CDM
MONITORING REPORT # 36
of
“N2O Emission Reduction in Paulínia, SP, Brazil”
UNFCCC 0116

From: May 27, 2010
To: June 17, 2010

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1 Introduction

The purpose of this monitoring report is to calculate and clarify GHG emission reduction quantity achieved by this project for periodic verification.

This monitoring report covers the activity from May 27th, 2010 to June 17th, 2010 as 36th period.

The project was registered by the UNFCCC on December 25, 2005.
The first crediting period (on-going) is from November 19, 2006 to November 18, 2013 (renewable).

2. Reference

Approved Baseline methodology :
Baseline Methodology for decomposition of N2O from existing adipic acid production plants (AM0021/version 1)

Approved Monitoring methodology :
Monitoring Methodology for decomposition of N2O from existing adipic acid production plants (AM0021/version 1)

Project Design Document :
N2O Emission Reduction in Paulínia, SP, Brazil.
Version number of the document : 4
Date : October 12th, 2005

CDM registration number :
"N2O Emission Reduction in Paulínia, SP, Brazil" – UNFCCC ref number 0116

Directly related EB guidance:
EB45 Annex13 "Guidance to calculate adipic acid production in cases where it cannot be measured directly" version 1, February 13th 2009

3. Definition

y : Monitoring period (in this report, see dates § 1)
PDD : Project Design Document of this project "N2O Emission Reduction in Paulínia, SP, Brazil." Version number of the document: 4, issued on October, 12th, 2005

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4. General description of project

4.1 Project activity

Nitrous oxide (N2O) is a by-product of adipic acid production. It is of low toxicity but is a greenhouse gas (GHG), whose GWP is large (GWP=310 in the IPCC 2nd Assessment Report). Emissions of N2O will be controlled under the Kyoto Protocol. As far as we are aware, there are however no national or regional regulations or restrictions on the emission of N2O in Brazil. There are in fact no governmental regulations with quantified emission limits in any non-Annex I countries at this point.

In this project, Rhodia Poliamida e Especialidades Ltda. additionally installed N2O collection and a thermal decomposition process equipment to the currently operating adipic acid manufacturing plant. This installation reduces the GHG emissions, which would otherwise be released to the atmosphere if the project were not implemented.
The decomposition facility was installed in the factory site of Paulínia Rhodia Poliamida e Especialidades Ltda. in October 2006 and destruction of N2O was started in November 2006.

4.2 Technical description of the project

Location of the project activity
The decomposition facilities were installed in the factory site Rhodia Poliamida e Especialidades Ltda in Paulínia, SP, Brazil in October, 2006.

Technology employed by the project activity
A thermal oxidizer with 2 chambers is the technology used to decompose N2O.

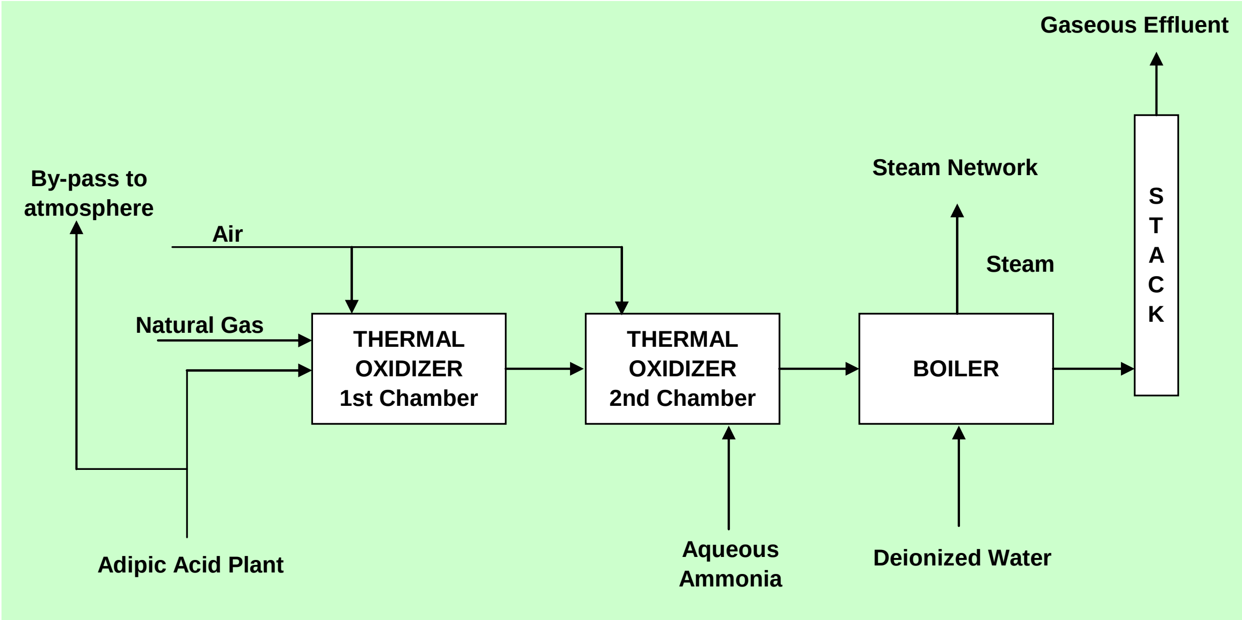
Natural gas is fed with the off gas adipic acid production containing N2O and some air in a reduction chamber, where it burns (oxidizes) to carbon dioxide CO2 and water vapour. N2O is used as an oxidizer. Being oxygen deficient, the oxidation is not complete and carbon monoxide and hydrogen are present.

$$CH_4 + 4\ N_2O \rightarrow CO_2 + 2\ H_2O + 4\ N_2$$

The temperature in the furnace is kept at about 1,300 °C and under fuel rich conditions, so as to promote the complete decomposition of N2O while minimizing the formation of unwanted combustion by-products such as NO and NO2.

The gas is then quenched with air to complete the combustion of carbon monoxide and hydrogen at a temperature of about 950°C in a second chamber. Aqueous ammonia is injected to control the emission of NO and NO2.

Before release to the stack, the flue gas coming from the thermal oxidizer is used to produce superheated steam, which is fed into the existing on-site steam network.



4.3 Implementation of the project

The project is fully implemented according to the description presented in the PDD. The project activity is completely operational.

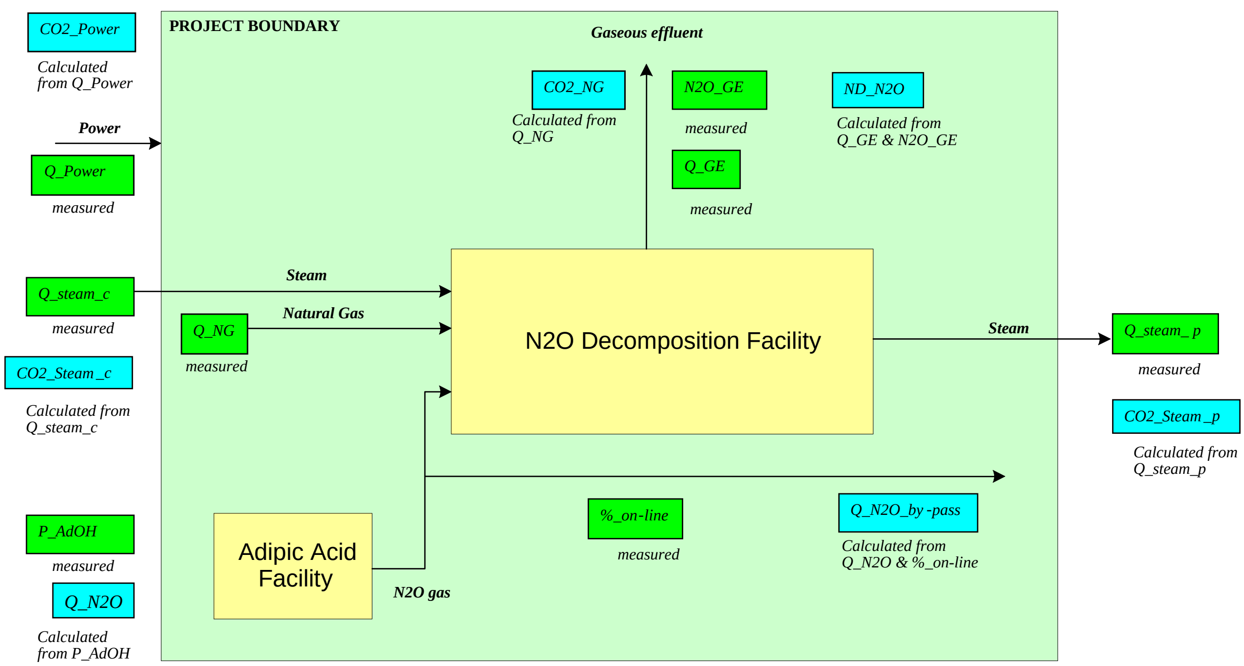
4.4 Deviation request

No deviation request has been made for the monitoring period in consideration

5. Baseline methodology

Approved baseline methodology AM 0021 / version 1: “Baseline methodology for decomposition of N2O from existing adipic acid production plants” is applied to this project.

The project boundary related to the baseline methodology is shown below and this project boundary is used and explained in the PDD.
Potential sources of anthropogenic emissions by sources of GHG within the project boundary and emissions which are not included in the project boundary are also shown in below.



6. Applicability of the methodology

Approved monitoring methodology AM 0021 / version 1 is applied to this project.
This methodology is applicable to projects which decompose N2O from an adipic acid production plant under the following conditions:

- either catalytic or thermal decomposition of the N2O by-product of adipic acid production at existing production plants
- The methodology is spatially generic, being applicable across regions where the data (both related and project activity as well) exist to undertake the assessment
- The methodology is applicable only for installed capacity (measured in tonnes of adipic acid per year) that exists by the end of the year 2004.

The present project satisfies these conditions as:

- Thermal decomposition of the N2O by-product of adipic acid production was implemented in an existing production plant
- All required data (see following paragraph) are available and used
- The production of adipic acid in Paulínia was operational before 2004.

For the sake of clarity, the amount of Emission Reductions can exceed the amount calculated in a year period in the PDD in "SECTION E. Estimation of GHG emissions by sources" as all data in the PDD were conservative, in particular the performance of the N2O abatement unit (in fact, the actual efficiency has been > 85%, and the destruction rate > 99%).

7. **Monitored Parameters**

According to the methodology AM 0021/version 1 and the Monitoring Plan, the data being collected to monitor the GHG reduction are given in the table below:

ID	**Data variable**	**Source of data**	**Data unit**	**Recording frequency**	**Reference**
Q_GE	Volume of effluent gas leaving the stack	Flow meter	Nm^3	Monthly	Appendix 1
N_2O_GE	Concentration of N_2O in the effluent gas	Laser diode online analyzer	ppm	Monthly	Appendix 2
ND_N2O	Quantity of N_2O in the effluent gas leaving the stack	Calculated from Q_GE and N_2O_GE	kg	Monthly	Appendix 3
Q_NG	Amount of natural gas burned	Natural gas meter	Nm^3	Monthly	Appendix 4
NGC	Natural gas composition required for calculation of E_NG	Gas supplier	-	Monthly	Appendix 5
%_on-line	% of production time the position switch on the by-pass valve is closed	Position switches on bypass valve	% of production time	Monthly	Appendix 6
Q_N2O_by-pass	N2O by passing the decomposition facility	Calculated from Q_N2O and %_on-line	kg	Monthly	Appendix 7

ID	Data variable	Source of data	Data unit	Recording frequency	Reference
P_AdOH	Amount of adipic acid production	Excel workbook for calculation of nylon salt production, AA slurry production and dry AA production	tonnes	Monthly	Appendix 8
Q_N2O	Quantity of N2O produced	Calculated from P_AdOH and N2O_AdOH	kg	Monthly	Appendix 8
Nitric acid consumption ($HNO3\_consumption$) & physical losses in the adipic acid production process ($HNO_3\_physical$)	All data required for calculation of HNO_3 chemical and the N2O emission factor N2O_AdOH	Excel workbook based on the raw material consumption, DCS data and Lab data	tonnes	Monthly	Appendix 9
Q N_2O reg	Per Brazilian regulation allowed N_2O emissions	Brazilian regulation	kg/year	Date when relevant legislation is in place	Appendix 10
N_2O reg/AdOH	Per Brazilian regulation allowed N_2O emissions per kg of adipic acid produced	Brazilian regulation	kg/kg	Date when relevant legislation is in place	Appendix 10
r_y	Per Brazilian regulation required share of N_2O emissions to be destroyed	Brazilian regulation	%	Date when relevant legislation is in place	Appendix 10
P N_2O	Market price of N_2O	Estimated	€/tonne	Yearly	Appendix 11
Q_Steam_p	Amount of steam produced by the decomposition process	Steam meter	kg	Monthly	Appendix 12

ID	Data variable	Source of data	Data unit	Recording frequency	Reference
Steam supplier data	All data required for calculation of E_Steam	Rhodia Industrial Platform of Paulínia	-	Yearly	Appendix 13
Q_Power	Electric consumption of the decomposition facility	Electricity meter	kWh	Monthly	Appendix 14
Electricity grid data	All data required for calculation of E_Power according to ACM0002 version 2 and the Monitoring Plan	Brazilian ONS (Operador Nacional do Sistema Elétrico)	-	Yearly	Appendix 15
Q_Steam_c	Amount of steam consumed by the decomposition facility	Steam meter	kg	Monthly	Appendix 16
Steam suppliers data	All data required for calculation of E_Steam_c	Rhodia Industrial Platform of Paulínia	-	Yearly	Appendix 17

8. Quality Control (QC) and Quality Assurance (QA)

8.1. Quality Management System

The Rhodia site is ISO 9001:2000 certified covering also the adipic acid plant and the N2O decomposition unit. The Quality Management System helps Rhodia to continually improve its product, processes and services, which includes quality planning, management responsibility, documentation and data control, resources management, product realization, process analysis and improvement Rhodia site is also ISO 14000 certified.

The thermal oxidation plant is operated by Rhodia operating personnel. Rhodia has assigned the responsibility for operating, monitoring and reporting to the Adipic Acid Plant Manager.

The operation, data transfer and reporting procedures are incorporated into the ISO 9001 procedures of the Paulínia Adipic Acid plant

The technology supplier John Zink Company LLC trained Rhodia engineers who trained the operational team.

8.2. Quality control (QC) and quality assurance (QA) procedures that are being undertaken for data monitored

The Paulínia adipic acid plant is certified according to ISO9001 and applies appropriate QA & QC procedures.

The equipment and analytical methods given by the technology supplier John Zink Company LLC, USA as well as those supplied by Rhodia are done according to internationally accepted standards.

The QA & QC procedures are set and implemented in order to:

1. Secure a good consistency through planning to implementation of this CDM project and,
2. Stipulate who has responsibility for what and,
3. Avoid any misunderstanding between people and organization involved.

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/ Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
2a.1. (D.2.1.1) Q_GE	*Low*	*This flow rate is measured with an Averaging Pitot tube. This instrument is a critical instrument in the QA/QC procedure.*
2a.2. (D.2.1.1) N_2O_GE	*Low*	*Measured using Laser Diode technology Specific procedures are applied to this analyzer for QA & QC following the manufacturer's recommendation.*
2a.4. (D.2.1.1) Q_NG	*Low*	*Is measured using natural gas meter from the supplier and as such is part of a regular procedure control between the Natural Gas supplier and Rhodia.*
2b.1. (D.2.1.3) P_AdOH	*Low*	*Is obtained from production records of the Paulínia Adipic Acid plant where the N2O waste originates. A QA/QC procedure is implemented. Production quantity is based on the packaged product plus slurry production used for the Nylon Salt production. Both dry adipic acid and nylon salt are weighed.*
2a.5. (D.2.1.1) %_on-line	*Low*	*Use high integrity performance by-pass valve to limit leaks. Procedures currently in place in Chalampé for monitoring N_2O emissions have been implemented in Paulínia to periodically check their tightness and assure their good operation. They have been added to the QA/QC existing procedures.*
2b.7. (D.2.1.3) Q_Steam_p	*Low*	*Steam meter placed on the list of critical instrument data in the QA/QC procedures*
3.1. (D.2.3.1) Q_Power	*Low*	*Electricity meter. Standard procedures are used. No QA/QC procedures implemented as this flow represents less than 0.01% of the baseline emissions.*
3.4. (D.2.3.1) Q_Steam_c	*Low*	*Steam meter placed on the list of critical instrument data in the QA/QC procedures.*

Main QC and QA procedures specific to the project activity:

Data Handling Protocol ISAL-ADOH-QA-007
Data Review Protocol ISAL-ADOH-QA-008

8.3. Calibration/Maintenance of Measuring and Analytical Instruments

All measuring and analytical instruments are being calibrated as per the methodology AM0021/version 1 and the PDD using either existing or specifically created protocols in Paulínia's Quality Management System procedures.

The maintenance methods and procedures have been incorporated as part of the ISO 9001 procedures and form an integral part of the systems and procedures for the organization.

The Monitoring Equipment Calibration/Maintenance requirements and status are presented on Appendix 18.

8.4. Environmental Impact

After commissioning the thermal oxidation plant, online analysis of the NOx content in the gaseous effluents is carried out to verify such discharge from the plant. Monitoring of the NOx content in the waste gas is required by local environmental legislation stated in the Commitment Agreement (TAC) signed with the Public Attorney of the State of São Paulo. NOx in the gaseous effluent can be randomly checked by the environmental agency Cetesb through sampling and analysis by an external laboratory. Analytical data show that the plant complies with the established environmental standard.

Table showing analysis of Gaseous Emission for Thermal Oxidation plant

Parameter	Unit	Limit as per applicable standard	Analytical results in this period
NOx	vppm	300 max at least 95% of time	Average of 70 and less than 300 for 97.1% of time

9. GHG Calculations

A spreadsheet Excel file "WORKBOOK ER PAULINIA" containing all the values of the monitoring parameters and the emission reduction calculation according to the methodology (AM0021/version 1) and the PDD is submitted to the DOE and to the UNFCCC for the request of issuance.

Statement of GHG emission reduction in this monitoring period.

As suggested by the methodology (AM0021/version 1), the GHG emission reduction, (ERy), achieved by the project activity for the period is
ERy = BEy - PEy - Ly

9.1. Calculation of Q_N2Oy

It has been checked that there are no Brazilian regulation into place that would limit the quantity of N_2O emitted that can be taken into account for the calculation of the baseline emissions (see D.2.1.4. in the PDD).

The quantity Q_N2Oy of N2O emitted over the period can then be calculated by (AM0021/version 1 equation (2)):

$$Q\_N2Oy = P\_AdOH \times N2O\_/AdOH$$

Over the period of reference the emission factor from the adipic acid plant was above the capped value of 0.27 kg N2O/kg AdOH (see Appendix 9). So the capped value is being used according to AM 0021/version 1.

Parameter	Value	Reference
Q_N2Oy	1,423,103 kg	Calculated
P_AdOH (eligible)	5,270.756 t	Appendix 8
N2O_/AdOH	0.27 kg N2O/kg AdOH	Appendix 9
Q_N_2O reg	No limit	Appendix 10
N_2O_reg / AdOH	No limit	Appendix 10
r_y	NA	Appendix 10

The Executive Board has confirmed on EB36 the application of a yearly Adipic acid production cap as required by the methodology. The 4th project year period started on November 19, 2009 and will end on November 18, 2010. The accumulated production of adipic acid in this project year period starting on November 19, 2009 and ending on June 17, 2010 (the last day of this monitoring period) is 48,020 tonnes, lower than 87,308 tonnes which is the yearly capped value as stated in the decision made by the EB47th meeting on May 28th 2009. This cap value is consistent with the clarification published in the EB 48th meeting report § 24 of July 17th 2009. Therefore the total production of this period can be used as such (see details in Appendix 8). This approach is consistent with the definitions and requirements of the "Guidance on accounting eligible HFC-23" AM0001 (EB39 Annex 8): the year of the crediting period is defined on the basis of the starting date of the crediting period of a project activity (in the present case November 19th).

9.2. Calculation of baseline emissions

The amount of baseline emissions in the given period y (measured in tCO2e) is calculated by (AM0021/version 1 equation (1)):

$$BEy = Q\_N2O_y \times GWP\_N2O + Q\_Steam\_p_y \times E\_Steam_y$$

and rounded down in tCO2e to get conservative consistency of final calculation of emission reductions formula.

Parameter	Value	Reference
BEy	**442,032 tCO2e**	Calculated
Q_N2O_y	1,423,103 kg	Calculated in 9.1
GWP_N2O	310 kg CO2e/ kg N_2O	Kyoto Protocol Rule. Decision 2/CP.3 and IPCC
$Q\_Steam\_p_y$	6,005,400 kg of steam	Appendix 12
E_Steam_y	0.145 kg-CO_2/kg of steam	Appendix 13

9.3. Calculation of (Q_N2O x (1-%_on-line))y

The quantity of N2O that has by-passed the decomposition facility is calculated from the adipic acid production made while by-passing the decomposition facility.

The quantity of adipic acid produced while by-passing the destruction facility is monitored and the quantity of N2O that by-pass the decomposition facility is registered daily:

Q_N2O_by-pass = P_AdOH x (1-%_on-line) x N2O_/AdOH

This value is a value by excess as during each connection/ disconnection phases the production is counted as completely by-passed.

The quantity of N2O that by-passed the decomposition facility over the period is:

$(Q\_N2O \times (1-\%\_on\text{-}line))y = Q\_N2O\_by\text{-}pass_y$

The $\%\_on\text{-}line_y$ equivalent over the period is calculated as:

$\%\_on\text{-}line_y = 1 - (Q\_N2O\_by\text{-}pass_y / Q\_N2O_y)$

Parameter	Value	Reference
$Q\_N2O\_by\text{-}pass_y$	0 kg	Appendix 7
P_AdOH	5,270.756 t	Appendix 8
N2O_/AdOH	0.270 kg N2O/kg AdOH	Appendix 9
$\%\_on\text{-}line_y$	100.000 %	Appendix 6

9.4. Calculation of project emissions

The emissions due to the decomposition process PEy are the emissions due to the N2O that has not been sent to the decomposition process, the N2O non destroyed by the decomposition process and the emissions due to the use of natural gas.

$PEy = ((Q\_ N_2O \times (1-\%\_on\text{-}line))y + (Q\_GE \times N_2O\_GE \times Specific\_gravity\_of\_N2O)y) \times GWP\_ N_2O + Q\_NGy \times E\_NGy$ (AM0021/version 1 equation (6))

$PEy = (Q\_N2O\_by\text{-}pass_y + (Q\_GE \times N_2O\_GE \times Specific\_gravity\_of\_N2O)y) \times GWP\_ N_2O + Q\_NGy \times E\_NGy$

The non-destroyed N_2O (ND_ N_2O y) is constantly monitored and obtained from the constant monitoring of the flow (Q_GE) and the concentration of N_2O (N_2O _GE) of the effluent gas:
ND_ N_2O = Q_GE x N_2O _GE x Specific_gravity_of_N2O

PEy = ($Q\_N2O\_by\text{-}pass_y$ + ND_ N_2O_y) x GWP_ N_2O + Q_NGy x E_NGy (AM0021/version 1 equation (5))
PEy is rounded up in tCO2e to get conservative consistency in final calculation of emission reductions formula.

Parameter	Value	Reference
PEy	**1,047 tCO2e**	Calculated
$Q\_N2O\_by\text{-}pass_y$	0 kg	Appendix 7
Q_GE	6,959,475 Nm^3	Appendix 1
N_2O_GE	6.8 vppm	Appendix 2
Specific gravity of_N2O	1.963 x 10^-6	Appendix 2 and 3
ND_ N_2O_y	94 kg N2O	Appendix 3
GWP_ N_2O	310 kg CO2e/ kg N_2O	Kyoto Protocol Rule. Decision 2/CP.3 and IPCC
Q_NG_y	458,512 Nm^3	Appendix 4
E_NG_y	2.200 kg CO2e/ Nm^3	Appendix 5

Note:

1) The value of E_NGy shown above is the yearly moving average of E_NG as required by the PDD for calculation of E_Steam. The project emissions are more accurately calculated using the monthly values of E_NG shown in Appendix 5, following methodology AM0021/version 1 and the Monitoring Plan.

2) The value of ND_N2Oy is calculated by the DCS using every 10 second data of Q_GE and N2O_GE (see Appendix 2 and 3) and is more accurate than the value calculated using total average values.

9.5. Calculation of leakage

Leak emissions comprise the emissions associated with the energy sources used to generate any steam and electricity used by the decomposition plant.

Leakage amounts to (AM0021/version 1 equation (7)):

L_y = Q_Power x E_Power + $Q\_steam\_c_y$ x $E\_steam\_c_y$

Ly is rounded up in tCO2e to get conservative consistency in final calculation of emission reductions formula.

Parameter	Value	Reference
Ly	**32 tCO2e**	Calculated
Q_Power	34,278 kWh	Appendix 14
E_Power	0.756 kg CO_2/kWh	Appendix 15
Q_Steam_ c_y	19,700 kg	Appendix 16
E_Steam_c_y	0.215 kg CO_2 / kg of steam	Appendix 17

9.6. Calculation of emission reduction

Following the PDD section D.2.4, the total emission reduction achieved by this project activity during this monitoring period is therefore,

ERy = BEy – PEy – Ly

Or,

ERy = 442,032 tCO2e – 1,047 tCO2e – 32 tCO2e

Or,,

ERy = 440,953 tCO2e

The above emission reduction covers the generation of N2O during this monitoring period.

9.7. Comparison of the emission reduction with the PDD estimates

In the PDD section E, the annual emission reduction is estimated to be 5,961,165 tCO2e. So the PDD-estimated emission reduction relative to the monitoring period of 22 days is around 359,301 tCO2e. The 81,653 tCO2e variance of the actual emission reduction is explained by:

PE: PDD value = 70,340 tCO2e	Period = 1,047 tCO2e
Variance	Explanation
64,332	The significant higher performance of the N2O abatement unit (the actual %_on-line of 100.000% in this period is significantly higher than the value of 85% estimated in the PDD due to excellent operational performance). The estimate of 85% in the PDD assumed a low performance rate of the destruction equipment due to the lack of experience with such equipment.
4,605	A higher destruction rate of the N2O which is in excess of 99.99 % during this period versus 99 % taken conservatively in the PDD.
356	Difference in the natural gas consumption estimate and actual in the period
69,293	**Total PE variance**

BE: PDD value = 429,715 tCO_2e	Period = 442,033 tCO_2e
Variance	Explanation
12,343	The adipic acid production used for the ex-ante emission reduction was conservatively taken as 85,000 t/y (232.8 t/d) which is only 89.6 % of the nameplate capacity (260 t/d). The daily average production was higher (239.58 t/d) than the estimate of the PDD during this period to supply the market demand.
- 26	steam produced in period lower than in PDD estimate
12,318	**Total BE variance**

L: PDD value = 74 tCO_2e	Period = 32 tCO_2e
Variance	Explanation
42	Difference mainly due to the quantity of steam consumed
42	**Total L variance**

It is important to note that according to the methodology AM0021/version 1, the eligible adipic acid production that can be used in the baseline is yearly capped, so it limits on a yearly basis the emission reduction calculation claimed for CERs. Please see Appendix 8 for further detail

Moreover, given the general experiences with constant overestimation of CER volumes in the first years of CDM project development, Rhodia wanted to set the CER estimates in the PDD in a conservative fashion, especially regarding performance of the abatement equipment.

Appendix 1

Name of item	Q_GE
Description	Volume of effluent gas leaving the stack
Value in period	6,959,475 Nm^3
Method of monitoring	Annubar flow meter, measurement done on wet basis according to Method D of EB47 – "Tool to determine the mass flow of a greenhouse gas in a gaseous stream".
Recording frequency	measured continuously, aggregated daily and monthly
Background data	Log sheet record / flowmeter

Period	Quantity of gaseous effluent Nm^3
May 27th – May 31st, 2010	1,562,358
June 1st – June 17th, 2010	5,397,117

Appendix 2

Name of item	N2O_GE
Description	Concentration of N_2O in the effluent gas
Value in period	6.8 vppm
Method of monitoring	Laser diode online analyzer
Recording frequency	Monthly
Background data	Log sheet record
Calculation method	According to AM0021/version1, the instant values of the on-line analyzer measured on a wet basis (Method D of EB47 – "Tool to determine the mass flow of a greenhouse gas in a gaseous stream") is used to calculate the quantity of ND_N2O every 10 sec: ND_N2O = Q_GE x N2O_GE x Specific_gravity_of_N2O N2O_GE need to be converted in kg/Nm3 according to AM0021/version1 note 2 table 2a, using the specific_gravity_of_N2O = 44/22.414 x 10^-6 The analyzer has a range of 0-500 ppm with a detection limit of 5 ppm (1% of range). We use 5 ppm as a default value when the measured value is below the detection limit. Cumulated value for ND_N2O is recorded (see appendix 3). At the end of the month/period based upon the flow Q_GE, and ND_N2O the concentration of N2O equivalent for the month/. N2O_GE = ND_ period is calculated N2O / (Q_GE x N2O_GE x Specific_gravity_of_N2O) This value is for information as the constant calculation of ND_N2O is more accurate.

Period	ND_N2O kg	Quantity of gaseous effluent Nm^3	Average concentration of N_2O_GE vppm
May 27th – May 31st, 2010	17	1,562,358	5.2
June 1st – June 17th, 2010	77	5,397,117	7.2

Appendix 3

Name of item	ND_N2O
Description	Quantity of non-destroyed N2O emitted by the decomposition facility
Value in period	94 kg N_2O
Method of monitoring	On-line DCS calculation
Recording frequency	Monthly
Background data	Log sheet record
Calculation method	According to AM0021/version1, the actual quantity of non destroyed N2O is calculated on-line in the DCS from the concentration of N2O and the flow rate of the gaseous effluent, both measured on a wet basis (Method D of EB47 – "Tool to determine the mass flow of a greenhouse gas in a gaseous stream") : ND_N2O = Q_GE * N2O_GE * Specific_gravity_of_N2O N2O_GE need to be converted in kg/Nm3 according to AM0021/version1 note 2 table 2a, using the specific_gravity_of_N2O = 44/22.414 x 10^-6

Period	ND_N2O kg
May 27th – May 31st, 2010	17
June 1st – June 17th, 2010	77

Appendix 4

Name of item	Q_NG
Description	Amount of natural gas used by the decomposition process
Value in period	458,512 Nm^3
Method of monitoring	Natural gas consumption data
Recording frequency	Monthly
Background data	Log sheet record / flowmeter

Period	Q_NG Nm^3	**CO2_NG tCO2e**
May 27th – May 31st, 2010	104,716	230
June 1st – June 17th, 2010	353,796	787

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Appendix 5

Name of item	E_NGy with NGC
Description	Emissions coefficient for natural gas combustion Natural Gas Composition (NGC) is informed by the natural gas supplier
Value in period for E_NG_y	2.200 kg CO_2/Nm^3
Method of monitoring	Natural Gas Composition (NGC)
Recording frequency	Monthly
Background data	Composition data received from COMGAS (supplier)
Calculation method	Following the PDD Monitoring Plan The average number of C in a mole of NG is calculated from the composition = ∑ (number of C in each mole) x (volume ratio) The CO2 specific gravity in standard state is 1.965 E_NG = 1.965 x (average number of C in a mole of NG) The yearly value (E_NGy) is calculated as the average weighted by the natural gas consumption of the twelve months available prior to the beginning of the period. E_Steam is calculated yearly as per the Methodology and needs a yearly value of E_NG (see Appendix 13). All monthly values of E_NG for the year are within +/- 0.5% of the yearly value of E_NGy. For this monitoring period, natural gas composition from June 2010 are not yet available, so to be conservative, the NGC of the month of August 2008 was used for June 2010 because it gives the highest E_NG value since the beginning of the crediting period (November 19th, 2006). These E_NG values are used in the calculation of the project emissions (part due to the natural gas combustion of the N2O unit)

Component	**May/10** NGC (%)	**June/10** NGC (%)	Number of C
CH4 (Methane)	89,23	88.30	1
C2H6 (Ethane)	5,92	6.35	2
C3H8 (Propane)	1,70	1.99	3
I-C4H10 (I-Butane)	0,26	0.29	4
N-C4H10 (N-Butane)	0,35	0.42	4
I-C5H12 (I-Pentane)	0,12	0.12	5
N-C5H12 (N-Pentane)	0,08	0.08	5
C6H14+ (Hexane)	0,07	0.10	6
N2 (Nitrogen)	0,68	0.76	0
CO2 (Carbon dioxide)	1,60	1.58	1
Average number of C	1,116	1.131	
E_NG (month)	**2,193**	**2.222**	

Appendix 6

Name of item	%_on-line
Description	% of production time that the N_2O is sent to the decomposition facility
Value in period	100.000 %
Method of monitoring	Position of limit switch on the valve allowing to by-pass the decomposition facility
Recording frequency	Monthly
Background data	Log sheet record
Calculation method	%_on-line is determined following the PDD. Based upon the position of the limit switch on the valve by-passing the decomposition facility, the % of time that the production is connected to the facility is continuously counted and used to calculate the daily value of Q_ N2O_by-pass (See Appendix 7). The daily values of Q_ N2O_by-pass are added to determine the monthly values of Q_ N2O_by-pass, as required by the PDD.

At the end of the period, %_on-line for the period y is calculated as:

$$\%\_on\text{-}line_y = 1 - (Q\_N2O\_by\text{-}pass_y / (P\_AdOH_y \times N2O\_/AdOH))$$

Period	$Q\_N2O\_by\text{-}pass_y$ kg	P_AdOH_y t	$\%\_on\text{-}line_y$ %
May 27th – May 31st, 2010	0	1,273.777	100.000
June 1st – June 17th, 2010	0	3,996.980	100.000

Appendix 7

Name of item	Q_N2O_by-pass
Description	N2O by-passing the decomposition facility
Value in period	0 kg
Method of monitoring	Production record and %_on-line DCS monitoring
Recording frequency	Monthly
Background data	Production & %_on-line log sheet record
Calculation method	The quantity of N2O that by-pass the facility is then recorded daily and calculated following AM0021/version1.

$Q\_N2O\_by\text{-}pass_d = Q\_N2O_d \times (1 - \%\_on\text{-}line)$ or

$Q\_N2O\_by\text{-}pass_d = P\_AdOH_d \times N2O\_/AdOH \times (1 - \%\_on\text{-}line)$

At the end of the period the quantity of N2O that by-passed the facility is:

$Q\_N2O\_by\text{-}pass_y = \Sigma\ (Q\_N2O\_by\text{-}pass_d)$

Period	$Q\_N2O\_by\text{-}pass_y$ kg
May 27th – May 31st, 2010	0
June 1st – June 17th, 2010	0

Rhodia

Appendix 8

Name of item	P_AdOH (eligible)
Description	Adipic acid production after cap application
Value in period	5,270.756 t
Method of monitoring	Packed production and slurry used to nylon salt production
Recording frequency	Monthly
Background data	Log sheet record

The accumulated production of adipic acid over this project year period starting on November 19, 2009 and ending on June 17th, 2010 (the last day of this monitoring period) is 48,020 t lower than the yearly capped value of 87,308 t as stated by the EB 47th meeting decision on May 28th (detailed information is available in the Excel file "Workbook ER Paulinia", sheet BE, line 22, submitted to UNFCCC). The value of 87,308 t was calculated in the Validation Report as the maximum daily production in 2004 x 365 days x the operational rate (260 t/day x 365 x 92%) which is consistent with the clarification of the EB48th meeting report §24 of 17th July 2009. Therefore, the total production of this period can be used as such. The Executive Board has confirmed on EB36 the application of a yearly Adipic acid production cap as required by the methodology. This approach is consistent with the definitions and requirements of the "Guidance on accounting eligible HFC-23" AM0001 (EB39 Annex 8): the year of the crediting period is defined on the basis of the starting date of the crediting period of a project activity (November 19th); the current period ends on November 18th, which is the end date of the year of the crediting period. The quantity of adipic acid produced during this period and eligible production for the baseline emission calculation are given below:

Month – year	Adipic acid production after cap application P_AdOH (eligible) t	Adipic acid production P_AdOH t_	Quantity of N2O produced Q_N2O kg
May 27th – May 31st, 2010	1,273.777	1,273.777	343,919
June 1st – June 17th, 2010	3,996.980	3,996.980	1,079,184

As described in the PDD (Section A.2, Section B.2 Table 3 and annex4 Monitoring plan), the adipic acid production is measured by adding the dry adipic acid production, the slurry adipic acid production contained in the Nylon salt, and the in-process product inventory variations. In this case:

- Dry adipic acid: is the product which was packaged (determined by weigh scales).
- Slurry adipic Acid: is the product used to be mixed in fixed proportions with Hexamethyldiamine and make Nylon salt on Paulínia site. Nylon salt quality is very accurately analyzed and controlled. Daily Nylon salt production is obtained by the sum of the weight of the truckloads plus the variation of Nylon salt storage tank levels. Both the concentration of Nylon salt as well as adipic acid content are controlled in the Nylon salt production process: the Nylon salt concentration is monitored online by refractive index measurement and the adipic acid slurry content is monitored through precise pH measurement. Furthermore, following the Quality Control procedure to guarantee the Nylon salt specification, the content of the storage tank F5300 is analyzed every 2 hours for pH and concentration using very accurate instruments in the laboratory, according to the Quality Document "ISAL-HMD-SAL-QA-006" as stated in the PDD, section D3 line 2b.1. Should a parameter show a deviation, the Nylon salt unit operator would immediately correct the concentrations in the process to correct Nylon salt concentration and/or adipic acid content. The Nylon salt specification is very narrow (± 0.02 for pH and ± 0.2% for concentration) and the analysis of the storage tank present a very low variability within those limits. This accuracy was checked by the auditor during the Initial Verification. Rhodia follows the PDD annex 3 and the monitoring plan and utilizes the Excel file "SAP-HMD.xls" to determine the nylon salt produced and automatically the corresponding adipic acid slurry. The calculation of the quantity of adipic acid in nylon salt on dry basis is based on a constant ratio of adipic acid in Nylon salt which is constant as fixed by the very precise value of the pH of the Nylon salt. The analytical results of pH and concentration of the Nylon salt solution for each period of one month are kept in an Excel file named "Qualidade SALN_month.xls" which is shown to the DOE for verification along with the file "SAP-HMD.xls". The ratio of Adipic Acid in Nylon Salt is 0.55748 in the Excel file "SAP-HMD.xls" in compliance with the guidance issued by the Executive Board in its 45th meeting of February 2009.

The details of the calculation of the production amount are as follows.

The total daily adipic acid made by the nitric oxidation reaction is the sum of two terms (Equation (1)):

Total Production [P_AdOH] = [Finished Product] + [Variation of the In-Process Product]	(1)

The finished adipic acid production is obtained by adding the production of dry and slurry adipic acid, according to Equation (2).

[Finished Product] = [Dry Adipic Acid] + [Slurry Adipic Acid]	(2)

The in-process adipic acid is obtained by adding the amount of adipic acid contained in all process equipment where adipic acid is present at different concentrations.

The variation of the In-Process Product inventory of day N is obtained by subtracting the total In-Process Product of day N minus In-Process Product of day (N-1) as in Equation (3):

[Variation of the In-Process Product] = [In-process Product of day N] – [In-process Product of day (N-1)]	(3)

Therefore, according to described in the sections above, the total production of adipic acid is the sum of the following terms described in Equation (4), after rewriting Equation (1) using Equation (2):

Total Production [P_AdOH] = [Dry Adipic Acid] + [Slurry Adipic Acid] + [Variation of the In-Process Product]	(4)

The total production is normally different from the finished product on a daily basis since the in-process product is always varying. The total production can be higher or lower than the finished product. On a long term basis however those differences compensate each other and the accumulated total production will of course approach the sum of dry + slurry.

For the purpose of determining the daily amount of N_2O generated by the nitric oxidation of the raw materials, it must be used the total production, not the finished adipic acid production, since N_2O is generated by the reaction and is independent of the finished production for a limited time (up to 1 or 2 days). In fact during such limited time the adipic acid made at the reaction can be accumulated in the process equipments awaiting to be processed through purification and drying.

Appendix 9

Name of item	HNO3_consumption & HNO3_physical
Description	Nitric acid consumption and losses in the adipic acid process
Value in period	(see table below)
Method of monitoring	Excel workbook based on monitoring data and analysis
Recording frequency	Monthly
Background data	Log sheet records
Calculation method	Nitric acid physical losses (HNO3_physical) in the aqueous wastes, the off gases, the adipic acid and the by-product are monitored. Those losses are deducted from the nitric acid consumption, (HNO3_consumption) to get the chemical consumption, (HNO3_chemical) (AM0021/version 1 equation (3)).

Period	HNO3_consumption t	HNO3_physical t	HNO3_chemical t
May 27th – May 31st, 2010	1,108.1	11.7	1,096.4
June 1st – June 17th, 2010	3,550.7	53.9	3,496.8
Rolling year June 17th, 2010	75,930	1,986	73,945

Name of item	N2O_AdOH
Description	N2O emission factor for adipic acid production
Value in period	0.270 kg N_2O/kg AdOH
Method of monitoring	Adipic acid production, nitric acid consumption and physical losses
Recording frequency	Yearly
Calculation method	The N2O emission factor is then calculated over the period on one year using the last rolling year data (AM0021/version 1 equation (4)):

N2O_AdOH = HNO3_chemical / P_AdOH / 63 /2 x 0.96 x 44

The calculated value for this period is above 0.270 and is then capped by the value of KE_N2O = 0.27, as specified in the PDD table D.2.1.3 and required by the methodology AM0021/version 1 referring to the IPCC Good Practice Guidance.

Period	Value N2O_AdOH calculated kg N2O/kg AdOH	KE_N20 kg N2O/kg AdOH	N2O_AdOH kg N2O/kg AdOH
Rolling year June 17th, 2010	0.291	0.270	0.270

Appendix 10

Name of item	Q_N_2O reg, N_2O_reg / AdOH and r_y
Description	Evolution of Brazilian legislation that may require limitation of N_2O emissions using one of the following criteria: - Q_N_2O reg : allowed N_2O emissions - N_2O_reg / AdOH: allowed N_2O emissions per kg of adipic acid produced - r_y: share of N_2O emissions required to be destroyed
Value in period	not applicable
Method of monitoring	Survey
Recording frequency	When relevant
Background data	Brazilian legislation No evolution of legislation since PDD emission.

Period	Q_N_2O reg kg	N_2O_reg / AdOH kg	r_y %
May 27th – June 17th, 2010	No limit	No limit	0

Note: Rhodia follows the evolution of Brazilian legislation about N2O emissions that could affect the project Emission Reduction through the parameters N2O_reg / AdOH, Q_N2O reg, or r_y as part of the ISO 14000 requirements.
Rhodia has hired an external company specialized in regulations. It sends to GSIMAP (Rhodia Industrial Platform) all the changes in regulations that may impact Rhodia. GSIMAP team evaluates the changes and discusses the applicability to the Rhodia operations in a steering committee. The conclusions from this steering committee are then presented to the Quality representatives of all plant units in a formal meeting that happens every three months.
Furthermore GSIMAP experts on environmental issues participate on meetings held on external organizations (such as ABIQUIM - Brazilian Association of Chemical Industries, CETESB - local environmental agency) that discuss draft regulations. Those experts know in advance what comes next in terms of environmental laws.

Appendix 11

Name of item	P_N_2O
Description	Market price of N_2O in waste gas
Value in period	0 €/t
Method of monitoring	Market survey
Recording frequency	Yearly
Background data	

Refer to study "N2O market study NITROUS OXIDE Brazil" –update September 2009
The N2O market is rather small and limited, requires highly pure N2O, not waste gas. The largest market usage is for the medical use (anesthetic and analgesic) then for food and electronics.
Beside the very high investment cost in a purification-concentration-liquefaction unit to extract the N_2O from the exhaust flow of the adipic acid plant, neither the process as the product will get the necessary certifications for the pharmaceutical and food markets.
The market study concludes that there is no N_2O market for the N_2O produced as by-product of adipic acid.

Year	P_N_2O
2010	0

Appendix 12

Name of item	Q_Steam_p
Description	Amount of steam produced by the decomposition facility
Value in period	6,005,400 kg
Method of monitoring	Flowmeter
Recording frequency	Monthly
Background data	Log sheet record

Period	Q_Steam_p kg	CO2_Steam_p tCO2e
May 27th – May 31st, 2010	1,381,400	200
June 1st – June 17th, 2010	4,624,000	670

Appendix 13

Name of item	E_Steam
Description	CO_2 emission factor for steam produced by the facility
Value in period	0.145 kg CO_2/kg of steam
Method of monitoring	Supplier data
Recording frequency	Yearly
Background data	Data supplied by the Rhodia Paulínia Industrial Platform
Calculation method	Calculation is made according to the monitoring plan, section 6.3. We first calculate the amount of natural gas required to generate steam in Nm3/t of steam in a very efficient boiler QNG_steam = △H (kJ/t) / (LHV (kJ/Nm3) x η (%)) The LHV data is the yearly average value for the gas supplied by COMGAS. The yield η (%) of the boiler is conservatively taken as 97%, while the yield is generally below 90%. E_NG_y is the yearly average value for the gas supplied by COMGAS (see appendix 5). The yearly value of E_Steam is calculated with the data available for the year prior to the beginning of the period in order to assure to have the data. E_Steam = QNG_steam x E_NGy
Comment	LHV data is supplied by COMGAS in kcal/m3 at 20 °C. Data were converted to kJ/Nm3.

Year ending	LHV kJ/Nm^3	△H kJ/t	η %	QNG_tsteam Nm3/t of steam	E_NG_y kg-CO_2/Nm3	E_Steam kg-CO_2/ kg of steam
May 1st, 2010	38,597	2,624,000	97	65.94	2.200	0.145

Appendix 14

Name of item	Q_Power
Description	Electricity consumption by the decomposition facility
Value in period	34,278 kWh
Method of monitoring	Power consumption data
Recording frequency	Monthly
Background data	Log sheet record / counter

Period	Q_Power kWh	CO2_Power tCO2e
May 27th – May 31st, 2010	7,961	7
June 1st – June 17th, 2010	26,371	20

Appendix 15

Name of item	E_Power
Description	CO_2 intensity for electric generation
Value in period	0.756 kg CO_2/kWh
Method of monitoring	Survey of data publication
Recording frequency	Yearly
Background data	Two sources of data are needed to up-date E_Power value: 1. ONS (Operador Nacional do Sistema Elétrico) http://www.ons.com.br/biblioteca_virtual/publicacoes_operacao_sin.aspx 2. Brazilian Ministry of Mines and Energy (MME) http://www.mme.gov.br/mme/menu/todas_publicacoes.html The E_Power calculation was done using basis data from 2008.
Calculation method	Calculated according to the PDD monitoring plan based on ACM0002 version 2. E_Power is calculated by taking into account only the emission factors of the fossil-fuel electricity generation (simple OM). As explained in the PDD Monitoring Plan, ONS still does not supply the plant-specific data required for BM (build margin) calculation. This is a very conservative approach since only 7% of the total electricity supplied to the grid is generated using fossil fuels (93% of Hydro and Nuclear). The detailed calculation is available in the Excel file "Workbook ER Paulínia" of this period (in the worksheet "E_Power") which is a confidential document communicated to the DOE and to the CDM Executive Board.

Date (year)	E_Power kg CO_2/kWh
2010	0.756

Appendix 16

Name of item	Q_Steam_c
Description	Amount of steam consumed by the decomposition facility
Value in period	19,700 kg
Method of monitoring	Mass flowmeter
Recording frequency	Monthly
Background data	Log sheet record

Period	Q_Steam_c kg	CO2_Steam_c tCO2e
May 27th – May 31st, 2010	4,500	1
June 1st – June 17th, 2010	15,200	4

Appendix 17

Name of item	E_Steam_c
Description	CO_2 intensity for steam consumed in the facility
Value in period	0.215 kg CO_2/kg of steam
Method of monitoring	Calculated from steam supplier data
Recording frequency	Yearly
Background data	Data supplied by the Rhodia Paulínia Industrial Platform
Calculation method	This steam is supplied by existing boilers on site. Steam production, natural gas, fuel oil and by-products consumptions are monitored. From the monthly consumption of all fuels, the monthly value of E_NG and of the carbon content of each liquid fuel, monthly emissions of CO2 for steam production are calculated and cumulated over the year. E_Steam_c is obtained from the ratio of yearly CO2 emission over the yearly steam production.

According to the PDD we calculate E_steam_c as a weighted average of the coefficients E_steam_c_NG (emission factor of steam produced by the boilers running on natural gas) and E_steam_c_chem&oil (emission factor of the steam produced by the boilers running on by-products and fuel oil) with the real share of the steam generated with each type of fuel.

E_steam_c = E_steam_c_NG x %_gen_NG +
+ E_steam_c_chem&oil x %_gen_chem&oil
where %_gen_chem&oil = 100% - %gen_NG

The yearly value of E_Steam_c is calculated with the data available for the year prior to the beginning of the period in order to assure to have the data.

Year ending	E_Steam_c_NG kg CO_2/kg of steam	E_Steam_c_chem&oil kg CO_2/kg of steam	%_gen_NG Share of steam generated using natural gas	E_Steam_c kg CO_2/ kg of steam
May 1st, 2010	0.210	0.295	94.8	0.215

Appendix 18 INSTRUMENT CALIBRATION & MAINTENANCE STATUS
(see also additional information in Cal_Maint sheet of the Workbook)

INSTRUMENT CALIBRATION & MAINTENANCE STATUS

● DONE

Related PDD parameter	Instrument Location/Description	Tag Number	Parameter in PDD	Reference	Frequency	Work Done by	2009												2010 - 1st Sem.						Last calibration date
							1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	
P_AdOH	Packaging machine 25 kg	Z-3110	Dry AA (P_AdOH)	INMETRO - Brazil Standard Portaria no. 236 (22December1994)	1/month	Third party	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	07 June 2010
P_AdOH	Packaging machine 25 kg	G-2532	Dry AA (P_AdOH)	INMETRO - Brazil Standard Portaria no. 236 (22December1994)	1/month	Third party	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	07 June 2010
P_AdOH	Weigh scale 1000 kg	Z-3120	Dry AA (P_AdOH)	INMETRO - Brazil Standard Portaria no. 236 (22December1994)	4/year	Third party		●			●			●			●			●			●		07 May 2010
P_AdOH	Trucks weigh scale	BB-0090	N-salt production (P_AdOH)	INMETRO - Brazil Standard Portaria no. 236 (22December1994)	2/year	Third party						●						●						●	04 June 2010
P_AdOH	Trucks weigh scale	BB-0335	N-salt production (P_AdOH)	INMETRO - Brazil Standard Portaria no. 236 (22December1994)	2/year	Third party						●						●						●	07 June 2010
P_AdOH	Level of tank R-5300	LT-4500	N-salt production (P_AdOH)	Manufacturer Specifications	Yearly	Rhodia								●											06 August 2009
P_AdOH	Level of tank R-5310	LT-4509	N-salt production (P_AdOH)	Manufacturer Specifications	Yearly	Rhodia			●												●				12 March 2010
P_AdOH	Refractometer	Lab equipment RFM-340	N-salt production (P_AdOH)	Manufacturer Specifications	Weekly	Rhodia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16 June 2010
				Manufacturer Specifications	2/Year	Third party			●						●						●				22 March 2010
HNO3_cons	Nitric acid mass flowmeter	FQ-2179	Nitric Cons	Manufacturer Specifications	2 years	Third party																			29 August 2008
HNO3_cons	Fresh nitric acid conc analyzer	AI-2179	Nitric Cons	Manufacturer Specifications	2 years	Third party																			29 August 2008
HNO3_physical	Flowmeter of effluent to biological WWT	FQ-2973	Nitric Loss	Manufacturer Specifications	Yearly	Rhodia								●											06 August 2009
HNO3_physical	Flowmeter of effluent to neutralization	FQ-2974	Nitric Loss	Manufacturer Specifications	Yearly	Rhodia								●											06 August 2009
HNO3_physical	Waste gas flowmeter	FQ-3450	Nitric Loss	Manufacturer Specifications	Yearly	Rhodia												●							16 December 2009
HNO3_physical	Nitric analyzer on effluent to neutralization	AI-2974	Nitric Loss	Manufacturer Specifications	2/month	Rhodia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	17 June 2010
HNO3_physical	Nitric analyzer on effluent to neutralization	AI-2974B	For failure of AI-2974	Manufacturer Specifications	2/month	Rhodia			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10 June 2010
HNO3_physical	NOx analyzer in the waste gas stream	AI-2195AB	Nitric Loss	Manufacturer Specifications	1/week	Rhodia	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	17 June 2010
HNO3_cons	Level of nitric acid storage tank F-1769	LI -3350	Nitric Cons (backup)	Manufacturer Specifications	Yearly	Rhodia								●											06 August 2009
HNO3_cons	Flowmeter of fresh nitric acid to storage	FQ-3318	Nitric Cons (backup)	Manufacturer Specifications	Yearly	Third party					●								●						08 January 2010
Q_NG	Natural gas flowmeter	FQ-3408	Project emission	INMETRO - Brazil Standard Portaria no. 114 (16October1997)	2 years	Third party															●				22 March 2010 12 March 2010 18 March 2010
Q_Steam_p	40 bar steam flowmeter	FQ-3470	Baseline emission	Manufacturer Specifications	Yearly	Rhodia										●									08 October 2009
Q_Steam_c	6,5 bar steam flowmeter	FQ-3409	Leakage	Manufacturer Specifications	Yearly	Rhodia	●												●						14 January 2010
Q_GE	Stack effluent gas flowmeter	FQ-3490	Project emission	Manufacturer Specifications	Yearly	Rhodia											●								04 November 2009
N2O_GE	Stack N2O analyzer (in-situ, laser diode)	AI-3490B	Project emission	Manufacturer Specifications	2/year	Rhodia										●						●			27 April 2010
N2O_GE	Stack N2O analyzer (extractive, infrared)	AI-3490G	Project emission (backup)	Manufacturer Specifications	1/week	Rhodia	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	17 June 2010
Q_N2O_bypass	By-pass valve leak test	HV-3402	Project emission	PDD section D3	Yearly	Third party			●												●				12 March 2010
Q_Power	Electricity meter	JI-3461	Leakage	ONS - Brazil Standard Submódulo 12.3 (07July2008)	2 years	Third party																			16 September 2008
HNO3_physical	Waste gas flowmeter	FIC-3401	For failure of FQ-3450	Manufacturer Specifications	Yearly	Rhodia										●									19 October 2009
Q_NG	Natural gas flowmeter	FQ-3460	For failure of FQ-3408	INMETRO - Brazil Standard Portaria no. 114 (16October1997)	2 years	Third party																			06 August 2008
Q_Steam_p	Boiler feed water flowmeter	FQ-3410	For failure of FQ-3470	Manufacturer Specifications	Yearly	Rhodia										●									05 October 2009
P_AdOH	Level of tank RE-2422	LI-2422	Inventory variation	Manufacturer Specifications	Yearly	Third party									●										22 September 2009

* Source of data: Quality Management System and SAP and Excel file "Instrument List"

INMETRO - Instituto Nacional de Metrologia www.inmetro.gov.br

ONS - Operador Nacional do Sistema Elétrico www.ons.org.br