



**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**

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



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

“FUEL SWITCHING FROM PETROLEUM COKE TO BIOMASS RESIDUE AT THE CAMARGO CORRÊA CEMENT PLANT OF IJACÍ” -

Version 1

Date: 26 December 2007

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

The Camargo Corrêa Group was founded in 1939 as a small construction and paving company. A strong and steady growing process let it to be one of the largest private economic groups in the country. Engineering and heavy construction remains its core activity while a wide diversification process takes place since 1968. Cement and steel production, environmental engineering, real estate development and light construction, textiles and footwear, public power utilities, transportation and highway concessions stand amongst other activities and investments of the Camargo Corrêa Group.

The first Camargo Corrêa Cimentos plant started up in 1974 in Apiai, state of São Paulo. In 1992, the group inaugurated a second cement production unit, located in Bodoquena, state of Mato Grosso do Sul. In 1997 the group acquired the “Cauê” brand under which it now generally operates in the Brazilian market. In 2003, it started the operation of its largest cement plant and the most modern of its kind in Brazil, located in Ijaci, state of Minas Gerais. Its installed production capacity exceeds 1.5 million tons of clinker a year. The group also operates other cement production units, located in Santana do Paraiso, MG, Pedro Leopoldo, MG and Jacarei, SP. These facilities mainly grind and blend different types of cement, basically using clinker produced in Ijaci.

Camargo Corrêa Cimentos is the fifth largest cement manufacturer in Brazil, with 8% of the domestic market share. In 2005, the group acquired the leading cement manufacturer in Argentina “Loma Negra”. With it, the group currently sums up overall sales of 6,3 MM tons of cement and 820M tons of concrete, operating in Brazil, Argentina, Bolivia, Paraguay and Uruguay.

The Camargo Corrêa group has a strong environmental and social commitment, and had implemented concrete actions to reduce the environmental impacts of its operations.

In this particular project Camargo Corrêa Cimentos is aiming at the reduction of Greenhouse Gases emissions at the Ijaci plant by means of the use of charcoal fine powder in place of petroleum coke in clinker production. The respective Carbon Credits issuance by the Clean Development Mechanism, and their sale into the international Carbon Market will help to overcome the financial, technical and market barriers related to the project.

The main raw material for cement production is clinker, which is the component that incorporates gluing properties to the product. Clinker is produced in high temperature kilns, where carbonated materials,

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mainly a mixture of limestone and clay, are oxidized. The kilns are special rotary long horizontal tubular structures, of high dimensions that operate continuously, receiving the raw mix in one end and delivering ready clinker in the other. Inside de kiln in the hottest zone (sinter zone) the material being fired reaches temperatures of around 1450°C. This temperature is obtained by burning in the kiln a fuel mix based on petroleum coke, that can be mixed with other materials, like charcoal, coal or different sort of residues.

Petroleum coke (often abbreviated *petcoke*) is a low cost carbonaceous solid derived from the oil refinery process. Being a fossil originated fuel, has very high GHG emission power.

Charcoal Fine Powder (CFP) is a residue generated in charcoal, pig iron and steel production plants. Its fine granulometry makes it non suitable for use in the industry so it remains as a leftover. Furthermore, charcoal fine powder comes from renewable biomass. For these reasons it is considered that it has no GHG emission power.

The state of Minas Gerais traditionally hosts most of the steel industry in Brazil. This is due to the location of large iron ore reserves in the state. Many pig iron plants operate in the region, and charcoal is currently used as the main reducer in the process. A large quantity of charcoal is locally produced and consumed, giving origin to an also large quantity of residual fine powder that exceeds its demand.

The Ijaci plant started in 2003 in that region, as one of the most advanced cement factories in Latin America. It was developed with the well renown F. L. Smith cement engineering company to operate with petroleum coke. In August 2005, aiming at the GHG emissions reduction, Camargo Corrêa Cimentos started industrial scale tests adding CFP to the fuel mix. In the following months the operational performance of the facility was carefully monitored and several adjustments were tried in order to overcome the operational problems, instabilities and interferences that effectively showed up with the new fuel addition to the mix. The tests carried out so far showed that in order to secure a stable and reliable degree of fuel shifting to CFP it is necessary to make a special investment in the plant, mainly in a new fuel storage and handling facility that will be build in 2008.

With this project Camargo Corrêa Cimentos aims at the GHG emissions reduction from its activity thus contributing to the Global Climate Change process mitigation. It also will contribute to sustainable development as a locally originated residue will be given a proper destination, leading to better local environmental and social conditions.

<b>A.3. <u>Project participants:</u></b>
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Name of Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil (host)	Camargo Corrêa Cimentos	No
Brazil (host)	ATA – Ativos Técnicos e Ambientais Ltda.	No

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**A.4. Technical description of the small-scale project activity:****A.4.1. Location of the small-scale project activity:****A.4.1.1. Host Party(ies):**

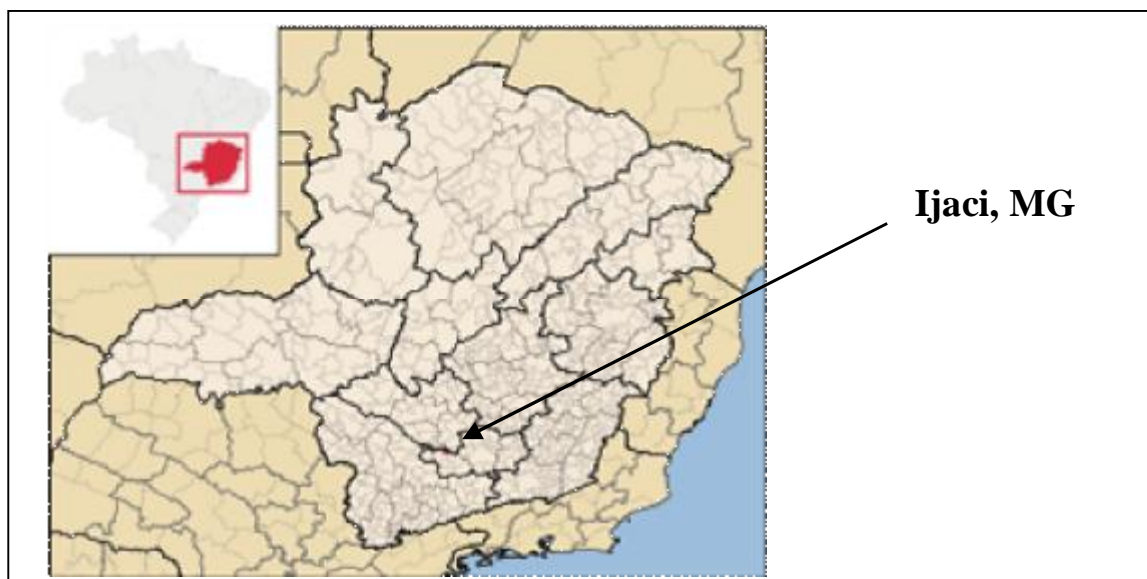
Brazil

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

State of Minas Gerais

**A.4.1.3. City/Town/Community etc.:**

City of Ijaci

**A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :****A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:**

This project is under **Type III** “Other project activities”, **category B** “Switching fossil fuels”, Sectoral scope 4 “Manufacturing Industries”

**Description of the technology utilized:**

The main raw material for cement production is clinker, which is the component that incorporates gluing properties to the product. Clinker is basically a mixture of limestone and clay, milled and grinded to fine particles, mixed in calculated proportions, which is commonly known in Brazil as “flour” or homogenized mixture.

In modern cement plants, the flour is heated in towers that support a series of vertical cyclone chambers through which the materials pass on their way to the kiln. The heating process utilizes the recovered heat

gases from the kiln, to increase energy efficiency. At the end of this phase the flour reaches even higher temperatures in a step called pre-calcination.

Pre-heated and pre-calcinated “flour” then enters a large rotating kiln, together with fuel. The fuel generally used in Brazil for this purpose is petcoke. It is used in the process in order to generate the necessary high temperatures for the calcination of the raw materials. This is the main chemical reaction that takes place in the kiln, besides other secondary reactions. The kiln is the heart of the cement producing process, a horizontally sloped steel rotary cylinder, lined with firebrick, turning at about one to three revolutions per minute. From the pre-heater, the material enters the kiln at the upper end. It slides and tumbles down the kiln into progressively hotter zones, while the chemical reactions are in progress. Additional heat is provided by a 1.800°C flame fueled by oil. In-process, in-process materials reach a temperature of 1.450°C. Finally ready clinker emerges at the lower end of the kiln.

The Camargo Correa Group has built the most modern kiln of its kind in Brazil in the cement plant of Ijaci. The design, construction and specifications of this kiln are suited specifically and uniquely for the utilization of petcoke as fuel. Not only the specific heat power, but also several other physicochemical characteristics of the fuel are determinant to the process efficiency and to the product quality. Any other types of fuel can lead to alterations in the functioning of the kiln and in the characteristics of the product.

The kiln was developed with the well renowned F. L. Smith cement engineering company. It has a nominal production capacity of 5.000 tons/day, with indicated heat efficiency of 720 Kcal/kg (3.015 KJ/kg) of clinker produced. The rotary cylinder has a diameter of 5.25 m and a length of 62 m. The preheating system is composed of 2 flows of 6 stages each.<sup>1</sup>

#### **Fuels used**

Petcoke is the most common fuel used in the cement industry due to its availability, relatively stable energy content and low price. On average, the petcoke used at Ijaci has a Net Calorific Value (NCV) of 0,033 TJoule/ton. Its emission factor is linked to its Carbon content. Although the company performs periodic analyses of the fuel, for conservative purposes, the emission factor assumed in this project is the one indicated in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Charcoal Fine Powder (CFP) is a residue obtained in charcoal and pig iron production plants. It is originated in the very charcoal production furnaces, as well in transport, storage and mechanical handling in the following phases, mainly in pig iron and steel production plants, where it is used as a reducer. Its fine granulometry makes it non suitable for use in the industry so it remains as a leftover. Charcoal is produced in large amounts in the State of Minas Gerais. The annual consumption in the State steel and pig iron industries is estimated in 5,250,000 tons<sup>2</sup>. Of this amount, around 17% is reduced to residue in the form of fine powder. Therefore, the total production of CFP can be estimated in 890.000 tons. The annual consumption of the kiln of Ijaci would represent around 4% of this amount.

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<sup>1</sup> According to construction and warranty contract signed between Camargo Correa Cimentos and F.L.Smith, June 2000.

<sup>2</sup> Source: AMS -Associação Mineira de Silvicultura - 2006

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As CFP is a residue from other industrial processes, its direct emission factor is not considered in this project, as the emissions of charcoal have already been inputted to its production or previous utilization. Fugitive emissions due to its transport have been included in this project.

On average, the NCV of the CFP utilized at Ijaci, indicate a value of 0,021 TJoule/ton. Therefore, it is necessary to utilize 1,57 tons of CFP per ton of Petcoke to produce the same energy output at the kiln.

The Petcoke utilized in Ijaci is discharged and stored in a third party contractor's area, located some 155 km away from the unit. This contractor also receives CFP, performs the analyses of both fuels and mixes them upon request. From this area, the fuel is transported to the unit of Ijaci either by truck or by train. Once discharged, the fuel is stored in a covered area, where it is remixed. From there, the fuel is stored in metallic silos, until it is conducted to the kiln.

**A.4.3 Estimated amount of emission reductions over the chosen crediting period:**
**Table 2: Estimated emission reductions**

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2008	28.942
2009	57.885
2010	57.885
2011	57.885
2012	57.885
2013	57.885
2014	57.885
2015	57.885
2016	57.885
2017	57.885
2018	28.942
<b>Total estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>578.847</b>
<b>Total number of crediting years</b>	<b>10</b>
<b>Annual average over the crediting period of estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>57.885</b>

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

No public funding is used for this project activity.

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

Based on the criteria set to determine the occurrence of debundling (see Appendix C of the Simplified Modalities & Procedures for Small-Scale CDM project activities – Determining the occurrence of debundling), we confirm that the project activity is not a debundled component of a large project activity as the project participants did not register or applied for another small-scale CDM project activity:



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- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

## **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:**

Simplified Small scale Methodology “AMS III. B. Switching fossil fuel”, version 12.

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

Project Category III B. The Sectorial scope category is 4 “Manufacturing Industries”.

1. This category comprises fossil fuel switching in existing industrial, residential, commercial, institutional or electricity generation applications. Fuel switching may change efficiency as well. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this category. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls in category II.D or II.E.

The project activity consists in the fuel switching from petroleum coke to Charcoal Fine Powder which is a biomass residue in the clinker kiln at Ijaci unit. The project activity aims at reducing emissions through fuel switching and therefore fits in the III. B category.

2. This category is not applicable to project activities that propose switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario. A relevant type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use.

The project activity consists in the fuel switching from petroleum coke to Charcoal Fine Powder residue, which is an alternative fuel, not renewable biomass, biofuel nor renewable energy.

3. Measures are limited to those that result in emission reductions of less than or equal to 60 ktCO<sub>2</sub> equivalent annually.

The project activity will not exceed the upper limit of 60KtCO<sub>2</sub>e /year. If the limit is exceeded in any year, the emission reductions accounted will match the 60ktCO<sub>2</sub>e.

### **B.3. Description of the project boundary:**

According to the AMS III B: switching fossil fuel, the project boundary is the physical (geographical) site where the fuel combustion affected by the fuel-switching measure occurs.

The project boundary is:

- The pre-heaters, where the heat of exhaust gas is used to heat the inputs for clinker production;



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- The pre-calciner, where fuels are fired for the pre-calcination of the inputs for clinker production;
- The kiln tube, where fuels are also fired and where the calcinations process takes place;
- On-site storage and on-site transportation and drying of alternative fuels (if alternative fuels are used in the project activity);
- The vehicles used for transportation of alternative fuels to the project site.

<b>B.4. Description of <u>baseline and its development</u>:</b>
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The project reduces CO<sub>2</sub> emissions by using alternative fuels in the pre-calciner and the kiln for the production of clinker in cement manufacture. Baseline emissions are calculated as follows:

$$BE_y = BE_{FF,y} + BE_{CH4,biomass,y}$$

Where:

$BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>).

$BE_{FF,y}$  = Baseline emission from fossil fuels displaced by alternative fuels or less carbon intensive fossil fuels in year y (tCO<sub>2</sub>).

$BE_{CH4,biomass,y}$  = Baseline methane emissions avoided during the year y from preventing disposal or uncontrolled burning of biomass residues (tCO<sub>2</sub>e).

Baseline emissions are determined in the following steps:

Step1: Estimate the project specific “fuel penalty”.

Step2: Calculate baseline emissions from the fossil fuels displaced by the alternative or less carbon intensive fuel(s).

Step3: Calculate baseline emissions from decay, dumping or burning of biomass residues.

All the calculation is showed in Section B.6.1.

<b>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 <u>small-scale</u> CDM project activity:</b>
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According to the Attachment A to Appendix B, project participants shall provide an explanation to show that the project activity would not have occurred anyway due at least one of the following barriers:

- Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
- Technological barrier: a less technologically advanced alternative of 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;
- Barrier due to prevailing practice: prevailing practice or existing regulatory, or policy requirements would have led to implementation of technology with higher emissions;




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- d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organization capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The information above shows that the switching fuels from petcoke to CFP is not financially attractive and has a technological barrier.

**Investment barrier:**

The NPV Project Activity undertaken without the CDM is economically less attractive than continuation of current practice.

The NPV analysis demonstrates that the project activity is not financially attractive due mainly for two reasons: the higher price in R\$<sup>3</sup>/Gcal of the CFP compared to petcoke and the investment in the construction of the CFP storage and handling facility, necessary to secure the needed fuel quality . The table below compares the NPV values with and without the CDM revenue:

	Project activity	
	with CDM revenue	without CDM revenue
NPV	1.435.315,98	-14.685.486,93

**Technological barrier:**

The CFP powder residue is obtained from various sources located in the region. This diversity makes its composition and heat power most unstable so the adjustments in the proportion of blend fuel / flour<sup>4</sup> should be performed more frequently. Moreover, the CFP powder residue tends to be contaminated with clay and other materials of the floor, during the handling of this fuel in power plants, significantly increasing the quality instability. In order to assure the quality of the fuel blend, an important investment will be made in the construction of a CFP storing and handling facility.

CFP is an abrasive material, on account of its silica contents, which causes damages to the fuel blending and grinding mill, mat carriers and other equipments in contact with this fuel. CFP also causes loss of productivity of fuel mill with increased mechanical vibration.

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<sup>3</sup> R\$ (real) - Brazilian currency. One R\$ is equivalent to 1, 81 US\$.

<sup>4</sup> Flour: raw material that enters the kiln and reacts to form clinker.




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The more the equipments are damaged the more financial and operational implications, since it increases the maintenance services, replacement or purchase of equipment and its parts and the stocks of these items has to be resized.

There is a limitation of the fuel dosage system due to the lower density, reaching a maximum loading capacity.

**Evidence that the CDM revenues were seriously considered:**

According to the Guidelines for completing CDM-PDD, CDM-NM Version 6.2 page. 11, “If the starting date of the project activity is before the date of validation, provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. This evidence shall be based on (preferably official, legal and/or other corporate) documentation that was available at, or prior to, the start of the project activity”.

The present project activity started before the date of validation. The information above shows the evidences that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

The Ijaci plant started in 2003 as one of the most advanced cement factories in Latin America. It was developed with the well renown F. L. Smith cement engineering company. It was developed, built and tuned to operate with petroleum coke. In August 2005, aiming at the GHG emissions reduction, Camargo Corrêa Cimentos started industrial scale tests adding Charcoal Fine Powder to the fuel mix. So far the clinker kiln used petcoke alone. Authorization for the CFP addition tests was asked by the Technical Management to the Operational Corporate Management of the company. The approval for the tests was granted under the condition that GHG emissions would be effectively reduced and a project for the CDM would be developed aiming at the benefits from Carbon Credits, as a support to overcome the problems that would occur in the fuel mix preparation and grinding, and mostly in its firing in the clinker kiln.

In the following months the operational performance of the facility was carefully monitored and several adjustments were tried in order to overcome the operational problems and interferences that effectively showed up with the new fuel addition to the mix. The tests carried out so far show that in order to secure the proper level of stability and reliability in the CFP addition project it is necessary to make a special investment in the plant, mainly in a new fuel storage and handling facility. The new investment was asked for approval to de Company’s Board of Directors in December 2007, and again approval was granted conditioned to the corresponding CDM project development and CERs origination. Investments are to be made in 2008 as the final step in the CFP Addition Project at Ijaci.

<b>B.6. Emission reductions:</b>
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<b>B.6.1. Explanation of methodological choices:</b>
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**Project emissions**

According to the methodology AMS III B / Version 12 used in this PDD for calculation purpose, the greenhouse gas project emissions achieved by the project activity during a year y shall be estimated as follow:

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$$PE_y = PE_{k,y} + PE_{FC,y} + PE_{EC,y} + PE_{T,y} + PE_{BC,y}$$

Where:

$PE_y$  = Project emissions during the year y (tCO<sub>2</sub>e).

$PE_{k,y}$  = Project emissions from combustion of alternative fuels and/or less carbon intensive fossil fuels in the project plant in year y (tCO<sub>2</sub>).

$PE_{FC,y}$  = Project emissions from additional fossil fuel combustion as a result of the project activity in year y (tCO<sub>2</sub>).

$PE_{EC,y}$  = Project emissions from additional electricity consumption as a result of the project activity in year y (tCO<sub>2</sub>).

$PE_{T,y}$  = CO<sub>2</sub> emissions during the year y due to transport of alternative fuels to the project plant (tCO<sub>2</sub>).

$PE_{BC,y}$  = Project emissions from the cultivation of renewable biomass at the dedicated plantation in year y (tCO<sub>2</sub>e).

The following steps are used to calculate Project Emissions:

**Step 1: Calculate project emissions from the use of alternative fuels and/or less carbon intensive fossil fuels.**

Project emissions from the use of alternative fuels and/or less carbon intensive fossil fuels in the project plant are calculated as follows:

$$PE_{k,y} = \sum_k FC_{PJ,k,y} \times NCV_{k,y} \times EF_{CO_2,k,y}$$

Where:

$PE_{k,y}$  = Project emissions from combustion of alternative fuels and/or less carbon intensive fossil fuels in the project plant in year y (tCO<sub>2</sub>).

$FC_{PJ,k,y}$  = Quantity of alternative fuel or less carbon intensive fossil fuel type k used in the project plant in year y (tons).

$EF_{CO_2,k,y}$  = Carbon dioxide emissions factor for alternative or less carbon intensive fossil fuels type k in year y (tCO<sub>2</sub>/GJ).

$NCV_{k,y}$  = Net calorific value of the alternative or less carbon intensive fossil fuel type k in year y (GJ/tonne).

$k$  = Alternative fuel types and less carbon intensive fossil fuel types used in the project plant in year y.

**Step 2: Calculate project emissions from additional electricity and/or fossil fuel consumption as a result of the project activity.**

The use of biomass residue at the project site results in additional fossil fuel and electricity consumption. This includes the following emission source:

- Mechanical treatment of the fuels.

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This mechanical treatment consists in a blend off-site process of CFP and petroleum coke. The process emissions are only from combustion of fossil fuel and the amount is considerable irrelevant to the project emissions.

***Step 3: Project emissions from combustion of fossil fuels for transportation of alternative fuels to the project plant.***

According to the methodology, project participants may choose between two different approaches to determine emissions from combustion of fossil fuel for transportation of alternative fuels: an approach based on distance and vehicle type (option 1) or on fuel consumption (option 2).

This project uses the option 2 and emissions are calculated based on the actual quantity of fossil fuels consumed for transportation. The following equation can be used:

$$PE_{T,y} = \sum_i FC_{TR,i,y} \times NCV_{i,y} \times EF_{CO_2,FF,i,y}$$

Where:

$PE_{T,y}$  = CO<sub>2</sub> emissions during the year y due to transport of alternative fuels to the project plant (tCO<sub>2</sub>/yr).

$FC_{TR,i,y}$  = Fuel consumption of fuel type i in trucks for transportation of alternative fuels during the year y (mass or volume units).

$NCV_{i,y}$  = Net calorific value of fossil fuel type i (GJ / mass or volume unit).

$EF_{CO_2,FF,i,y}$  = CO<sub>2</sub> emission factor for fossil fuel type i in year y (tCO<sub>2</sub>/GJ).

i = Fossil fuel types used for transportation of alternative fuels to the project plant in year y.

***Step 4: Calculate project emissions from the cultivation of renewable biomass at the dedicated plantation.***

This step is not applicable to this project activity.

**Baseline emissions**

The project reduces CO<sub>2</sub> emissions by using biomass residue in the pre-calciner and the kiln for the production of clinker in cement manufacture. Baseline emissions are calculated as follows:

$$BE_y = BE_{FF,y} + BE_{CH_4,biomass,y}$$

Where:

$BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>).

$BE_{FF,y}$  = Baseline emission from fossil fuels displaced by alternative fuels or less carbon intensive fossil fuels in year y (tCO<sub>2</sub>).

$BE_{CH_4,biomass,y}$  = Baseline methane emissions avoided during the year y from preventing disposal or uncontrolled burning of biomass residues (tCO<sub>2</sub>e).

Baseline emissions are determined in the following steps:

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**Step 1: Estimate the project specific “fuel penalty”.**

A project specific fuel penalty is not applied because the heat transfer efficiency will be the same.

**Step 2: Calculate baseline emissions from the fossil fuels displaced by the alternative or less carbon intensive fuel (s).**

Baseline emissions from displacement of fossil fuels are calculated as follows:

$$BE_{FF,y} = \left[ \sum_k (FC_{PJ,k,y} \times NCV_{k,y}) - FP_y \right] \times EF_{CO_2,BL,y}$$

Where:

$BE_{FF,y}$  = Baseline emission from fossil fuels displaced by alternative fuels or less carbon intensive fossil fuels in year y (tCO<sub>2</sub>).

$FC_{PJ,k,y}$  = Quantity of alternative fuel or less carbon intensive fossil fuel type k used in the project plant in year y (tons).

$NCV_{k,y}$  = Net calorific value of the alternative or less carbon intensive fuel type k in year y (GJ/tonne)

$FP_y$  = Fuel penalty in year y (GJ) = 0.

$EF_{CO_2,BL,y}$  = Carbon dioxide emissions factor for the fossil fuels displaced by the use of alternative fuels or less carbon intensive fossil fuels in the project plant in year y (tCO<sub>2</sub>/GJ).

$k$  = Alternative fuel types and less carbon intensive fossil fuel types used in the project plant in year y.

The emission factor ( $EF_{CO_2,BL,y}$ ) for the fossil fuel displaced used in this PDD, in order to determine baseline emission, is according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Values provided by the fuel supplier, measure by the project participant and regional or national default are not available or are calculated without using good practice.

**Step 3: Calculate baseline emissions from decay, dumping or burning of biomass residues.**

According to the methodology ACM0003 / Version 07, this step is included if leakage can be ruled out. Furthermore, according to the methodology AMS III-B, no leakage calculation is required.

**Leakage**

No leakage calculation is required.

**Emission Reductions**

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

$ER_y$  = Emission reductions during the year y (tCO<sub>2</sub>/yr).

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$BE_y$  = Baseline emissions during the year  $y$  (tCO<sub>2</sub>e/yr).

$PE_y$  = Project emissions during the year  $y$  (tCO<sub>2</sub>e/yr).

$LE_y$  = Leakage emissions during the year  $y$  (tCO<sub>2</sub>e/yr) = 0.

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

<b>Data / Parameter:</b>	FC <sub>PJ,k,y</sub>
Data unit:	tons
Description:	Quantity of charcoal fine powder (FC <sub>PJ,k,y</sub> ), used in the project plant in year $y$
Source of data used:	2008 Camargo Corrêa Plan
Value applied:	33.153
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value was estimated for the 2008 Camargo Corrêa Plan.
Any comment:	

<b>Data / Parameter:</b>	EF <sub>CO<sub>2</sub>,k,y</sub>
Data unit:	tCO <sub>2</sub> /TJ
Description:	Weighted average CO <sub>2</sub> emission factor for charcoal fine powder (EF <sub>CO<sub>2</sub>,k,y</sub> ) for fossil fuel of type $i$ (EF <sub>CO<sub>2</sub>,FF,i</sub> ) in year $y$ .
Source of data used:	ACM0003 / Version 07
Value applied:	zero
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology ACM 0003, EF <sub>CO<sub>2</sub>,k,y</sub> is zero for the following alternative fuels: - Wastes originating from fossil sources where W1 has been identified as the most plausible baseline scenario; - <b>Biomass residues</b> ; - Renewable biomass.
Any comment:	

<b>Data / Parameter:</b>	EF <sub>CO<sub>2</sub>,BL,y</sub>
Data unit:	tCO <sub>2</sub> /TJ
Description:	Weighted average CO <sub>2</sub> emission factor for petcoke (EF <sub>CO<sub>2</sub>,FF,i,y</sub> ) in year $y$
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	82,90
Justification of the choice of data or description of measurement methods and procedures actually applied :	Petcoke is the fossil fuel displaced by the project activity. The project participant decided to use 2006 IPCC Guidelines because no regional or national data is available.

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Any comment:	
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<b>Data / Parameter:</b>	$NCV_{i,y}$ and $NCV_{k,y}$
Data unit:	TJ/t
Description:	Weighted average net calorific value of the CPF ( $NCV_{k,y}$ ) and petcoke ( $NCV_{i,y}$ ) in year y.
Source of data used:	Measured in Project Plant
Value applied:	$NCV_{i,y} = 0,04$ and $NCV_{k,y} = 0,02$
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements are undertaken in line with national fuel standards.
Any comment:	

<b>Data / Parameter:</b>	$FC_{TR,i,y}$
Data unit:	tons
Description:	Average consumption of diesel oil in trucks for transportation of alternative fuels during the year y.
Source of data used:	Transportation companies.
Value applied:	176
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology ACM0003 / Version 07, the combustion of fossil fuel for transportation of alternative fuels to the project plant is one of the project emissions sources. Project participants chose Option 2 to calculate the emissions. Option 2: Actual quantity of fossil fuels consumed.
Any comment:	

<b>Data / Parameter:</b>	$EF_{CO_2,FF,i,y}$
Data unit:	tCO <sub>2</sub> /TJ
Description:	CO <sub>2</sub> emission factor for diesel oil
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	74,80
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	



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<b>B.6.3 Ex-ante calculation of emission reductions:</b>
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**Ex-ante Baseline emissions:**

The baseline emissions were calculated as the formula above:

$$BE_y = BE_{FF,y} + BE_{CH4,biomass,y}$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$BE_y$	58.441	29.219	tCO <sub>2</sub>
$BE_{FF,y}$	58.441	29.219	tCO <sub>2</sub>
$BE_{CH4,biomass,y}$	0	0	tCO <sub>2</sub>

Where  $BE_{FF,y}$  was calculated as follows:

$$BE_{FF,y} = \left[ \sum_k (FC_{PJ,k,y} \times NCV_{k,y}) - FP_y \right] \times EF_{CO2,BL,y}$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$BE_{FF,y}$	58.441	29.219	tCO <sub>2</sub>
$FC_{PJ,k,y}$	33.153	16.576	Tons
$NCV_{k,y}$	0,02	0,02	TJ/t
$FP_y$	0	0	TJ
$EF_{CO2,BL,y}$	82,90	82,90	tCO <sub>2</sub> /TJ

**Ex-ante project emission:**

The project emissions were calculated as the formula above:

$$PE_y = PE_{k,y} + PE_{FC,y} + PE_{EC,y} + PE_{T,y} + PE_{BC,y}$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$PE_y$	555,79	277,9	tCO <sub>2</sub>
$PE_{k,y}$	0	0	tCO <sub>2</sub>
$PE_{FC,y}$	0	0	tCO <sub>2</sub>
$PE_{EC,y}$	0	0	tCO <sub>2</sub>
$PE_{T,y}$	555,79	277,9	tCO <sub>2</sub>

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$PE_{BC,y}$	0	0	tCO <sub>2</sub>
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Where  $PE_{T,y}$  was calculated as follows:

$$PE_{T,y} = \sum_i FC_{TR,i,y} \times NCV_{i,y} \times EF_{CO_2,FF,i,y}$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$PE_{T,y}$	555,79	277,90	tCO <sub>2</sub>
$FC_{TR,i,y}$	176	88	tons
$NCV_{i,y}$	0,04	0,04	TJ/t
$EF_{CO_2,FF,i,y}$	74,8	74,8	tCO <sub>2</sub> /t

And  $PE_{k,y}$  was calculated as follows:

$$PE_{k,y} = \sum_k FC_{PJ,k,y} \times NCV_{k,y} \times EF_{CO_2,k,y}$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$PE_{k,y}$	0	0	tCO <sub>2</sub>
$FC_{PJ,k,y}$	33.153	16.576	tons
$NCV_{k,y}$	0,02	0,02	TJ/t
$EF_{CO_2,k,y}$	0	0	tCO <sub>2</sub> /t

**Ex-ante Emission Reductions**

The following equation was used to calculate emission reductions:

$$ER_y = BE_y - PE_y - LE_y$$

	Value Applied (2009 to 2017)	Value Applied (2008 and 2018)	Data unit
$ER_y$	57.885	28.942	tCO <sub>2</sub>
$BE_y$	58.441	29.219	tCO <sub>2</sub>
$PE_y$	556	278	tCO <sub>2</sub>
$LE_y$	0	0	tCO <sub>2</sub>

For more detail see section B.6.1.

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

Year	Estimation of project Activity emissions (tCO <sub>2</sub> e)	Estimation of baseline emissions (tCO <sub>2</sub> e)	Estimation of overall emissions reductions(tCO <sub>2</sub> e)
Jul. 2008	278	29.219	28.942
2009	556	58.441	57.885
2010	556	58.441	57.885
2011	556	58.441	57.885
2012	556	58.441	57.885
2013	556	58.441	57.885
2014	556	58.441	57.885
2015	556	58.441	57.885
2016	556	58.441	57.885
2017	556	58.441	57.885
Jun. 2018	278	29.219	28.942
<b>Total</b> (tonnes of CO <sub>2</sub> e)	5.558	584.405	578.847

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

<b>Data / Parameter:</b>	FC <sub>PJ,k,y</sub>
Data unit:	Tons
Description:	Quantity of charcoal fine powder used during year y
Source of data to be used:	FCPJ,k,y actual measurement in project plant.
Value of data	33.153
Description of measurement methods and procedures to be applied:	The consistency of metered fuel consumption quantities will be crosschecked by an annual energy balance that is based on purchased quantities and stock changes. Recorded continuously and aggregated annually.
QA/QC procedures to be applied:	According to ISO 9000 or similar quality systems.
Any comment:	

<b>Data / Parameter:</b>	NCV <sub>k,y</sub> and NCV <sub>i,y</sub>
Data unit:	TJ/t
Description:	Weighted average net calorific value of the charcoal fine powder (NCV <sub>k,y</sub> ) and diesel (NCV <sub>i,y</sub> ) in year y.

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Source of data to be used:	Measurements by the project participants.
Value of data	$NCV_{k,y} = 0,02$ and $NCV_{i,y} = 0,04$
Description of measurement methods and procedures to be applied:	Measurements will be undertaken in line with national or international fuel standards. The NCV will be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures to be applied:	Verify if the values are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	

<b>Data / Parameter:</b>	$FC_{TR,i,y}$
Data unit:	Tons
Description:	Fuel consumption of diesel in trucks for transportation of charcoal fine powder during the year $y$ .
Source of data to be used:	Fuel purchase receipts.
Value of data	176
Description of measurement methods and procedures to be applied:	Continuously, aggregated annually.
QA/QC procedures to be applied:	Cross-checked the resulting CO2 emissions for plausibility with a simple calculation based on the distance approach (option 1).
Any comment:	

<b>Data / Parameter:</b>	$P_{clinker,y}$
Data unit:	Tons
Description:	Production of clinker in year $y$ .
Source of data to be used:	Production data logs at the project site.
Value of data	1.500.000 tons/year
Description of measurement methods and procedures to be applied:	Weighing feeders. Recorded/calculated and reported monthly.
QA/QC procedures to be applied:	According to ISO 9000 or similar quality systems
Any comment:	



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**B.7.2 Description of the monitoring plan:**

According to the AMS III B- “Switching fossil fuels”, the monitoring shall involve:

- a. Monitoring of the fuel use and output for an appropriate period (e.g., a few years, but records of fuel use may be used) prior to the fuel switch being implemented - e.g. coal use and heat output by a district heating plant, liquid fuel oil use and electricity generated by a generating unit (records of fuel used and output can be used *in lieu* of actual monitoring);
- b. Monitoring fuel use and output after the fuel switch has been implemented - e.g. gas use and heat output by a district heating plant, gas use and electricity generated by a generating unit.

In the case of coal, the emission coefficient shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases.

The section contains the means and procedures to gather and store data for project monitoring purposes. The monitored data will be kept for at least two years after the end of the credit period, or at least two years after the last project activity CER is issued, whatever happens last. According to the methodology, the monitoring involves parameters related to natural gas combustion, and will be a responsibility of Camargo Corrêa and ATA.

Camargo Corrêa Cimentos will provide the monitoring, compared against receipts; ISO 9001 and 14000 certification will provide reliability for the gathered and monitored data, thereby meeting the best monitoring practices.

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

The baseline and monitoring methodology were completed in 12/07/2007 by ATA- Ativos Técnicos e Ambientais. ATA contact details are:

ATA - Ativos Técnicos e Ambientais

São Paulo-Brazil

Tel: 55 (11) 5505-9676

e-mail: [info@atapart.com.br](mailto:info@atapart.com.br)

**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:**

The starting date of the project activity is 01/01/2005.



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

The project activity is expected to have a minimum operational lifetime of 30 years from starting date.

**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:**

N/A

**C.2.1.2. Length of the first crediting period:**

N/A

**C.2.2. Fixed crediting period:**
**C.2.2.1. Starting date:**

01/07/2008

**C.2.2.2. Length:**

10 years

**SECTION D. Environmental impacts**
**D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

Camargo Corrêa Cimentos holds an Operation License for the activities of cement production in Ijaci n.480, granted by Fundação Estado do Meio Ambiente (FEAM), a state organization of the Government of the State of Minas Gerais, under COPAN Process no. 010/1999/003/2002. The grant of the Operational License means that the company meets the legal requirements for the activity.

Camargo Corrêa Cimentos elaborated a document called "Corporate Standard for Emergency Readiness and Handling", referred to as "Standard". The purpose of this Standard is to set and keep updated the mechanisms to handle health and safety environmental emergency occurrences, identifying their potential risk, and seeking to handle any situation involving victims, material damages and/or environmental damages; it is also intended to prevent and minimize the effects associated to those occurrences. Thus, Camargo Corrêa Cimentos S.A. demonstrates its commitment and concerns with sustainability and the environment.

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

The environmental impacts are considered not significant.

**SECTION E. Stakeholders' comments**

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

According to the Resolution #1 dated on December 2<sup>nd</sup>, 2003, from the Brazilian Inter-Ministerial Commission of Climate Change (Comissão Interministerial de Mudança Global do Clima -CIMGC), decreed on July 7<sup>th</sup>, 1999, any CDM projects must send a letter with a description of the project and an invitation for comments by local stakeholders. In this case, letters were sent to the following local stakeholders:

- City Hall of Ijaci;
- Chamber of Ijaci;
- Environment agencies from the State and Local Authority: FEAM (Fundação Estadual do meio Ambiente);
- Brazilian Forum of NGOs;
- Public District Attorney (in Portuguese: Ministério Público) and;
- Local communities associations.

Local stakeholders were invited to provide comments about the project activity. Local stakeholders had 30 days after receiving the letter to post their comments and concerns. The questions were addressed by ATA-Ativos Técnicos e Ambientais e Camargo Corrêa Cimentos. A written copy of the PDD was sent as requested.

Identification of Stakeholders:

Organization	Name of the Person	Address
City Hall of Ijaci	Mayor Maria Horaci de Oliveira	Praça Prefeito Elias Antônio Filho, 119, Centro, Ijaci-MG. Zip Code: 372005-000
Municipal Legislative Council of Ijaci	Carlos Antonio Aparecido Barbosa	Praça Prefeito Elias Antônio Filho, 55, Centro, Ijaci-MG. Zip Code: 372005-000
Fundação Estadual do Meio Ambiente - FEAM	Consuelo Ribeiro de Oliveira	R. Espírito Santo, n.495, Centro, Belo Horizonte – MG, Zip Code: 30160-030.
Public District Attorney – Comarca de Lavras - MG	Dr. Carlos Alberto Ribeiro Moreira	Av. Ernesto Matioli, n. 850, Lavras – MG, Zip Code: 37.200-000.
Fórum Brasileiro de ONG's e Movimentos Sociais para o Meio Ambiente e o Desenvolvimento	Esther Neuhaus	SCS – Quadra 08, Bloco B-50, Ed. Venâncio 2000, Sala 105, Zip Code: 70333-900, Brasília – DF.

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Lar Esperança e Vida Mateus Loureiro Ticle	Dalvanir Divina da Silva	R. Juliano Divina da Silva, 310 - Nova Era II, Lavras – MG, Zip Code: 37200-000.
AMAE – Associação de Moradores e Amigos de Ijací	Alemilson Aparecido Ferreira Brasileiro	R. José de Bastos Neto, 303, Ijací – MG, Zip Code: 37205-000
APAE de Lavras – Associação de Pais e Amigos de Excepcionais de Lavras.	Hellen / José Luis	Av. Padre Dehon, 209 - Caixa Postal 22, Lavras-MG, Zip Code: 37200-000.

**E.2. Summary of the comments received:**

No comments received at the moment.

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

N/A



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

Organization:	Camargo Corrêa Cimentos
Street/P.O.Box:	Av. Gonçalo Madeira, 600 - Jaguaré
Building:	
City:	São Paulo
State/Region:	São Paulo
Postfix/ZIP:	05348-000
Country:	Brasil
Telephone:	+ 55 11 3718-4284
FAX:	+ 55 11 3718-4320
E-Mail:	<a href="mailto:seiiti.suzuki@camargocorrea.com.br">seiiti.suzuki@camargocorrea.com.br</a>
URL:	
Represented by:	Seiiti Suzuki
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Personal E-Mail:	<a href="mailto:seiitisuzuki@hotmail.com">seiitisuzuki@hotmail.com</a>

Organization:	ATA- Ativos Técnicos e Ambientais
Street/P.O.Box:	Rua Alcides Ricardini Neves, 12
Building:	
City:	São Paulo
State/Region:	São Paulo State
Postfix/ZIP:	04575-050
Country:	Brazil
Telephone:	55 (11) 5505-9676
FAX:	55 (11) 5505-9676
E-Mail:	<a href="mailto:info@atapart.com.br">info@atapart.com.br</a>
URL:	
Represented by:	Jaime Eduardo Bunge
Title:	Partner
Salutation:	Mr.
Last Name:	Bunge
Middle Name:	Eduardo
First Name:	Jaime



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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

No public funding is used for this project activity.



**Annex 3**

**BASELINE INFORMATION**

All the explanation of the baseline is in section B.6.



#### Annex 4

### MONITORING INFORMATION

#### **Fuels net calorific value:**

The fuels are sampled and monitored in 3 points:

- 1) in gross sample, collected in Divinópolis, before being mixed,
- 2) in gross sample, collected at the plant, the mixture petcoke + charcoal fine powder, before being ground roasted,
- 3) in the sample “moída”, before being fed to the furnace. Because the mill of coke use hot gases from the furnace, there is a merger of flour to the mix of fuel, in the order of 8 to 10%.

All tests are performed in bomb calorimétrica's own laboratory. The equipment is calibrated with a standard of benzoic acid.

ASTM 240/92 for calculating the Calorific Power. As the pump calorimétrica is automatic, or simply insert the sample only for the result, there is no specific test procedure of ABNT or ASTM.

Frequency of measurements:

- Charcoal fine powder: every fifteen days,
- Crude blended fuel (fuel mix) (petcoke + charcoal fine powder): weekly,
- Grinded fuel mix: weekly.

#### **Clinker production:**

The clinker production report made on a daily basis, and goes through a system that accumulates the all the plant information every hour. All the amount of flour that is fed into the cement kiln is weighted. The quantity of clinker is then calculated through the amount of fuel ashes and the factor (flour/clinker).

Everyday information is launched manually on the SAP system.

The Monitoring Plan was described in Sections B.7 and B.8.

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