MONITORING REPORT

Boiler Fuel Conversion from RFO to Biomass Based Briquettes at Fresenius Kabi India Private Limited, Ranjangaon (M.S.), India

(UNFCCC Reference Number – 1497)

Submitted By

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First Periodic Verification

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CER Claimed: 6774 T-CO_2-e

Version 01 **Date of Report: 8th May 2009**

Content

1. INTRODUCTION

Fresenius Kabi India Private Limited (FKIPL) has registered a small-scale project activity of boiler fuel conversion as a Clean Development Mechanism (CDM) project under host country India. Fresenius Kabi India Private Limited is the leader in Infusion Therapy and Clinical Nutrition in Europe and in its most important countries of Latin America and Asia Pacific. Product portfolio of Fresenius Kabi India Private Limited (hereafter referred as FKIPL) consists of standard solutions, which include common solution, high calorie solution, hydrating solution, electrolyte, antibiotic, osmotic diuretics, glucose for parenteral nutrition. In the production process, steam is required as source for heating at various stages.

Sectoral Scope: 1 Energy industries (renewable - / non-renewable sources)

Verification Period: 1st May 2008 – 30th April 2009

2. PROJECT REFERENCE:

Sr. No.	Particulars	Reference
1	Baseline Methodology Used	AMS IC. (Version 09: 23 Dec 2006 Thermal energy for the user)
2	Registered PDD Version	Version 06 Dated: 12th Oct 2007
3	Validation Report	**Validated By:** DNV (Report No. 2007 – 1029 Revision No. 03 Date of First Issue: 05-06-07, Project No.: 46071029 **Approved by:** Michael Lehmann (Technical Director) **Organizational unit:** DNV Certification, International Climate Change Services
4	Monitoring Methodology	As Para 11 AMS IC. (Version 09: 23 December 2006 Thermal energy for the user)
5	Project Registration Date	1st May 2008

6	UNFCCC Reference No.	1497
8	Crediting Period	10 yr fixed crediting period
9	Monitoring Period	1St May 2008 – 30th April 2009
10	Version of Monitoring report	1
11	Date of Report	08 May 2009

3. BRIEF PROJECT DESCRIPTION:

Earlier plant had two Residual Furnace Oil (RFO) fired Boilers. Out of two boilers one was 10 TPH (smoke tube boiler) & another was of 8 TPH (water tube boiler). Initially 8 TPH boiler was acting as standby to the 10 TPH RFO fired boiler. In this project, fuel conversion (from RFO to biomass based briquettes) was carried out in the 8 TPH water tube boiler for steam generation. The project got commissioned on 13th June 2006. The boiler produces saturated steam at a pressure of 10 Kg/cm^2 with saturation temperature of 183.3 Deg C. While 10 TPH RFO fired boiler keeps acting as standby arrangement to project activity boiler. Now 10 TPH RFO fired boiler is also retrofitted to briquette firing mode in September 08 and kept as a standby. Its operation and briquette consumption, steam generation and monitoring is done separately.

In the first monitoring period there were no additions done by PP in project activity for further improvement. Also project activity boiler was operated successfully for 346 days in a year. As per registered PDD of project (Ref. No. 1497), briquette consumption for the year is considered as 6600 Tone per year. While in actual practice briquette was consumed equivalent to 6382 Tone per year. Accordingly estimated baseline emissions are equivalent to 7860 tones per year of CO_2 equivalent by emitting CO_2, CH_4 and N_2O. Where as the baseline emissions as per PDD are 7856 Tones of CO_2. Therefore we can say that project activity is performing as envisaged in the PDD.

As per monitoring plan direct boiler efficiency is evaluated annually and it is equivalent to 72.5% which is lower than 75.31% taken in PDD. This is again as per standard operating practices observed in industry. All monthly briquette samples are sent for NCV test. This value is used for calculating NCV ratio of FO and briquette on monthly basis thereby equivalent RFO consumption is evaluated. Also project emissions are calculated by considering N_2O and CH_4 emissions due to combustion of briquettes in boiler as per IPCC values whenever required. In addition to emissions due to electricity consumption at briquette manufacturing plant GHG emissions due to transportation of biomass and briquettes are calculated. These are equivalent to 1086.31 tones of CO_2 which is lesser than 1298 tones of CO_2 estimated in PDD. The deviations in project emissions are arising due to consideration of actual distances given by briquette supplier for each location rather than considering one single value

of distance travelled for calculation as per PDD. Project has abided with all legal compliances and has all certificates from boiler inspector and pollution control board.

The RFO fired boilers were contributing to GHG emissions. This CDM project activity primarily aims at reducing these GHG emissions by fuel conversion in the boilers for steam generation (i.e. firing briquettes in place of Residual Fuel Oil). These boilers fully comply the existing pollution norms and also operating efficiently, however FKIPL has opted to have environmentally sustainable solution for steam generation and therefore it has taken-up this project activity.

4. APPLICATION OF MONITORING METHODOLOGY & DESCRIPTION OF THE MONITORING PLAN

4.1 Data and parameters monitored:

Data / Parameter:	BRQ
Data unit:	MT/Day
Description:	Quantity of briquettes consumed per day
Source of data to be used:	Boiler log sheets maintained at the FKIPL, Ranjangaon
Value of data	17.7 (Average Value of daily briquette Consumption)
Description of measurement methods and procedures to be applied:	Electronic weighing balance is used to measure the briquette quantity in truckload. Daily briquette consumption is measured by number of tipper loads. Record of receipt of briquette quantity in truckloads through external weighing balance & also daily record of number of tipper loads carrying briquettes to the furnace is maintained at the plant.
QA/QC procedures to be applied:	Quantity of briquette consumed is monitored by using calibrated weighing scale.
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	BRQ (NCV)
Data unit:	Kcal/Kg
Description:	NCV of briquettes
Source of data to be used:	Test records maintained at Fresenius Kabi
Value of data	----
Description of measurement methods and procedures to be	Values obtained from test records from accredited laboratory & verified from briquette purchase invoices

applied:	
QA/QC procedures to be applied:	Sample of briquettes should be sent once in a month to accredited laboratory for measurement of NCV of briquettes & Verification should be done from briquette purchase invoices
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	Efficiency of briquette fired boiler
Data unit:	%
Description:	Ratio of heat output to the heat input
Source of data to be used:	Boiler log sheet maintained at Fresenius Kabi
Value of data	72.5
Description of measurement methods and procedures to be applied:	Direct Efficiency of the boiler will be evaluated by BEE Certified Energy Auditor once in a year.
QA/QC procedures to be applied:	The Boiler efficiency is checked by BEE Certified Energy Auditor and proper reports are maintained
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	SG
Data unit:	T/day
Description:	Quantity of steam generation per day
Source of data to be used:	Boiler log sheet maintained at Fresenius Kabi
Value of data	74.37 (Average Value of daily steam generation)
Description of measurement methods and procedures to be applied:	By Qualified and Trained Operator
QA/QC procedures to be applied:	Quantity of steam generation is metered on continual basis and monitored daily with the help of online cumulative meter which is already installed
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	Distance of the briquette supplier from the FKIPL
Data unit:	KM

Description:	Average distance travelled by the vehicle from briquette supplier to FKIPL
Source of data to be used:	From Briquette supplier
Value of data	-----
Description of measurement methods and procedures to be applied:	Start to end point the distance travelled is known and available.
QA/QC procedures to be applied:	
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	E_{Br}
Data unit:	KWh/tone
Description:	Electricity consumption at briquetting plant in Kwh per metric tone of briquette produced.
Source of data to be used:	Monitored data of monthly electricity bill
Value of data	------
Description of measurement methods and procedures to be applied:	From consultation with Briquetting plant and verifying the data from the electricity bill received at the Briquetting plant
QA/QC procedures to be applied:	Electricity consumption at briquetting plant will be verified annually once from the Briquette Manufacturer.
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	Distance of the biomass supplier from briquetting plant
Data unit:	KM
Description:	Average distance travelled by the vehicle from biomass supplier to briquetting plant
Source of data to be used:	Based on details provided by the Briquette Manufacturer
Value of data	-------
Description of measurement methods and procedures to be	From consultation with briquette manufacturing plant

applied:	
QA/QC procedures to be applied:	Average distance travelled by the vehicle for biomass supply will be checked if the source of biomass supply changes
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	T_s
Data unit:	^0C
Description:	Temperature of the steam generated
Source of data to be used:	Boiler log sheet maintained at Fresenius Kabi
Value of data	--------
Description of measurement methods and procedures to be applied:	Temperature of the steam generated will be daily monitored with the help of temperature gauge
QA/QC procedures to be applied:	Temperature measuring instrument will be calibrated once in a year to check its degree of accuracy
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	P_s
Data unit:	Kg/cm^2
Description:	Pressure of the steam generated
Source of data to be used:	Boiler log sheet maintained at Fresenius Kabi
Value of data	-------
Description of measurement methods and procedures to be applied:	Pressure of the steam generated will be daily monitored with the help of Pressure gauge
QA/QC procedures to be applied:	Pressure measuring instrument will be calibrated once in a year to check its degree of accuracy
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	MT steam (yr)
Data unit:	MT/Year
Description:	Quantity of Steam Generation in a Year
Source of data to be	Boiler log sheet maintained at the plant

used:	
Value of data	25733
Description of measurement methods and procedures to be applied:	Steam meter has been provided which is duly calibrated. Daily steam generated is recorded.
QA/QC procedures to be applied:	The flow meter is calibrated every year.
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	KWh-B in KWh/MT of Steam-Briquette
Data unit:	KWh/MT
Description:	Electricity consumption in briquette fired boiler per MT of Steam
Source of data to be used:	Data recorded and maintained in Boiler Records of the plant
Value of data	------
Description of measurement methods and procedures to be applied:	Electricity consumption will be measured by KWh meter and steam flow will be measured by steam flow meter.
QA/QC procedures to be applied:	Electricity Meter and Flow Meter are calibrated every year.
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spread sheet (Electronic) for 12 years.

Data / Parameter:	Evaluation for surplus biomass availability for briquette manufacturing
Data unit:	MT/year
Description:	Annual evaluation of whether there is a surplus of biomass in the region will be carried out by BEE accredited Energy Audit agency. Accordingly any leakage that may need to be estimated and deducted from the emission reductions in accordance with the Board's "General guidance on leakage in biomass project activities (Ver.2) will be accounted for.
Source of data to be used:	Data available from reliable sources backed by physical survey for biomass availability in the area
Value of data	-------
Description of measurement methods and	As described above

procedures to be applied:	
QA/QC procedures to be applied:	Feedback from briquette manufacturer will also be undertaken
Any comment:	The data monitored will be archived in Logbook (Paper) for 3 years and Spreadsheet (Electronic) for 12 years.

4.2 Description of the monitoring plan:

In this project activity, as per paragraph 11 of "Type AMS. I.C. Thermal energy for the user (Version 09: 23 December 2006)", energy generated due to firing of briquette (a renewable energy source) is quantified. To verify reduction in GHG emission, the monitoring has to ensure that the quantity of steam generation is consistent with baseline steam generation.

The data monitoring will involve measurement of:

1. Quantity of briquettes consumed per day on daily basis
2. NCV of briquette once in a month
3. Efficiency of Briquette Fired Boiler to be evaluated once in a year by Certified Energy Auditor
4. Quantity of steam generation is measured on continues basis by qualified and trained operators
5. Average distance travelled by the vehicle for briquette supply to the plant will be checked if the source of briquette supply changes
6. Electricity consumption for briquette manufacturing in KWh per MT of briquette produced; this will be verified annually once from briquette manufacturer.
7. Average distance travelled by the vehicle for biomass supply will be checked if the average sources of biomass supply changes.
8. Temperature & Pressure of the steam generated is recorded in the boiler log sheet on regular basis.
9. Electricity consumption in the boiler house will be monitored with KWh meter on daily basis.
10. Annual evaluation for surplus biomass availability for briquette manufacturing will be checked.

For measurement of all the parameters and maintenance of records due care has been taken and to prepare elaborated formats for data collection; methodology has been described for measurement and collection of each of the parameter; proper training is being provided to concerned personnel; other instruments such as steam flow meter, KWh meter, electronic weigh bridge, pressure and temperature gauge are calibrated.

Quality Control & Quality Assurance Procedures identified for data monitoring are explained in detail:

Procedures identified for maintenance of steam generation system (boiler + furnace):

FKIPL has already contracted an agency for maintenance of the steam generation system (boiler + furnace). When the boiler is shut down for maintenance purposes, steam requirement will be fulfilled by standby smoke tube boiler.

Procedures identified for monitoring, measurements & reporting:

Quantity of briquette received is measured by monitoring the receipt briquette quantity in truckloads through external electronic weighing balance. Daily briquette consumption is measured by number of tipper loads. The report will be archived to make it available for the external audit & verification purposes.

Procedures identified for dealing with possible monitoring data adjustments and uncertainties:

The important parameter in calculating project emissions is briquette consumption. Briquette consumption is metered continuously. In actual practice, it may happen that the external electronic weighing balance may not work. In such cases, corresponding values from briquette purchasing invoices will be applied.

Procedures identified for internal audits of GHG project compliance with operational requirements as applicable:

In order to check the project's compliance with operational requirements, internal audit can be carried out. For this purpose, a team will be formed under the supervision of the Project Manager.

Procedures identified for day-to-day record handling (including what records to keep, storage area of records and how to process performance documentation):

Procedures identified for day-to-day record handling are as follows:

1. Daily record of quantity of the briquette consumed should be maintained properly in the format provided.
2. Records of the parameters that are monitored monthly should be maintained properly in the format provided.
3. All these records should be placed properly at the place provided.
4. Performance parameters are to be monitored by the outside accredited agencies. Monitored data should be collected from the agencies and stored properly for further reference.

5. EMISSION REDUCTIONS FROM THE SMALL SCALE PROJECT ACTIVITY:

5.1 Baseline Emissions:

As described in the item B.4, the proposed baseline is the GHG emissions that would have occurred due to use of RFO in the boiler in absence of this project activity. After switching from RFO to briquettes, the boiler's efficiency will reduce so it will consume more fuel (in terms of input energy) than with RFO. Baseline emissions are calculated based on the equivalent RFO consumption in the boiler in the absence of the project activity. Equivalent RFO consumption in the boiler in the absence of the project activity is calculated based on the quantity of briquette consumed in the project activity.

The baseline methodology is applied in the context of the project activity as follows:

GHG (yr) = GHG emissions due to RFO burning in boiler, in tons of CO_2-e per year

GHG (yr) = {(Energy generated from Equivalent RFO consumption in TJ/year x Carbon oxidation factor for RFO x IPCC default value for CO_2 emission coefficient for RFO in T/TJ) + (Energy generated from Equivalent RFO consumption in TJ/year x IPCC default value for CH_4 emission coefficient for RFO in T/TJ x GWP for CH4) + (Energy generated from Equivalent RFO consumption in TJ/year x IPCC default value for N_2O emission coefficient for RFO in T/TJ x GWP for N_2O)) + (Electricity required per MT of Steam Generation in FO fired Boiler GHG emission x Steam Generation per Year x MT of CO_2e generated per KWh)
}

GHG (yr) = {(FOH-e (yr) in TJ/year x 1 x 77.4 TCO_2/TJ)
+ (FOH-e (yr) in TJ/year x 0.003 TCH_4/TJ x 21 TCO_2/TCH_4)
+ (FOH-e (yr) in TJ/year x 0.0006 TN_2O/TJ x 310 TCO_2/TN_2O)
+ (KWh-B in KWh/MT of Steam FO x MT steam (yr) x TCO_2/KWh)
} ……. (Eq. 1)

FO-e (yr) = Equivalent RFO consumption in KT/year
= (Briquette Consumption in KT per year/2.55) x (ηB-Br /ηB-RFO)

(Oil to Briquette conversion factor is 2.55 which is because of Net Calorific Value difference; NCV of RFO = 9,665 Kcal/kg and NCV of Briquette = 3,787Kcal/kg. Ratio of these two NCVs is 2.55. While in CER calculations similar ratio is calculated for each month from laboratory tested net calorific value of briquette and IPCC NCV value of FO)

Where,

ηB-RFO = Efficiency of RFO fired boiler
ηB-Br = Efficiency of briquette fired boiler

FOH-e (yr.) = Net Heat generated by Equivalent RFO Consumption in TJ/year

= FO-e (yr) x 40.4
(Where 40.4 = NCV of RFO in TJ/KT)

5.2 Project Emissions:

Evaluation of project emissions of the project activity is based upon the quantity of briquette (renewable energy source) burnt in the boiler. GHG emissions due to burning of briquettes are evaluated based on the energy generated from burning of briquette & considering the factors for CH_4 & N_2O per TJ of energy generated from burning of briquette. It also involves the emissions related to briquette, which consists of the emissions due to transportation of biomass, manufacturing of briquette & also due to the transportation of briquette. Detailed calculations are as follows:

GHG-P (yr) = GHG emission due to burning of briquettes in boiler, in tCO_2e per year

GHG-P (yr) = {(Energy generated from burning of briquettes in TJ/year x IPCC default value for CH_4 emission coefficient for Biomass in T/TJ x GWP for CH_4) + (Energy generated from burning of briquettes in TJ/year x IPCC default value for N_2O emission coefficient for Biomass in T/TJ x GWP for N_2O) + KWh-B in KWh/MT of Steam-Briquette x MT of steam generated per year x TCO_2/KWh
}

GHG-P (yr) = {(BRH in TJ/year x 0.03 TCH_4/TJ x 21 TCO_2/TCH_4)
+ (BRH in TJ/year x 0.004 TN_2O/TJ x 310 TCO_2/TN_2O)
+ (KWh-B in KWh/MT of Steam-Briquette x MT steam (yr) x TCO_2/KWh)
}…… (Eq. 2)

BRH (TJ/year) = Net heat generated by briquette consumption in TJ/year
= BRQ (KT/year) x NCV_{Br} (TJ/KT)

Where,

BRQ (KT/year) = Briquette consumption in KT/year

NCV_{Br} (TJ/KT) = Net calorific value of briquette in TJ/KT

GHG emissions due to Briquettes:

GHG-L (yr) is sum of (a), (b) and (c)

(a) GHG emissions due to road transportation of biomass to the briquetting plant: **GHG-LR (yr)**

GHG-LR (yr) = HSD-RM-e (yr) in TJ/year x Carbon oxidation factor for HSD x CO_2 emission factor for HSD (TCO_2/TJ)

GHG-LR (yr) = HSD-RM-e (yr) in TJ/year x 1 x 74.1 TCO_2/TJ … (Eq. 3)

HSD-RM-e (yr) = Net Heat value of total HSD consumption in raw material transport from field to the briquette manufacturing plant
= HSD1 consumption in KT/Year x 43.0 TJ/KT
(Where 43.0 is NCV for HSD in TJ/KT)

HSD1 consumption in KT/year = ((Total KM travelled per year/Vehicle average fuel consumption in KM/lit) x (Density of HSD in Kg/lit) x 10^{-6}))

Total KM travelled per year = ((Total quantity of agro waste required in MT per year/Average quantity of agro waste per vehicle in MT) x (Average distance travelled per trip))

Total quantity of Agro waste required per year = (Dry biomass required in MT per year /0.65)

(65% yield and 35 % considering maximum Moisture in the Biomass received at the Briquetting plant)

Dry biomass required per year = ((Total quantity of briquette required in MT per year x 0.02) + (Total quantity of briquette required in MT per year))

(To produce briquette, dry biomass required is 2 % more than the actual quantity of briquette produced)

(b) GHG emissions due to electricity usage in briquette manufacturing: **GHG-LM (yr)**

GHG-LM (yr) = BRQ in Tonnes/year x E_{Br} (KWh/Tone) x 0.89 (TCO_2/MWh) x 0.001... (Eq. 4)

BRQ (Tones/year) = Quantity of briquette consumed in tones per year
E_{Br} (KWh/Tone) = Electricity consumption at briquetting plant in KWh per metric tone of briquette produced.

0.89 (TCO_2/MWh) = CO_2 emission factor for combined margin for Western Grid Region in TCO_2/MWh---- (As per PDD)
While for CER calculation purpose lasted CEA Version 4, baseline emission value for combined margin emission factor is taken. It is 0.805 TCO_2/MWh

0.001 = Conversion from KWh to MWh

(c) GHG emission due to road transportation of briquettes to FKIPL, Ranjangaon: **GHG-LT (yr)**

GHG-LT (yr) = HSD-BRQ-e (yr) in TJ/year x Carbon oxidation factor for HSD x CO_2 emission factor for HSD (TCO_2/TJ)

GHG-LT (yr) = HSD-BRQ-e (yr) in TJ/year x 1 x 74.1 TCO_2/TJ… (Eq. 5)

HSD-BRQ-e (yr) = Net Heat value of total HSD consumption in Briquettes from briquette manufacturing plant to FKIPL, Ranjangaon
= HSD2 consumption in KT/Year x 43.0 TJ/KT

HSD2 consumption in KT/year = ((Total KM travelled per year/Vehicle average fuel consumption in KM/lit) x (Density of HSD in Kg/lit) x 10^{-6}))

Total KM travelled per year = ((Total quantity of briquettes required in MT per year/Average quantity of briquettes per vehicle in MT) x (Average distance traveled per trip))

GHG-L (yr) = GHG emissions due to Briquettes in Tonnes per year
= GHG-LR (yr) + GHG-LM (yr) + GHG-LT (yr) ….. (Eq. 6)

Total GHG emissions that will occur due to the project activity are calculated from summation of GHG emissions obtained from Eq.2 and Eq.6.

Total project activity emissions = GHG-P (yr) + GHG-L (yr) …….. (Eq.7)

6. LEAKAGES:

Paragraph 10 of "AMS I.C. Thermal Energy for The User (Version 09: 23 December 2006)" states that

"10. If the generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered."

In the project activity, there is no transfer of energy generating equipment from another activity and no transfer of the existing equipment to another activity hence no leakage is considered.

Further, referring to "General guidance on leakage in Biomass Project Activities" with reference to the attachment C to appendix B of Indicative simplified baseline and monitoring methodologies of SSC, the project has to identify potentially significant source of leakage from renewable biomass. In this regard, following 3 aspects as per Table-1 of "General guidance on leakage in Biomass Project Activities" are evaluated:

1. Shift of previous project activity
2. Emission from Biomass Generation/Cultivation
3. Surplus biomass availability has been evaluated in the region of the project activity

1. Shift of previous project activity:

Here it is to be noted that the project activity has no bearing on the crop pattern, both of them are totally independence of each other. In absence of the project activity also crop cultivation would have occurred in as usual manner. Therefore any emission due to this reason has not been considered.

2. Emission from Biomass Generation/Cultivation:

As mentioned above there is no increase or decrease in biomass generation/cultivation or in other terms there is no impact on the agricultural practices due to this proposed CDM project activity. Therefore any emission due to this reason has not been considered.

3. Surplus biomass availability has been evaluated in the region of the project activity:

The biomass resource availability assessment for briquette manufacturing was conducted to study the biomass availability. This assessment was carried out in 20 to

200 km radius by third party. The basic objective of the study was to assess the biomass resource availability, their consumption and therefore, the surplus biomass availability.

It was found that out of total production of biomass residues only 69.46% residues are used for fuel purpose in all forms of activities and 30.54% of biomass residues are remaining as a surplus. Hence there is surplus biomass available in the region, which is not utilized and the available quantity of the surplus biomass is larger (more than 25%) than the quantity of biomass that is utilized including the project activity. Therefore implementation of the project activity has not diverted the biomass from other user to the project plant and therefore no net emission from the fossil fuel combustion due to such diversion are accounted and are considered negligible. Therefore this leakage has been neglected.

7. EMISSION REDUCTIONS:

Emission reduction due to the project activity is the difference between baseline emissions & project activity emissions.

Emission reductions
Due to the project activity = Baseline emissions – Project activity emissions
= ((GHG emission through Eq.1) - (GHG emission through Eq.7))……. (Eq. 8)

SAMPLE CALCULATION:

Emission Reduction calculation for the month of May 2008:

1. Baseline Emissions:

Referring to Eq. 1, Baseline emissions are calculated as:

GHG (month) = {(FOH-e (month) in TJ/month x 1 x 77.4 TCO_2/TJ)
+ (FOH-e (month) in TJ/month x 0.003 TCH_4/TJ x 21 TCO_2/TCH_4)
+ (FOH-e (month) in TJ/month x 0.0006 TN_2O/TJ x 310 TCO_2/TN_2O))
+ KWh-B in KWh/MT of Steam-FO x MT steam (month) x TCO_2/KWh

FO-e (month) = Equivalent RFO consumption in KT/month
= ((Briquette Consumption in KT per month/ (NCV_{FO}/NCV_{Br}) x (ηB-Br/ηB-RFO))

= ((0.544/2.19) x (72.5/79.73))

= 0.23 KT/month

FOH-e (month) = Net Heat generated by Equivalent RFO Consumption in TJ/month
= FO-e (month) x 40.4
= 0.23 x 40.4
= 9.13 TJ/month

GHG (month) = {(FOH-e (month) in TJ/month x 1 x 77.4 TCO_2/TJ)
+ (FOH-e (month) in TJ/month x 0.003 TCH_4/TJ x 21 TCO_2/TCH_4)
+ (FOH-e (month) in TJ/month x 0.0006 TN_2O/TJ x 310 TCO_2/TN_2O))
+ KWh-B in KWh/MT of Steam-FO x MT steam (month) x TCO_2/KWh

GHG (month) = ((9.13x 1 x 77.4) + (9.13 x 0.003 x 21) + (9.13 x 0.0006 x 310) + (7.2 x 2251 x 0.000805))

= 722 TCO2-e/month

GHG (month) = 722 TCO_2-e/month

2. Project Emissions:

GHG emissions due to burning of briquettes in boiler:

Referring to Eq.2, GHG emissions due to burning of briquettes in boiler are as follows:

GHG-P (month) = ((BRH in TJ/month x 0.03 TCH_4/TJ x 21 TCO_2/TCH_4)
+ (BRH in TJ/month x 0.004 TN_2O/TJ x 310 TCO_2/TN_2O)
+ (KWh-B in KWh/MT of Steam-Briquette x MT steam (yr) x TCO_2/KWh)

BRH (TJ/month) = Net heat generated by briquette consumption in TJ/month
= BRQ (KT/month) x NCV_{Br} (TJ/KT)

BRQ (KT/month) = Briquette consumption in KT/month
NCV_{Br} (TJ/KT) = Net calorific value of briquette in TJ/KT

NCV_{Br} (TJ/KT) = NCVBr (Kcal/kg) x 4.18 x 0.001
= 4413.27 x 4.18 x 0.001
= 18.45

BRH (month) = BRQ (KT/month) x NCV_{Br} (TJ/KT)
= 0.544 x 18.45

= 10.04

GHG-P (month) = ((BRH (month) in TJ/month x 0.03 TCH_4/TJ x 21 TCO_2/TCH4)
+ (BRH (month) in TJ/month x 0.004 TN_2O/TJ x 310 TCO_2/TN_2O)
+ KWh-B in KWh/MT of Steam-Briquette x MT steam (month) x TCO_2/KWh

= ((10.04x 0.03 x 21) + (10.04x 0.004 x 310) + (11.95 x 2251 x 0.00080))
= 40.29 TCO_2-e/ month

GHG-P (month) = 40.29 TCO_2-e/ month

GHG emissions due to Briquettes:

GHG-L (month) is sum of (a), (b) and (c)

(a) GHG emission due to road transportation of biomass to the briquetting plant: **GHG-LR (month)**

Referring to Eq.3, GHG emission due to road transportation of biomass to the briquetting plant is as follows:

GHG-LR (month) = HSD-RM-e (month) in TJ/month x 1 x 74.1 TCO_2/TJ

= **27.27 …** (Please refer CER sheet for detail calculation)

GHG-LR (month) = 27.27 TCO_2-e/month

(b) GHG emissions due to electricity usage in briquette manufacturing: **GHG-LM (month)**

Referring to Eq. 4, GHG emissions due to electricity usage in briquette manufacturing are as follows:

GHG-LM (month) = BRQ (Tonnes/month) x E_{Br} (KWh/Tone) x 0.80 (TCO_2 /MWh) x 0.001

0.80 (TCO_2/MWh) = CO_2 emission factor for combined margin for NEWNE Grid Region in TCO_2/MWh--------- (Value is taken from latest Central Electricity Authority (CEA): CO_2 baseline database, Version 4, for year 2007-08.

= **21.98 ….** (Please refer CER sheet for detail calculation)

GHG-LM (yr) = 21.98 TCO_2-e/month

(c) GHG emission due to road transportation of briquettes to FKIPL, Ranjangaon: **GHG-LT (month)**

Referring to Eq.5, GHG emissions due to road transportation of briquettes to FKIPL, Ranjangaon are as follows:

GHG-LT (month) = **HSD-BRQ-e (month) in TJ/month x 74.1 TCO_2/TJ**

= 10.60 ….. (Please refer CER sheet for detail calculation)

GHG-LT (month) = 10.60 TCO_2-e/month

Referring to Eq.6, total GHG emissions due to briquettes in tonnes per year are as follows:

GHG-L (month) = GHG emissions due to Briquettes in Tonnes per month
= GHG-LR (month) + GHG-LM (month) + GHG-LT (month)

= 27.27 + 21.98 + 10.6
= 59.85 TCO_2-e/month

GHG-L (yr) = 59.85 TCO_2-e/month

Referring to Eq.7, total project activity emissions is estimated as follows:

Total project activity emissions = GHG-P (month) + GHG-L (month)
= 40.29 + 59.85
= 100.14 TCO_2-e/month

Total project activity emissions = 100.14 TCO_2-e/month

3. Emission Reduction:

Referring to Eq. 8, Emission reductions due to project activity are estimated as follows:

Emission reductions
Due to the project activity = Baseline emissions – Project activity emissions
= ((GHG emission through Eq.1) - (GHG emission through Eq.7))

= ((722 – 100.14))
= 621.41 TCO_2-e/month

Emission reductions due to the project activity = 621.41 TCO_2-e/month

8. SUMMARY OF THE ESTIMATED EMISSION REDUCTIONS:

The estimated Emissions Reductions are **6774** tCO_2e for the period of 1st May 08 to 30th April 09. The break-up of CER is given in following table. As per registered PDD total estimated emission reductions are 6558 per annum. These were calculated by taking single value of distance of biomass transportation to briquetting plant and distance of briquetting plant to FKIPL. While in detail CER calculations all project emissions are calculated by taking individual distances of 16 locations from where briquette is received. Thereby difference occurs in calculation of project emission and finally quantity of emission reductions achieved. Also for monitoring period quantity of briquette consumed is approximately 17.7 Tons per day and operating days are 346. Hence number of days has gone up than 330 days taken in PDD.

Table: Emission Reductions for the Period: May 2008 to April 2009

Month	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
May-08	100.14	721.54	0	621.41
June-08	71.91	538.90	0	466.99
July-08	73.82	694.94	0	621.12
Aug-08	68.44	685.00	0	616.55
Sep-08	89.10	700.92	0	611.82
Oct-08	81.80	603.48	0	521.67
Nov-08	105.21	572.88	0	467.67
Dec-08	81.91	641.94	0	560.03
Jan-09	101.25	680.60	0	579.35
Feb-09	119.52	674.50	0	554.98
Mar-09	101.65	746.35	0	644.70
Apr-09	91.55	599.29	0	507.67
Total (Tonnes of CO_2e)	**1086.31**	**7860.27**	**0**	**6773.96**

9. ENVIRONMENTAL IMPACT

The project activity does not have any significant negative environmental impact. Therefore the environmental impact assessment undertaken in accordance with the procedure as required by the host party is not necessary for this project. Still as per regular practice observed in industries all environmental rules and regulations are followed. Flue gas analysis is carried out by third party in each three months and reports are available. Suspended particulate matter and SO_2 levels are well within the prescribed norms stated by Maharashtra Pollution Control Board (MPCB).

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Their contact details are as follows:

Organization:	Fresenius Kabi India Private Limited
Street/P.O. Box:	A-3, MIDC
Building:	
City:	Ranjangaon
State/Region:	Maharashtra
Postfix/ZIP:	412209
Country:	INDIA
Telephone:	91-2138-232283/84/85
FAX:	91-2138-232282
E-Mail:	gajanan.sathe@fresenius-kabi.com
URL:	www.fresenius-kabi-india.com
Represented by:	
Title:	Director-Technical & President Standard Solutions
Salutation:	
Last Name:	Sathe
Middle Name:	D.
First Name:	Gajanan
Department:	
Mobile:	91-9823332064
Direct FAX:	91-20-26059258
Direct tel:	91-20-26053602/3/4/5/6/7
Personal E-Mail:	gajanan.sathe@fresenius-kabi.com

Annex 2

Quantity of Briquettes consumed (MT) and Steam generation (MT) at Fresenius Kabi India Private Limited, Ranjangaon, India

Sr.No.	Year-2008-09	Briquette Consumption (MT)	Steam Generation (MT)
1	May-08	544	2251.00
2	June-08	430	1672.00
3	July-08	578	2368.00
4	Aug-08	564	2092.00
5	Sep-08	576	2323.00
6	Oct-08	506	2025.00
7	Nov-08	489	1978.00
8	Dec-08	505	2046.00
9	Jan-09	530	2143.00
10	Feb-09	544	2205.00
11	Mar-09	622	2608.00
12	Apr-09	494	2022.00
13	**Total**	**6382**	**25733**

Annex-3

Description of Facilities and Working Physical Components at FKIPL, Ranjangaon

FKIPL have following Facilities at their manufacturing plant in Ranjangaon:

1. Briquettes Storage Shed: In the FKIPL there is separate Briquettes Storage Shed to prevent briquettes from atmospheric moisture and from rain. For briquette handling man power is required. Manually briquette feeding takes place in the furnace with the help of trolley.

2. Boiler house: There are two Boilers in the boiler house one is standby and another is used for steam generation. One Boiler of 10 TPH is smoke tube boiler and another of 8 TPH water tube boiler

3. Furnace: Furnace is used to fire the briquettes. Briquette firing takes place manually in the furnace. Hot gases are passed to the Boiler for the Steam generation.

Details of Physical Equipments:

Sr. No.	Equipment/ Facility	Make/specification	Identification No.	Remark
1.	Boiler	Make: Nestler Type: Water Tube Boiler No.: B 1018 Capacity: 10 TPH Pressure: 10 kg/cm^2 Temperature: 183.3 Deg C.	IB Registry No.: MR 13500	

Details of Monitoring Equipments and Calibration Schedule:

Sr. No.	Equipment/ Facility	Make/specification	Identification No.	Remark
1.	Steam Flow meter	Make: Forbes Marshall Installed on the steam line of 8 TPH boiler to measure quantity of steam generated	(Commissioned Date:12 April, 2008) ID.No.:U08FM00100 Type: Krohne Vortex Flow	Steam flow meter will be calibrated once in a year.

			Meter VFM 5097 Sr.No.: 070357 Temp. Range: 20 to 240 deg.Centigrade.	
2.	Weighing Bridge	Make: Essae – Teraoka Ltd. Capacity: Min: 20 Kg Max:6000kg Accuracy:2kgs Machine No.:4510757223 Working Voltage:90 – 270 Volt A/C 50 Hz	Model No.: DS-451	Calibrated annually
3.	Pressure Gauge	Make: WIKA Range: 0 to 21 Kg/cm2 Location: M. P. Header Accuracy: +/- 1% F.S.D.	ID Code: U08PG01100	Calibrated Annually
4.	Temperature Gauge	Make: WIKA Range: 0 to 300 deg. Cent. Location: M. P. Header Accuracy: +/- 3% F.S.D.	S.N.: 19789 ID Code: U08TG01100 Model No. R5503/4	Calibrated Annually
5.	KWh Meter	Make: ENERCON Rating: 230 Volts, 5 A Configuration: 3 Phase -4 wire Location: Electrical room Accuracy: Class 1	S.N: 67899/12163-0805 ID No.: U01KW00100 Model No: 5240	Calibrated Annually

NOTATIONS

Notation	Representing	Unit
%	Percentage	
BEE	Bureau of Energy Efficiency	
BRQ (NCV)	NCV of briquettes	Kcal/Kg
Briquette	Briquettes manufactured using biomass	Tonnes
CDM	Clean Development Mechanism	
CEA	Central Electricity Authority	
VER	Verified Emissions Reduction	
KWh-B in KWh/MT of Steam-FO	Electricity consumption in briquette fired boiler per MT of Steam	
CO_2	Carbon-di-oxide	
CO_2-e	CO_2 equivalent	TCO_2-e
EVR	Evaporation ratio	Kg/Kg
FO-e (yr)	Equivalent RFO Consumption per year	KT
FOH-e (yr)	Net Heat generated by Equivalent RFO Consumption	TJ/year
FKIPL	Fresenius Kabi India Private Limited	
GHG	Green House Gas	
GHG Emissions	Green House Gas Emissions	TCO_2-e/year
GHG-L (yr)	GHG emission due to the Briquettes	TCO_2-e/year
GHG-LM (yr)	GHG gases emission due to electricity usage in briquette manufacturing	TCO_2-e/year
GHG-LR (yr)	GHG gases emission due to road transportation of biomass to the briquette manufacturing plant	TCO_2-e/year
GHG-LT (yr)	GHG gases emission due to road transportation of briquettes to FKIPL	TCO_2-e/year
IPCC	Intergovernmental Panel on Climate Change	
Kcal/kg	Kilo Calorie Per Kilo Gram	
Kcal/lit	Kilo Calorie Per Litre	
KG	Kilo Gram	
Kg/Kg	Kilogram Per Kilogram	
Kg/litre	Kilogram Per Litre	
Kg/TJ	Kilogram Per Tera Joule	
kg CO2equ/kWh	Kilogram of CO_2 equivalent per Kilo Watt Hour	
KT	Kilo Ton	
KT/month	Kilo Ton Per Month	

Notation	Representing	Unit
KT/year	Kilo Ton Per Year	
KWh	Kilo Watt hour	
KWh/MT	Kilo Watt Per Metric Ton	
M & P	Modalities and Procedures	
MT/Year	Metric Ton per Year	
NCV	Net Calorific Value	
PDD	Project Design Document	
RFO	Residual Fuel Oil	
TCO_2-e	Tonnes of CO_2 equivalent	
T-CO_2-e/TJ	Tonnes of CO_2 equivalent Per Tera Joule	
TJ	Tera Joule	
TJ/KT	Tera Joule Per Kilo Ton	
TJ/year	Tera Joule Per Year	
TPH	Tones Per Hour	
UNFCCC	United Nations Framework Convention on Climate Change	
yr.	Year	
$\eta_{(Direct)}$	Direct Efficiency of Boiler	%
$\eta_{(Indirect)}$	Indirect Efficiency of Boiler	%
$\eta_{B\text{-}FO}$	Efficiency of RFO Fired Boiler	%
$\eta_{B\text{-}Br}$	Efficiency of Briquette Fired Boiler	%