oil.
Source of data used:	IPCC 2006 default values are used
Value applied:	77.22
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

➤ **Emission Reduction (ER):**

$$ER = BE - PE - L \dots\dots\dots(i)$$

BE – Baseline Emission by TANFAC in tCO₂/year

PE – Project Emissions by TANFAC in tCO₂/year

L – Emissions due to leakage by TANFAC in tCO₂/year

❖ **BASELINE EMISSION (BE)**

$$BE = HG * EF_{Furnace\ Oil\ CO_2} / \eta_{th} \dots\dots\dots(ii)$$

HG = the net quantity of heat supplied by the TANFAC Gasifier during the year y in TJ.

EF_{Furnace Oil CO₂}= the CO₂ emission factor per unit of furnace oil in 77.2 TCO₂/Tj, IPCC 2006 default emission factors are used.

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η_{th} = the efficiency of the plant using furnace oil that would have been used in the absence of the project activity is taken as 100%*.

* *Conservative approach the efficiency of the plant using furnace oil is determined by adopting a Maximum efficiency of 100%*

The Net Quantity of heat Supplied by the TANFAC Gasifier (HG)

$$HG = (Q_{\text{Coconut shell}} * C.V_{\text{Coconut shell}} + Q_{\text{Prosopis Juliflora}} * C.V_{\text{Prosopis Juliflora}}) * \eta_{\text{Gasifier}}$$

$Q_{\text{Coconut shell}}$ - Quantity of coconut shell consumed by the gasifier in Tons/month = 581

$C.V_{\text{Coconut shell}}$ - Net Calorific value of Coconut Shell in Tj/Ton = 0.01701

$Q_{\text{Prosopis Juliflora}}$ - Quantity of prosopis juliflora consumed by the gasifier in Tons/month = 0

$C.V_{\text{Prosopis Juliflora}}$ - Net Calorific value of Prosopis Juliflora in Tj/Ton = 0.01681

η_{Gasifier} - Efficiency of Gasifier 83 %

$$HG_1 = (581 * 0.01701 + 0 * 0.01681) * 0.83 * 12 \text{ months}$$

$$HG_1 = 98.43 \text{ Tj/year}$$

By substituting values of HG, $EF_{\text{Furnace Oil}}$, η_{th} in formula (ii)

$$BE = 98.43 \text{ (Tj/year)} \times 77.23 \text{ (tCO}_2\text{/Tj)} / 100\%$$

$$BE = 7,602 \text{ tCO}_2\text{/year}$$

Project Emission (PE):

This project activity is based on biomass fuel. Other than biomass there is no fossil fuel consumption by this project activity. Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO₂. Hence there is no GHG emission within the project boundary.

$$\text{Project Emission PE} = 0$$

Emissions due to leakage (L):

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As per paragraph 17 of the methodology AMSI-C-Version-13 “*If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered*”.

This biomass gasifier system is a new project and it is not transferred from another activity. The existing equipments are not transferred to another activity, hence the leakage is not considered for this project activity.

$$\text{Emissions due to leakage (L)} = 0$$

By substituting values of BE, PE and L in formula (i)

$$\begin{aligned} \text{ER} &= (7602 - 0 - 0) \\ &= 7,602 \end{aligned}$$

$$\text{Emission Reduction (ER)} = 7,602 \text{ tCO}_2/\text{year}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:

S.No	Year	Base line Emission tCO ₂ /year	Project emission tCO ₂ /year	Net Emission reduction tCO ₂ /year
1	2008	4,434	0	4,434
2	2009	7,602	0	7,602
3	2010	7,602	0	7,602
4	2011	7,602	0	7,602
5	2012	7,602	0	7,602
6	2013	7,602	0	7,602
7	2014	7,602	0	7,602
Total		50,046	0	50,046

B.7 Application of a monitoring methodology and description of the monitoring plan:
B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

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Data / Parameter:	Q _{Coconut Shell}
Data unit:	MT/Month
Description:	Quantity of coconut shell consumed by the gasifier.
Source of data to be used:	Monthly Biomass Consumption Report
Value of data	581
Description of measurement methods and procedures to be applied:	Measured by Weigh Machine. Shift engineer measure the data in every shift. Every shift data log sheet is submitted to the plant manager and these log sheets are cross verified. The plant manager maintains all the records in the paper mode. The Plant manager submits a Monthly biomass consumption report to the management, which will be documented and stored in the project office.
QA/QC procedures to be applied:	The data is cross checked with Weigh bridge Receipt. The Weigh machine is regularly calibrated as per the supplier manual.
Any comment:	-

Data / Parameter:	Q _{Prosopis Juliflora}
Data unit:	MT/Month
Description:	Quantity of prosopis juliflora consumed by the gasifier .
Source of data to be used:	Monthly Biomass Consumption Report
Value of data	0
Description of measurement methods and procedures to be applied:	Measured by Weigh Machine. Shift engineer measure the data in every shift. Every shift data log sheet is submitted to the plant manager and these log sheets are cross verified. The plant manager maintains all the records in the paper mode. The Plant manager submits a Monthly biomass consumption report to the management, which will be documented and stored in the project office
QA/QC procedures to be applied:	The data is cross checked with Weigh bridge Receipt. The Weigh machine is regularly calibrated as per the supplier manual.
Any comment:	-

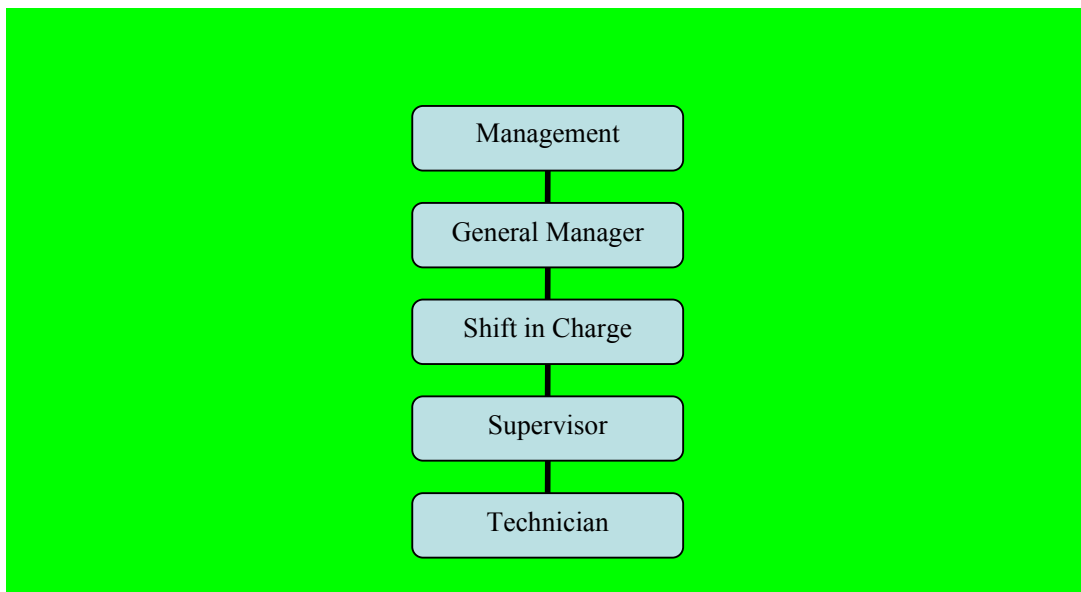
Data / Parameter:	C.V _{cocont shell}
Data unit:	Tj/Ton
Description:	Net Calorific value of Coconut Shell
Source of data used:	The Calorific Value is taken from the lab report
Value of data	0.01701
Description of measurement methods and procedures to be applied:	The calorific value of the biomass will be tested with nearest lab.
QA/QC procedures to be applied:	Lab test will be carried out once in a month.
Any comment:	-

Data / Parameter:	C.V _{Prosopis Juliflora}
Data unit:	Tj/Ton
Description:	Net Calorific value of Prosopis Juliflora
Source of data used:	The Calorific Value is taken from the lab report

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Value of data	0.01681
Description of measurement methods and procedures to be applied:	The calorific value of the biomass will be tested with nearest lab.
QA/QC procedures to be applied:	Lab test will be carried out once in a month.
Any comment:	-

B.7.2 Description of the monitoring plan:



All the measurements taken by the Shift Engineer and supervisor are recorded in the log sheets and these log sheets are verified by the shift in charge. Every shift data log sheet is submitted to the plant manager and these log sheets are cross verified. The plant manager maintains all the records in the paper mode. The Plant manager submits a monthly report to the management, which will be documented and stored in the project office. By this operational structure, the management can monitor the project activity and make amendments immediately, if needed. Hence there is no chance for data loss.

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To address all O&M issues, though the overall authority and responsibility belongs the management, it has formed a team of Technician and Supervisors, Shift in charge headed by a General Manager to effectively control and monitor the complete process of fuel procurement, quality issues, and the handling and storage of material in the plant area.

S.No	Monitoring Equipment	Functions	Calibration of the Equipments	Quality of Data
1.	Weigh Machine	Measurement of biomass quantity	Calibration is done at regular intervals as per the supplier schedule.	The biomass quantity is cross checked with the invoice from the supplier and the entry record.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of Completion of the base line study: 28/02/2007

Asia Carbon Emission Management India P Ltd.,
167, Kodambakkam High Road,
Nungambakkam, Chennai,
Tamilnadu - 600 024.

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/02/2003

C.1.2. Expected operational lifetime of the project activity:

The operational life time of the project is 25 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

The starting date of the crediting period is 01/06/2008 or a date not earlier than the date of registration of the project activity.

C.2.1.2. Length of the first crediting period:

7 Years

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C.2.2. <u>Fixed crediting period:</u>

N/A

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

D.1. If required by the <u>host Party</u>, documentation on the analysis of the environmental impacts of the project activity:

According to Indian regulation, the implementation of small scale biomass plants does not require an Environmental Impact Assessment (EIA). This project activity is an environment friendly project. The project activity generates producer gas from biomass which is a clean source of energy. The producer gas is used for thermal energy generation and thus will replace the CO₂ intensive FO. The process is thus highly environment friendly as it replaces fossil fuel with renewable energy alternative. The ash generated in this process is very low (less than 4%) and it is non-toxic. The net CO₂ emission from this project activity is zero.

D.2. If environmental impacts are considered significant by the project participants or the <u>host Party</u>, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the <u>host Party</u>:

This project activity is a small scale project activity. There is no significant environmental impact due to this project activity and hence environmental impacts assessment is not required for this project activity.

SECTION E. Stakeholders' comments**E.1. Brief description how comments by local stakeholders have been invited and compiled:**

TANFAC has conducted a stakeholder meeting on 23/03/2007 at their project site. The local population and regulatory authorities participated in that meeting. The project promoters explained the stakeholders about the various benefits like eco-friendly nature, increase of income due to the supply of biomass, improvement in their standards for living and employment opportunities due this biomass gasification project. The doubts of local people had been cleared by TANFAC.

E.2. Summary of the comments received:

The local people expressed their consent and they told this unit would initiate the economical and environmental welfare of this local region. In that meeting project promoters distributed the questionnaire to all participants and there is no negative comment received from the stakeholders. The project proponent has already established good relationship with local people who ensure co-operation for the successful and continuous operation of the plant. The local people also agreed that the biomass gasification system is an eco friendly project compared to the fossil fuel system operated earlier.

E.3. Report on how due account was taken of any comments received:

Local people are very much interested in this project due to employment generation by this project activity and there is no negative comment received from the stakeholders.

CDM – Executive Board

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY****Project Entity**

Organization:	Acclaim Technology Services
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URL:	
Represented by:	
Title:	Advisor
Salutation:	Mr.
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Direct Tel:	91-44-5216 9190
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project activity.

Annex 3

BASELINE INFORMATION

➤ Emission Reduction (ER):

$$ER = BE - PE - L \dots\dots\dots(i)$$

BE – Baseline Emission by TANFAC in tCO₂/year

PE – Project Emissions by TANFAC in tCO₂/year

L – Emissions due to leakage by TANFAC in tCO₂/year

❖ BASELINE EMISSION (BE)

$$BE = HG * EF_{\text{Furnace Oil CO}_2} / \eta_{\text{th}} \dots\dots\dots(ii)$$

HG = the net quantity of heat supplied by the TANFAC Gasifier during the year y in TJ.

$EF_{\text{Furnace Oil CO}_2}$ = the CO₂ emission factor per unit of furnace oil in 77.2 TCO₂/Tj, IPCC 2006 default emission factors are used.

η_{th} = the efficiency of the plant using furnace oil that would have been used in the absence of the project activity is taken as 100%*.

** Conservative approach the efficiency of the plant using furnace oil is determined by adopting a Maximum efficiency of 100%*

The Net Quantity of heat Supplied by the TANFAC Gasifier (HG)

$$HG = (Q_{\text{Coconut shell}} * C.V_{\text{Coconut shell}} + Q_{\text{Prosopis Juliflora}} * C.V_{\text{Prosopis Juliflora}}) * \eta_{\text{Gasifier}}$$

$Q_{\text{Coconut shell}}$ - Quantity of coconut shell consumed by the gasifier in Tons/month = 581

$C.V_{\text{Coconut shell}}$ - Net Calorific value of Coconut Shell in Tj/Ton = 0.01701

$Q_{\text{Prosopis Juliflora}}$ - Quantity of prosopis juliflora consumed by the gasifier in Tons/month = 0

$C.V_{\text{Prosopis Juliflora}}$ - Net Calorific value of Prosopis Juliflora in Tj/Ton = 0.01681

η_{Gasifier} - Efficiency of Gasifier 83 %

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$$HG_1 = (581 * 0.01701 + 0 * 0.01681) * 0.83 * 12 \text{ months}$$

$$HG_1 = 98.43 \text{ Tj/year}$$

By substituting values of HG, $EF_{\text{Furnace Oil}}$, η_{th} in formula (ii)

$$BE = 98.43 \text{ (Tj/year)} \times 77.23 \text{ (tCO}_2\text{/Tj)} / 100\%$$

$$BE = 7,602 \text{ tCO}_2\text{/year}$$

Project Emission (PE):

This project activity is based on biomass fuel. Other than biomass there is no fossil fuel consumption by this project activity. Combustion of biomass in the proposed project does not result in net increase in GHG emissions of CO₂. Hence there is no GHG emission within the project boundary.

$$\text{Project Emission PE} = 0$$

Emissions due to leakage (L):

As per paragraph 17 of the methodology AMSI-C-Version-13 “*If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered*”.

This biomass gasifier system is a new project and it is not transferred from another activity. The existing equipments are not transferred to another activity, hence the leakage is not considered for this project activity.

$$\text{Emissions due to leakage (L)} = 0$$

By substituting values of BE, PE and L in formula (i)

$$ER = (7602 - 0 - 0)$$

$$= 7,602$$

$$\text{Emission Reduction (ER)} = 7,602 \text{ tCO}_2\text{/year}$$

Annex 4

MONITORING INFORMATION

Monitoring plan already discussed in section B.7.

Appendix 1

Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission Reductions
F.O	Furnace Oil
LDO	Light Diesel Oil
SIPCOT	Small Industries Promotion Corporation of Tamilnadu.
SIDCO	Small Industries Development Corporation.
CO ₂	Carbon Di oxide
DPR	Detailed Project Report
GHG	Green House Gas
IPCC	Intra governmental Panel for Climate Change
KP	Kyoto Protocol
MNES	Ministry of Non-Conventional Energy Sources
MW	Megawatt
NGO	Non Government Organizations
PDD	Project Design Document
QA	Quality Assurance
QC	Quality Control
TEDA	Tamilnadu Energy Development Agency

Appendix 2 References

1	Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)
2	Website of United Nations Framework Convention on Climate Change, http://unfccc.int
3	UNFCCC decision 17/CP.7: Modalities and procedures for a clean development mechanism as defined in article 12 of the Kyoto Protocol
4	UNFCCC, Clean Development Mechanism, Project Design Document (CDM-PDD) AMS1C
5	Detailed Project Report(DPR) – TANFAC
6	Monthly Biomass Consumption Report of TANFAC
7	Website of Ministry of Environment and Forest (Government of India) http://envfor.nic.in/divisions/iass/notif/eia.htm
8	Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, www.mnes.nic.in