CLEAN DEVELOPMENT MECHANISM
1ST CDM MONITORING REPORT:

PROJECT 1314: SWITCHING OF FUEL FROM COAL TO PALM OIL MILL BIOMASS WASTE RESIDUES AT INDUSTRIAL DE OLEAGINOSAS AMERICANAS S.A. (INOLASA)

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Annexes

SECTION A. General project activity information

A.1 Title of the project activity:

Project 1314: Switching of fuel from coal to palm oil mill biomass waste residues at Industrial de Oleaginosas Americanas S.A. (INOLASA)

A.2. CDM registration:

Registration number: 1314
Registration date: 30 Nov 2007

A.3. Short description of the project activity:

The project activity comprises the installation of a biomass fuelled boiler to supply steam for internal production processes, displacing a coal-fired boiler. Coal will be replaced by palm kernel shells (PK shells) and empty fruit bunches (EFB), saving coal consumption and consequently reducing carbon emissions.

Biomass fuel will be mainly purchased from three nearby palm oil mills, called Palo Seco, Naranjo and Coto. The first two mills are located in Quepos and the last one in Golfito, in the province of Puntarenas. The biomass will be transported from the palm oil plants using trucks with a capacity of 25-28 tons each, making approximately 3 trips per day.

The proposed project activity intends to replace the current boilers by a new biomass boiler. This new boiler will have a capacity to produce 35 tons of steam/hour with a design pressure of 35 bars. However, during the first years it will only produce 20 tons of steam/hour with a pressure of 12 bars.

The boiler will combust biomass in a mixture of approximately 85% PK shells and 15% of EFB. The quantity of PK shells that the plant will need is approximated 20,000 tons a year. The combustion of biomass will result in a low amount of ash production, corresponding to 3 - 4% of the feeding mass. These ashes will be used as an aggregate for cement and concrete mixtures.

A.4. Monitoring period:

Monitoring period covered by this report: *30 November – 31 December 2007* (both days are included)

A.5. Methodology applied to the project activity:

The reference for the Baseline and Monitoring methodology is the following approved small scale methodology:

Type AMS I.C. - Thermal Energy for User (Version 10; Scope: 1; 18 May 2007)[1]

[1] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_SF2SIJB6UANOO4Z7KM1WH9YEEKKK94

A.6. Status of implementation including time table for major project parts:

The project installation is finished according to the description in the PDD and completely operational. The most important milestones are included in the following table:

Date	Milestone
15 Apr 07	Installation of boiler
24 Apr 07	Start up of boiler
30 Nov 07	Registration of project activity & start of first crediting period

A.7. Intended deviations or revisions to the registered PDD or monitoring plan:

No deviations to the monitoring procedure documented in the registered monitoring plan occurred.

A.8. Changes since last verification:

N/A

A.9. Person(s) responsible for the preparation and submission of the monitoring report:

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SECTION B. Key monitoring activities according to the monitoring plan for the monitoring period stated in A.4.

B.1. Monitoring equipment:

B.1.1. Table providing information on the equipment used:

Identification code	Device	Manufacturer	Model	Serial number	Date of installation	Date of Initial-calibration	Period of calibration
ID 1	Mass Flow Transmitter	Rosemount	3095M	0217271	05-Nov-2007	12-Sept-2007	according supplier information ten year stability
ID 3	Electricity meter	SCHNEIDER ELECTRIC	CM3250	0015000219	05-Nov-2007	Factory calibration	periodically

B.1.2. Calibration procedures:

The calibration of the monitoring equipment was carried out according to the information provided in the PDD. Since the initial calibration by the manufacturers takes place a few months ago, no further calibrations were necessary.

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default values:

Parameter	Default value	Description
ID 5: km_i	340 km and 133 km	Distance from Coto and Quepos to Barranca
ID 6: VF_{cons}	0.6 l/km	Vehicle fuel consumption
ID 7: CV_{Diesel}	45.91 (MJ/kg)	Calorific value of the fuel
ID 8: D_{Diesel}	0.85 kg/l	Diesel density in Costa Rica
ID 9: EF_{Diesel}	74.1 tCO_2/TJ	Emission factor diesel
ID 10: EU_y	1.07 GWh	Electricity consumption of baseline boiler (coal)
ID 11: EF_{grid}	62.86 tCO_2/GWh	Emission factor of the Costa Rican grid
ID 12: η_{th}	78 %	Efficiency of the boiler in the baseline scenario
ID 13: η_p	80 %	Efficiency of the boiler in the project scenario
ID 14: NCV_c	25.73 TJ/kt	Net calorific value of coal
ID 15: $COEF_c$	2380 tCO_2/kt coal	CO_2 Emission factor for coal
ID 16: h_{ss}	2782.73 KJ/kg	Enthalpy of saturated steam at 12 bar

B.2.2. Data concerning GHG emissions by sources of the project activity:

Data variable	Unit	Description
ID 2: $trucks_{i,y}$	number	Number of trucks and origin
ID 3: EU_y	GWh	Electricity consumption of the biomass boiler

B.2.3. Data concerning GHG emissions by sources of the baseline:

Data variable	Unit	Description
ID 1: F_{ss}	t	Steam flow
ID 4: Mc	t	Mass of coal consumption for co-incineration

In this monitoring period no co-incineration of coal takes place.

B.2.4. Data concerning leakage:

Since the used technology does not involve equipment transferred from another activity and the existing equipment is not transferred to another activity, no leakage needs to be considered.

B.3. Data processing and archiving:

Data handling was carried out according to the description in the PDD.

B.4. Special event log:

Date	Special event
24 Dec 07	Boiler shut down

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

C.1.1. Roles and responsibilities:

The Project owner is Industrial de Oleaginosas Americanas S.A. (INOLASA). INOLASA is therefore responsible for the operation and the monitoring of the project activities.

C.1.2. Trainings:

The technical team of INOLASA have been introduced to the system by the technology provider PETRA. Additional to that OneCarbon has trained the monitoring personal regarding CDM-monitoring aspects.

C.2. Involvement of Third Parties:

PETRA also supports the technical team during operation. Support and consultancy regarding the CDM obligations is provided by the companies Ecofys and OneCarbon B.V., both subsidiaries from the Dutch company Econcern.

C.3. Troubleshooting procedures:

In case of unforeseen problems or failures of the data recording system the operating staff will switch to manual readings of all meters. This procedure is well defined and trained to the people since manual readings as back-up for the computerised data readings are part of the normal operation during the starting period of this project. Furthermore, a logbook will be written all the time where observations and all other information necessary to document are included. In this way jumps or periods with not normal operating conditions can be identified and explained.

In cases where no data are available due to failures of the monitoring equipment the responsible for the monitoring decides as soon as possible which actions will be undertaken to minimise the amount of not registered GHG emission reduction. In this case the CDM-consultant OneCarbon will be consulted.

SECTION D. Calculation of GHG emission reductions

D.1. The used formulas:

The total emission reductions can be easily calculated with the results of the below de-scribed equations. The emission reduction is equal to the baseline emissions minus pro-ject emissions and leakage emissions. Leakage emissions in this project are considered to be zero. The general equation is as follows:

$$ER_y = BE_y - (PE_y + L_y) \qquad (1)$$

ER_y = Emission reduction$_{year}$
BE_y = Baseline emissions$_{year}$
PE_y = Project emissions$_{year}$
L_y = Leakage$_{year}$

Baseline emissions

The baseline emissions can be calculated with the following equation:

$$BE_y = BE_{heat,y} + BE_{boiler,y} \qquad (2)$$

Where :
$BE_{heat,y}$ = Emissions due to coal combustion. In absence of the project the heat would be generated by a coal boiler.
$BE_{boiler,y}$ = Emissions caused by grid electricity consumption (coal boiler).

The emissions due to coal combustion are determined by dividing the amount of generated heat during the project activity by the net calorific value of coal and the efficiency of the coal boiler. This is multiplied with a CO_2 emission factor for the displaced fossil fuel (coal):

$$BE_{heat,y} = \frac{Q_y}{\eta_{th} \cdot NCV_i} \cdot COEF_i \qquad (3)$$

Where:

$BE_{heat,y}$ = the baseline emissions for fossil fuels during the year y in tons of CO_2eq.
Q_y = is the quantity of heat generated in the project plant using renewable resources only, that displaces heat generation in the fossil fuel fired boiler during the year y in TJ. This is the same variable mentioned in AMS.I-C ver. 10 as HG_y.
η_{th} = is the energy efficiency of the boiler. The energy efficiency of the boiler that would be used in absence of the project activity is based upon the manufacturer's information. (**ID 12, fixed**)
NCV_i = is the net calorific value of the fossil fuel type i per TJ/kt. In the project only coal as a fossil fuel is used. (**ID 14, fixed**)
$COEF_i$ = is the CO_2 emission factor of the fossil fuel type i fired in the boiler in the absence of the project activity in tCO_2/kt – in the project activity only coal. (**ID 15, fixed**)

In order to open the possibility of co-incinerating renewable biomass and a minor fraction of coal, Qy should always be calculated using the following formulae (in this monitoring period no co-incineration took place):

$$Q_y = \left(Qt_y - Mc_y \cdot NCV_c \cdot \eta_p\right) \qquad \textbf{(4)}$$

Where:

Q_y	=	is the quantity of heat generated in the project plant using renewable resources only, that displaces heat generation in the fossil fuel fired boiler during the year y in TJ.
Qt_y	=	is the total quantity of heat generated in the project plant using renewable and fossil fuel resources, during year y, in TJ.
Mc_y	=	is the total mass of coal consumption for co-incineration at the project plant, during year y, in kt. (**ID 4, to be monitored**)
NCV_c	=	is the net calorific value for coal (TJ/kT). A default value of 11,404 BTU/lb will be considered based on tests done to Colombian coal (equivalent to 26.5 TJ/kt). (**ID 14, fixed**)
η_p	=	is the energy efficiency of the boiler in the project scenario. This variable is based upon the manufacturer's information. (**ID 13, fixed**)

The purpose of co-incineration for certain periods is to assure the supply of steam needed for the soybean process.

The total quantity of heat generated in the project plant (Qt_y), is to be based on the following equation:

$$Qt_y = h_{ss} \cdot F_{ss} / 10^6 \qquad \textbf{(5)}$$

Where

Qt_y	=	is the total quantity of heat generated in the project plant using renewable and fossil fuel resources, during year y, in TJ.
h_{ss}	=	is the enthalpy of the saturated steam at 12 bar (2782.73 MJ/t set as a default value) (**ID 16, fixed**).
F_{ss}	=	is the steam flow monitored, during year y (t/year) (**ID 1, to be monitored**)

The emissions resulting from electricity consumption by the boiler are determined by:

$$BE_{boiler,y} = EU_y \cdot EF_{grid} \qquad \textbf{(6)}$$

Where:

$BE_{boiler,,y}$	=	Baseline emissions resulting from electricity usage in year 'y'
EU_y	=	Electricity Usage in year 'y' (**ID 10, fixed**)
EFgrid	=	Emission factor of the Costa Rican grid. (**ID 11, fixed**)

Project emissions

The project emissions can be calculated with the following equation:

$PE_y = PE_{trans,y} + PE_{boiler,y}$ **(7)**

Where :
$PE_{trans,y}$ = project emissions resulting from transportation of the biomass in year 'y'
$PE_{boiler,,y}$ = Project emissions resulting from electricity usage in year 'y'

The CO2 emissions from a biomass load are calculated from the quantity and the specific CO2-emission factor of the fuel used by the trucks.

$$PE_{trans,y} = \sum trucks_{i,y} \cdot TransCOEF_i \quad \textbf{(8)}$$

Where:
$PE_{trans,y}$ = project emissions resulting from transportation of the biomass in year 'y'
$trucks_{i,y}$ = number of trucks supplying the biomass originating from palm oil mill i in year 'y' (**ID 2, to be monitored**)
TransCOEFi = Coefficient for the CO_2 emissions from 1 truck load of biomass originating from palm oil mill i

$$TransCOEF_i = km_i \cdot VF_{cons} \cdot CV_{diesel} \cdot D_{diesel} \cdot EF_{diesel} \quad \textbf{(9)}$$

Where:
Km_i = distance from palm oil mill i to the biomass boiler (km) (**ID 5, fixed**)
VF_{cons} = vehicle fuel consumption in litres per kilometre (l/km) (**ID 6, fixed**)
CV_{diesel} = Calorific calue of the fuel (MJ/kg) (**ID 7, fixed**)
D_{diesel} = diesel density (kg/l) (**ID 8, fixed**)
EFdiesel = emission factor diesel (tCO_2/MJ) (**ID 9, fixed**)

For the transportation of biomass trucks with a load capacity of 28 ton are used. To be conservative TransCOEFi is determined based on a full truck load. The trucks use 0.6 liter of diesel per kilometer[2], the calorific value of the fuel is 45.91 MJ/kg[3], the fuel density of diesel in Costa Rica is 0.85 kg/l[4] and the emission factor of the fuel is 20.2 tC/TJ[5].

The project emissions resulting from electricity consumption by the boiler are determined by:

$$PE_{boiler,y} = EU_y \cdot EF_{grid} \quad \textbf{(10)}$$

Where:
$PE_{boiler,,y}$ = Project emissions resulting from electricity usage in year 'y'
EU_y = Electricity Usage in year 'y' (**ID 3, to be monitored**)
EF_{grid} = Emission factor of the Costa Rican grid. (**ID 11, fixed**)

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[2] Source: truck supplier

[3] Source: Refinadora Costarricense de Petróleo, RECOPE

[4] Source: Refinadora Costarricense de Petróleo, RECOPE

[5] Source: 2006 IPCC Guidelines for National GHG inventories Table 1.3 p1.21

D.2. GHG emission reductions (referring to B.2. of this document)

D.2.1. Project emissions:

The project emissions for the project activity according to the PDD are included in the following table:

Month	**ID2: number of trucks**		**PE_{trans} [tCO_2e]**	**ID3: EU_y in MWh**	**PE_{boiler} [tCO_2e]**	**PE_{total} [tCO_2e]**
	Quepos	Coto 47				
Nov 07	0	0	0	0	0	0
Dec 07	3	18	22.62	80.13	39.13	61.75
Sum	**3**	**18**	**22.62**	**80.13**	**39.13**	**61.75**

D.2.2. Baseline emissions:

The baseline emissions for the project activity according to the PDD are included in the following table:

Month	**ID 1: F_{SS} [t]**	**ID 4: Mc [t]**	**BEheat [tCO2e]**	**BEboiler [tCO2e]**	**BEtotal [tCO2e]**
Nov 07	0	0	0	0	0
Dec 07	5,277.35	0,00	1,741.52	44.37	1,785.89
Sum	**5,277.35**	**0,00**	**1,741.52**	**44.37**	**1,785.89**

D.2.3. Leakage:

Leakage is considered to be zero (see also section B.2.4).

D.2.4. Summary of the emissions reductions during the monitoring period:

According to the general equation:

$$ER_y = BE_y - (PE_y + L_y)$$

$$Emission\ reduction = Baseline\ emissions_{total} - (Project\ emissions + Leakage)$$

Month	**BEtotal [tCO2e]**	**PE_{total} [tCO_2e]**	**ER_{total} [tCO_2e]**
Nov 07	0	0	0
Dec 07	1,785.9	61.8	1,724.1
Sum	**1,785.9**	**61.8**	**1,724.1**

The emission reductions for the period which is covered by this monitoring report is therefore

1,724.1 t CO_{2e}.

Annex 1

Definitions and acronyms

ACM	: Approved Consolidated Methodology
CDM	: Clean Development Mechanism
DOE	: Designated Operational Entity
GHG	: Greenhouse Gases
IPCC	: Intergovernmental Panel on Climate Change
PDD	: Project Design Document