

**MONITORING REPORT FORM (F-CDM-MR)**
Version 02.0**MONITORING REPORT**

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|--|--|
| Title of the project activity | “N2O Emission Reduction in Paulínia, SP, Brazil” |
| Reference number of the project activity | UNFCCC 0116 |
| Version number of the monitoring report | 1.2 |
| Completion date of the monitoring report | 23/11/2012 |
| Registration date of the project activity | 25/12/2005 |
| Monitoring period number and duration of this monitoring period | Monitoring period #56 01/10/2012 to 18/11/2012 (49 days) |
| Project participant(s) | Rhodia Energy Brazil Ltda. Solvay Energy Services SAS Rhodia Energy GHG SAS Société Générale (withdrawn) ORBEO NATIXIS NATIXIS Environnement & Infrastructure Noble Carbon Credits Limited Rhodia Japan Ltd. |
| Host Party(ies) | Brazil |
| Sectoral scope(s) and applied methodology(ies) | Scope 5 Methodology AM0021, Version 1 |
| Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD | 800,263 t CO ₂ eq |
| Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period | 760,350 t CO ₂ eq |



SECTION A. Description of project activity

A.1. Purpose and general description of 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 are considered under the Kyoto Protocol and there are no national or regional regulations or restrictions on the emission of N₂O in Brazil.

In this project, the thermal decomposition process equipment has been added to the adipic acid manufacturing plant. This installation reduces the GHG emissions, which would otherwise be released to the atmosphere if the project was not implemented.

The thermal decomposition facility was installed and commissioned in the manufacturing factory site of Paulínia Rhodia Poliamida e Especialidades Ltda. during October and November 2006 and the destruction of N₂O was started in 19/11/2006. The N₂O destruction unit is in continuous operation since its start-up and has only stopped for short periods due to planned and corrective maintenance operations.

In the monitoring period #56 the emission reductions achieved are: 760,350 tCO₂e

A.2. Location of project activity

Host Party: Brazil

State: São Paulo

City: Paulínia

GPS coordinates: -22.753611 -47.158889

**A.3. Parties and project participant(s)**

| Party involved (host) indicates a host Party) | Private and/or public entity(ies) project participants (as applicable) | Indicate if the Party involved wishes to be considered as Project participant (Yes/No) |
|---|--|--|
| Brazil (host) | Private entity : Rhodia Energy Brazil Ltda. | No |
| France | Private entity: Solvay Energy Services SAS Private entity: Rhodia Energy GHG SAS Private entity: Société Générale (withdrawn) Private entity: ORBEO Private entity: NATIXIS | No |
| United Kingdom of Great Britain and Northern Ireland | Private entity: NATIXIS Environnement & Infrastructures Private entity: NATIXIS Private entity: ORBEO Private entity: Noble Carbon Credits Limited | No |
| Netherlands | Private entity: ORBEO | No |
| Japan | Private entity: Rhodia Japan Ltd | No |
| Switzerland | Private entity: ORBEO; Private entity: Société Générale (withdrawn) Private entity: Rhodia Energy GHG SAS Private entity: Rhodia Japan Ltd. | No |

A.4. Reference of applied methodology

AM0021/version 1 – “Baseline Methodology for decomposition of N₂O from existing adipic acid production plants”

"Tool for the demonstration and assessment of additionality" agreed by the Executive Board (Annex 1, EB16).

A.5. Crediting period of project activity

The first crediting period (on-going) is from 19/11/2006 to 18/11/2013 (renewable).

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The project is fully implemented according to the description presented in the PDD. The project activity is completely operational since the start date of operation on 19/11/2006.

A thermal oxidizer with 2 chambers is the technology used to decompose N_2O at the Rhodia Paulinia site.

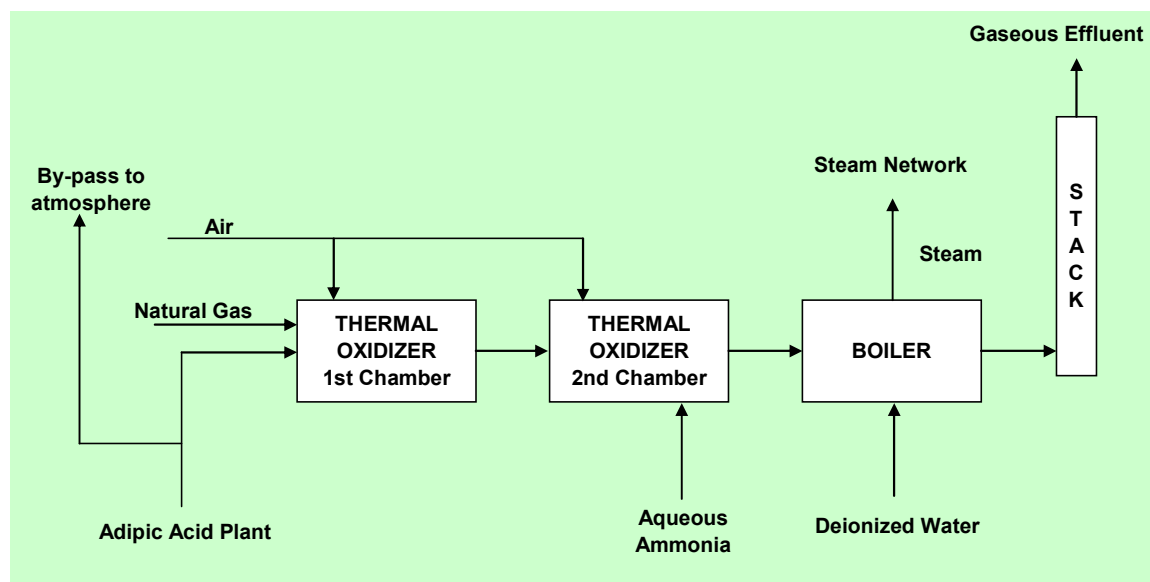
Natural gas is fed with the off gas from the adipic acid production containing N_2O and a controlled amount of air in a reduction chamber, where it burns (oxidizes) to carbon dioxide (CO_2) and water vapour. N_2O is used as an oxidizer. Being oxygen deficient, the oxidation is not complete and carbon monoxide and hydrogen are present.



The temperature in the furnace is kept at about $1300^\circ C$ and under fuel rich conditions, so as to promote the complete decomposition of N_2O while minimizing the formation of unwanted combustion by-products such as NO and NO_2 .

The gas is then quenched with air to complete the combustion of carbon monoxide and hydrogen at a temperature of about $950^\circ C$ in a second chamber. Aqueous ammonia is injected to control the emission of NO and NO_2 .

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.



During this monitoring period # 56 no particular event occurred that could impact the applicability of the methodology.



During this period, there were two events:

- The N₂O Unit had a shutdown on 08/10/2012 at 16:51 due to leakage of gas in the inlet pipeline. This event was followed by the adipic acid plant shutdown on 08/10/2012 at 16:53, so the % online was lower than 100%. The N₂O unit was reconnected on 10/10/2012 at 00:42, before the AA plant start-up.
- Planned shutdown of AA plant from 23/10/2012 at 19:56 (so, 24/10/2012) until 27/10/2012 at 22:48 (so, 28/10/2012). The N₂O unit was disconnected as planned on 23/10/2012 at 20:22. The reconnection was performed on 27/10/2012 at 19:56 (so, 28/10/2012) before the AA plant start-up. Therefore, the % online was 100%.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

No request for temporary deviation from registered monitoring plan or applied methodology was applied to this monitoring period.

B.2.2. Corrections

No correction related to project information or parameters fixed at validation was approved during this monitoring period or submitted with this monitoring report.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

No permanent changes from registered monitoring plan or applied methodology was approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

No changes to the project design of registered project activity was approved during this monitoring period or submitted with this monitoring report.

B.2.5. Changes to start date of crediting period

No changes to the start date of the crediting period was approved during this monitoring period or submitted with this monitoring report.

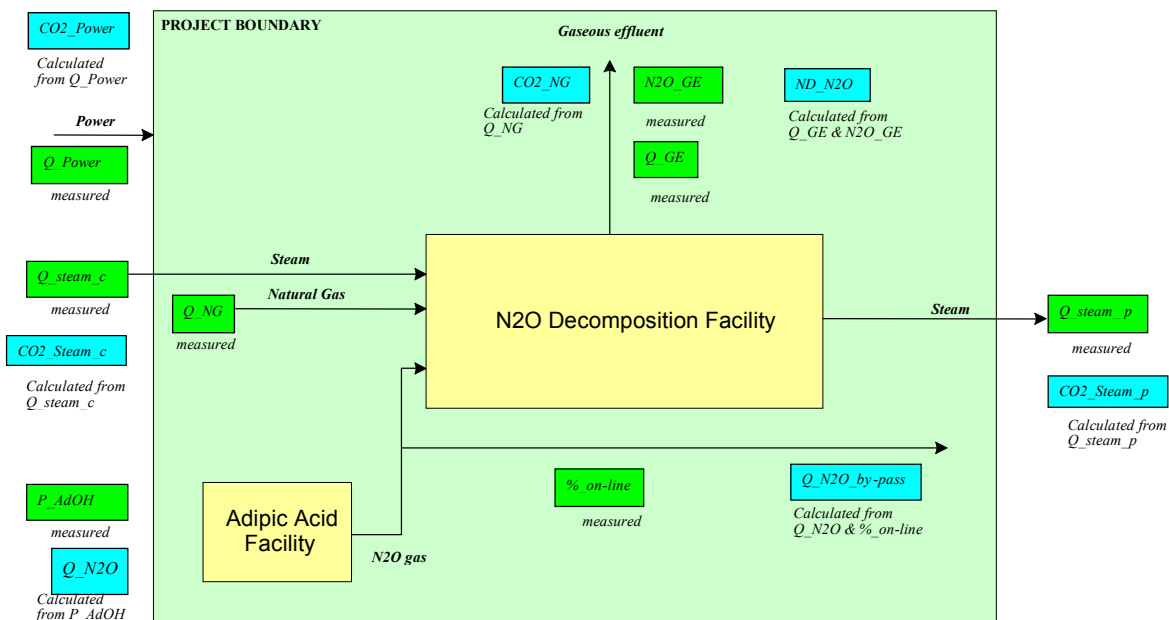
B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

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 and the details of the parameters are informed in the section D.



All data collection procedures, the organizational structure, the roles and responsibilities and procedures for dealing with abnormal situations are described in detail in the Data Handling Protocol and Data Review Protocol which are documents of Rhodia Quality System. Rhodia Paulinia plant is ISO9001 and ISO14001 certified.

The responsibilities of all persons dealing with information and data used to prepare the monitoring report are clearly indicated in the internal quality management system.

The Adipic Acid Plant Manager is responsible for implementing and maintaining the monitoring procedures on site (Data Handling Protocol, training, calibration and maintenance, data review) and for validating all data. The overall responsibility of the project belongs to the CO₂ Operations Director of Rhodia Energy GHG located in Paris, France.

All measuring instruments used in this project are calibrated and maintained according to the specifications provided by the manufacturers and/or relevant national and international standards.

All the data used for monitoring the baseline, project and leakage emissions are collected in the PIMS (Plant Information Management System). Two types of data are stored in the PIMS:

- Process data (flow rates, pressures, temperatures etc.) are continuously acquired by the DCS (Distributed Control System) and automatically stored by the PIMS;
- Packaged dry adipic acid production, slurry production and laboratory analysis used for daily production calculation are obtained from dedicated excel files and are manually entered into the PIMS database every working day by the authorized staff.

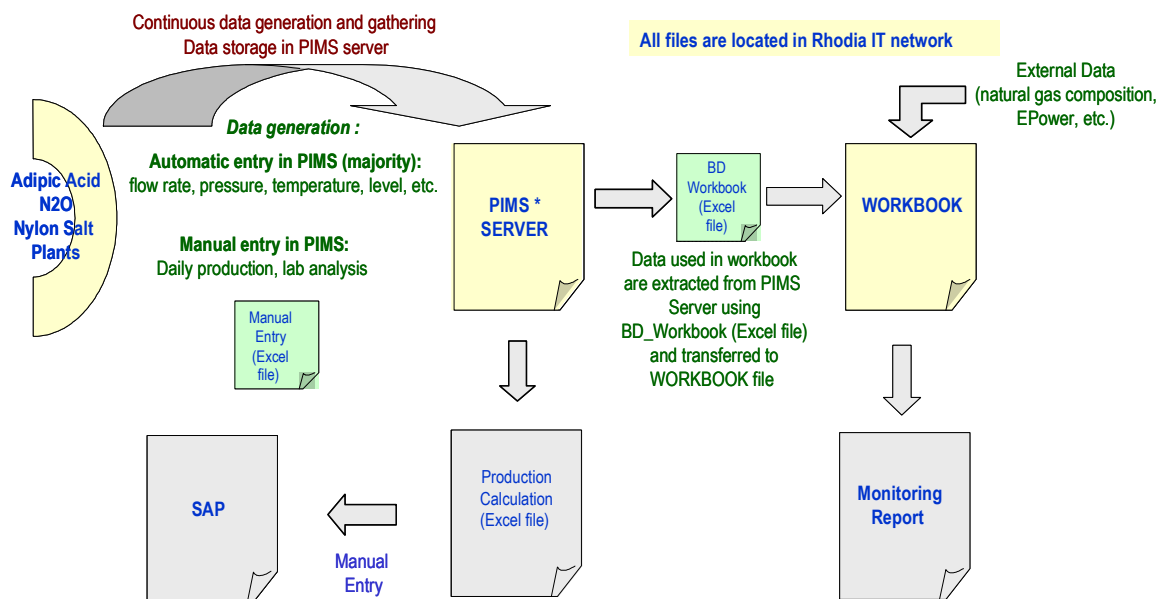
The calculation of the daily production of adipic acid and of the nitric acid consumption is carried out using the data stored in PIMS. The results obtained are transferred to the SAP (System, Applications and products

for Data Processing) system which is the official system used by Rhodia for production management and accounting purposes.

The emission reductions calculations are performed in a dedicated excel Workbook. Data are periodically extracted from PIMS using an excel tool and transferred to the Workbook. Some external data are input directly into the Workbook (e.g.: natural gas composition).

The calculations made in the Workbook are used for the preparation of the monitoring report.

The following diagram illustrates the entire process of data acquisition, storage and transfer to the Workbook and preparation of the monitoring report:



* PIMS = Plant Information System (Supplier: OSI)

Figure 2. Data Flow Diagram



SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

| | |
|----------------------------|---|
| Data / Parameter: | GWP_N₂O |
| Unit: | tCO ₂ e per tN ₂ O |
| Description: | Global Warming Potential of N ₂ O |
| Source of data used | Kyoto Protocol (Decision 2/CP.3) and IPCC |
| Value(s) applied : | 310 |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; |
| Additional comment: | |

| | |
|----------------------------|--|
| Data / Parameter: | KE_N₂O |
| Unit: | tN ₂ O per tonne of adipic acid produced |
| Description: | N ₂ O Emission factor |
| Source of data: | IPCC Good Practice Guidance |
| Value(s) applied: | 0.27 |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional Comment: | Cap value for N ₂ O_/AdOH emission factor |

| | |
|----------------------------|--|
| Data / Parameter: | ΔH |
| Unit: | kJ/t of steam |
| Description: | Enthalpy of super heated steam at a pressure level of 40 Bar |
| Source of data: | Monitoring Plan Section B.3 |
| Value(s) applied: | 2,624,000 |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional comment: | Use to calculate E_Steam |

| | |
|----------------------------|--|
| Data / Parameter: | η |
| Unit: | % |
| Description: | Operational efficiency of the natural gas steam boiler |
| Source of data: | Monitoring Plan Section B.3 |
| Value(s) applied: | 97 |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional Comment: | Not Applicable |



D.2. Data and parameters monitored

| | | | | | |
|---|--|---------------------|----------------|-----------------------|-------------------------|
| Data / Parameter: | P_AdOH | | | | |
| Data unit: | tonnes | | | | |
| Description: | Amount of adipic acid production | | | | |
| Measured | Measured | | | | |
| /Calculated /Default: | Several instruments are used | | | | |
| Source of data: | DCS data and Production log sheets | | | | |
| Value(s) of monitored parameter: | | From | To | P_AdOH Produced | P_AdOH Eligible* |
| | Period Value: | 01/10/2012 | 18/11/2012 | 9,093.307 | 9,093.307 |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 5,102.611 | 5,102.611 |
| | | 01/11/2012 | 18/11/2012 | 3,990.695 | 3,990.695 |
| | P_AdOH Current year | | 64,807 | | |
| | P_AdOH Annual Cap: | | 87,308 | | |
| * Adipic acid production for baseline emission calculation, after cap application | | | | | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | Packaging machine (Z-3110) Serial Number 6046 | Load cell 50 kg | +/- 0.02 kg | 1/month | Last calibration |
| | | | | | 25/10/2012 |
| | | | | | Valid until |
| | | | | | 24/11/2012 |
| | Packaging machine (G-2532) Serial Number 10869A | Load cell 100 kg | +/- 0.02 kg | 1/month | Last calibration |
| | | | | | 25/10/2012 |
| | | | | | Valid until |
| | | | | | 24/11/2012 |
| | Weigh scale (Z-3120) Serial Number 104BA4 | Load cell 1,000 kg | +/- 0.5 kg | 4/year | Last calibration |
| | | | | | 31/08/2012 |
| | | | | | Valid until |
| | | | | | 29/11/2012 |
| | Truck weigh scale (BB-0090) Serial Number 7597 | Load cell 80,000 kg | +/- 15 kg | 2/year | Last calibration |
| | | | | | 15/10/2012 |
| | | | | | Valid until |
| | | | | | 14/04/2013 |
| | Truck weigh scale (BB-0335) Serial Number 28812 | Load cell 80,000 kg | +/- 15 kg | 2/year | Last calibration |
| | | | | | 15/10/2012 |
| | | | | | Valid until |
| 14/04/2013 | | | | | |
| Level tank R-5300 (LT-4500) Serial Number U505269 | Pressure bubbling level – differential. Pressure | +/- 0.075 % | 1/year | Last calibration | |
| | | | | 06/11/2012 | |
| | | | | Valid until | |
| | | | | 05/11/2013 | |



| | | | | | |
|---|--|---|-------------|-------------------------------------|------------------|
| | Level tank R-5310 (LT-4509) Serial Number U308909 | Pressure bubbling level – differential Pressure | +/- 0.075 % | 1/year | Last calibration |
| | | | | | 23/02/2012 |
| | | | | | Valid until |
| | | | | | 22/02/2013 |
| | Lab equipment RFM-340 Serial Number BT99344 | Refractometer | +/- 0.02 % | 1/week (Rhodia verification) | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| | | | | | following week |
| | | | | 2/year (Third party calibration) | Last calibration |
| | | | | | 14/08/2012 |
| | Level tank RE-2422 (LI-2422) Serial Number 91F345706 611 | Pressure insufflation level Differential pressure | +/- 0.065 % | 1/year | Valid until |
| | | | | | 13/02/2013 |
| Last calibration | | | | | |
| 17/08/2012 | | | | | |
| Measuring/ Reading/ Recording frequency: | Measured and recorded daily/Aggregated monthly and yearly | | | | |
| | Calculation method (if applicable): | The daily adipic acid production is the sum of the dry adipic acid + slurry adipic acid used in the Nylon salt production + the in-process inventory variation. This calculation is automatically performed in the PIMS every day at 5:00 p.m. From the PIMS data bank the daily production is automatically extracted using an Excel file and is manually input into the SAP. | | | |
| | | The dry adipic acid is the product packed determined by weigh scales. | | | |
| | | The slurry adipic acid cannot be measured directly. In accordance with the EB guidance issued in the 45th EB meeting the production of slurry adipic acid is obtained by multiplying the Nylon Salt produced by the ratio 0.55748 between adipic acid and Nylon Salt, consistent with the steady composition of the Nylon Salt (reflected by a constant and precise value of the pH). | | | |
| | | The Nylon Salt produced is measured by weigh scales of trucks and inventory variation of the Nylon Salt. | | | |
| | | The cumulated production of Adipic acid over the current year (starting last November 19th and ending with the last day of this period) is below the cap value of 87,308 tonnes as stated by the EB 47th meeting decision. | | | |



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|----------------------------|--|
| | <p>The value of 87,308 tonnes was calculated in the Validation Report as the maximum daily production in 2004 x 365 x the operational rate (260 t/day x 365 x 92%) which is consistent with the clarification of EB 48th meeting report §24 of 17/07/2009.</p> <p>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 current year of the crediting period.</p> <p>The overall accuracy on P_AdOH is calculated, sheet UC_AdOH, and was found to be around 0.27% which is consistent with the PDD requirement of +/- 1%.</p> |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; |
| Additional Comment: | |

| | | | | | |
|----------------------------------|--|-----------------|------------------|-----------------------|-------------------------|
| Data / Parameter: | Nitric acid consumption (HNO3_consumption) | | | | |
| Data unit: | tonnes | | | | |
| Description: | Nitric acid consumption for the calculation of HNO ₃ chemical | | | | |
| Measured /Calculated /Default: | Measured Several instruments are used | | | | |
| Source of data | DCS data and Production log sheets | | | | |
| Value(s) of monitored parameter: | | | HNO3_consumption | | |
| | Rolling year | 18/11/2012 | 58,222 | | |
| | From | To | | | |
| | 01/10/2012 | 31/10/2012 | 4,620 | | |
| | 01/11/2012 | 18/11/2012 | 3,640 | | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | Nitric acid mass flow meter (FQ-2179) Serial number 12000364 3748161 | Mass flow meter | +/- 0.1 % | 2 years | Last calibration |
| | | | | | 30/05/2012 |
| | | | | | Valid until |
| | | | | | 29/05/2014 |



| | | | | | |
|--|--|--|-------------|---------|------------------|
| | Fresh nitric acid concentration analyzer (AI-2179) Serial number 12000364 3748161 | Device integrated to mass flow meter FQ-2179 | +/- 0.5 % | 2 years | Last calibration |
| | | | | | 30/05/2012 |
| | | | | | Valid until |
| | | | | | 29/05/2014 |
| | Level of nitric acid storage tank F-1769 (LI-3350) Serial number 91F345787-611 | Air bubble gauge (back-up from FQ-2179) | +/- 0.065 % | 1/year | Last calibration |
| | | | | | 19/04/2012 |
| | | | | | Valid until |
| | | | | | 18/04/2013 |
| | Flow meter of fresh nitric acid to storage (FQ-3318) Serial number 880162188 (Flow meter) 0304645 (Transmitter) | Magnetic Flow Meter (back-up from FQ-2179) | +/- 1 % | 1/year | Last calibration |
| | | | | | 29/02/2012 |
| | | | | | Valid until |
| | | | | | 27/02/2013 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly and yearly | | | | |
| Calculation method (if applicable): | The nitric acid consumption is based upon the quantity of nitric acid fed to the adipic acid plant during given period and the holding volume and concentration of the process storage tanks (mother acid tank, Oxidation acid tank, Concentration acid tank), which is obtained directly from the DCS and stored at PIMS data base. | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

| | |
|---------------------------------------|---|
| Data / Parameter: | Physical losses in the adipic acid production process (HNO₃_physical) |
| Data unit: | tonnes |
| Description: | Physical losses in the adipic acid production process data required for calculation of HNO ₃ chemical and the N ₂ O emission factor N ₂ O_AdoH |
| Measured /Calculated /Default: | Measured Several instruments are used |
| Source of data | DCS data and lab data |



| Value(s) of monitored parameter: | | | HNO ₃ _physical | | |
|----------------------------------|--|--|----------------------------|-----------------------|-------------------------|
| | Rolling year | 18/11/2012 | 962 | | |
| | From | To | | | |
| | 01/10/2012 | 31/10/2012 | 64 | | |
| | 01/11/2012 | 18/11/2012 | 60 | | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | Flow meter of effluent to biological WWT (FQ-2973) Serial number 91F321071-608 | Orifice plate flow - Differential pressure | +/- 0.60 % | 1/year | Last calibration |
| | | | | | 11/07/2012 |
| | | | | | Valid until |
| | | | | | 10/07/2013 |
| | Flow meter of effluent to neutralization (FQ-2974) Serial Number 91F321074-608 | Orifice plate flow - Differential pressure | +/- 0.85 % | 1/year | Last calibration |
| | | | | | 11/07/2012 |
| | | | | | Valid until |
| | | | | | 10/07/2013 |
| | Waste gas flow meter (FQ-3450) Serial Number 91G511075-720 | Orifice plate flow - Multivariable transmitter | +/- 1.6 % | 1/year | Last calibration |
| | | | | | 30/11/2011 |
| | | | | | Valid until |
| | | | | | 29/11/2012 |
| | Waste gas flow meter (FIC-3401) Serial Number JEJAAR772-625 | Pitot tube flow meter - Differential pressure (back-up from FQ-3450) | +/- 1.45 % | 1/year | Last calibration |
| | | | | | 26/09/2012 |
| | | | | | Valid until |
| | | | | | 25/09/2013 |
| | Nitric analyzer on effluent to neutralization (AI-2974) Serial Number 45201 | pHmeter | +/- 0.05 % | 2/month | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| | | | | | Following 15 days |
| | Nitric analyzer on effluent to neutralization (AI-2974B) Serial number 39237 | pHmeter (back-up from AI-2974) | +/- 0.07 % | 2/month | Last calibration |
| | | | | | 08/11/2012 |
| | | | | | Valid until |
| | | | | | Following 15 days |



| | | | | | |
|--|---|---|----------|-----------------------------|------------------|
| | NOx Analyzer (AI-2195AB) Serial Number 400561459533 | Gas Analyzer - infrared and ultraviolet NOx measurement Sum of AI-2195A (NO) and AI-2195B (NO ₂) | +/- <1 % | 1/week (Rhodia calibration) | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| | | | | | Following week |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly and yearly. | | | | |
| Calculation method (if applicable): | Physical losses (HNO ₃ _physical) are calculated as the sum of the losses of nitric acid or its derivatives in the aqueous wastes, the off gases, the adipic acid product (impurity) and the by-products | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

| | | | | | |
|---|--|------------|-------------------------------|----------------------------|----------------------------|
| Data / Parameter: | HNO₃_Chemical | | | | |
| Data unit: | tonnes | | | | |
| Description: | Chemical consumption of Nitric acid required for the calculation of the N ₂ O emission factor N ₂ O_AdOH | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data | Excel Workbook based on HNO ₃ _consumption and HNO ₃ _physical | | | | |
| Value(s) of monitored parameter: | | | HNO ₃ _consumption | HNO ₃ _physical | HNO ₃ _chemical |
| | Rolling year | 18/11/2012 | 58,222 | 962 | 57,260 |
| | From | To | | | |
| | 01/10/2012 | 31/10/2012 | 4,620 | 64 | 4,556 |
| | 01/11/2012 | 18/11/2012 | 3,640 | 60 | 3,580 |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Calculated and recorded monthly and yearly | | | | |
| Calculation method (if applicable): | To obtain the chemical consumption (HNO ₃ _chemical), the physical losses are deducted from the nitric acid consumption. HNO ₃ _chemical = HNO ₃ _consumption - HNO ₃ _physical | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |



| | | | | | |
|---|---|---|---|--|---|
| Data / Parameter: | N₂O_/AdOH | | | | |
| Data unit: | t N ₂ O/t adipic acid | | | | |
| Description: | Actual N ₂ O emission factor for adipic acid production | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Excel Workbook based on HNO ₃ chemical and P_AdOH | | | | |
| Value(s) of monitored parameter: | Period or Month | N₂O_/AdOH (Calculated for month/period) | N₂O_/AdOH (Calculated for rolling year) | N₂O_/AdOH (Applied for baseline emissions) | N₂O_/AdOH (Applied for project emissions) |
| | 01/10/2012 18/11/2012 | 0.300 | 0.296 | 0.270 | 0.300 |
| | 01/10/2012 31/10/2012 | 0.299 | 0.296 | 0.270 | 0.299 |
| | 01/11/2012 18/11/2012 | 0.301 | 0.296 | 0.270 | 0.301 |
| | The calculation of the by-pass emissions uses the monthly values of the emission factor N ₂ O_/AdOH applied for project emissions. The by-pass emissions for the period are calculated as the sum of the monthly values, and do not use the N ₂ O_/AdOH value of the period, given here for information only. | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly and yearly | | | | |
| Calculation method (if applicable): | <p>The N₂O emission factor is calculated in two ways:</p> <p>(1) with the month/period values of HNO₃_chemical and P_AdOH</p> <p>(2) using the rolling year cumulated data of HNO₃_chemical and P_AdOH</p> <p>The formula used according to AM0021/version 1 equation (4) is:</p> $N_2O_AdOH = HNO_3_chemical / P_AdOH / 63 / 2 \times 0.96 \times 44$ <p>For Baseline Emissions, the lowest among the 2 above calculated values and 0.27 is used conservatively, as specified in the PDD table D.2.1.3 and required by the methodology AM0021/version 1 (page 4).</p> <p>To be conservative, the highest value of the three (two calculated values and 0.27) is applied to calculate Q_N₂O_by-pass (see this parameter for details)</p> | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |



| | | | | | |
|---|--|------------|------------|--------------------|--|
| Data / Parameter: | Q_N₂O | | | | |
| Data unit: | kg | | | | |
| Description: | Quantity of N ₂ O produced | | | | |
| Measured /Calculated /Default: | Calculated value | | | | |
| Source of data: | Excel Workbook based on P_AdOH and N ₂ O_/AdOH data | | | | |
| Value(s) of monitored parameter: | | From | To | Q_N ₂ O | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 2,455,192 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 1,377,705 | |
| | | 01/11/2012 | 18/11/2012 | 1,077,487 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly | | | | |
| Calculation method (if applicable): | Q_N ₂ O = P_AdOH x N ₂ O_/AdOH Only the adipic acid production after cap application is used to determine the baseline emission | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a)Calculation of baseline emissions or baseline net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

| | | | | | |
|---|---|--|--|--|--|
| Data / Parameter: | Q_N₂O reg | | | | |
| Data unit: | kg | | | | |
| Description: | Allowed N ₂ O emission | | | | |
| Measured /Calculated /Default: | Default value | | | | |
| Source of data: | Brazilian legislation | | | | |
| Value(s) of monitored parameter: | Not applicable | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | At date of the regulatory value introduction or change of the regulation | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Rhodia follows the evolution of Brazilian legislation about N ₂ O emissions that could affect the project Emission Reduction through the parameters N ₂ O_reg / AdOH, Q_N ₂ O reg, or ry as part of the ISO 14000 requirements. Experts on environmental matters from Rhodia Brazil follow closely any project or change in the laws and regulations. They participate in external organizations such as ABIQUIM (Brazilian Association of Chemical Industries) and meetings organized by CETESB (local environmental agency). | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; | | | | |



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|---|---|
| Additional Comment: | |
| Data / Parameter: | N₂O reg/AdOH |
| Data unit: | kg/kg |
| Description: | kg of allowed N ₂ O emission / kg of adipic acid produced |
| Measured /Calculated /Default: | Default value |
| Source of data: | Brazilian legislation |
| Value(s) of monitored parameter: | Not applicable |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | At date of the regulatory value introduction or change of the regulation |
| Calculation method (if applicable): | Not applicable |
| QA/QC procedures: | Rhodia follows the evolution of Brazilian legislation about N ₂ O emissions that could affect the project Emission Reduction through the parameters N ₂ O_reg / AdOH, Q_N ₂ O reg, or r _y as part of the ISO 14000 requirements. Experts on environmental matters from Rhodia Brazil follow closely any project or change in the laws and regulations. They participate in external organizations such as ABIQUIM (Brazilian Association of Chemical Industries) and meetings organized by CETESB (local environmental agency). |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional Comment: | |

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|---|--|
| Data / Parameter: | r_y |
| Data unit: | % |
| Description: | Share of N ₂ O emissions required to be destroyed |
| Measured /Calculated /Default: | Default value |
| Source of data: | Brazilian legislation |
| Value(s) of monitored parameter: | Not applicable |
| Data used for: | Baseline Emissions |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | At date of the regulatory value introduction or change of the regulation |
| Calculation method (if applicable): | Not applicable |



| | |
|----------------------------|--|
| QA/QC procedures: | Rhodia follows the evolution of Brazilian legislation about N ₂ O emissions that could affect the project Emission Reduction through the parameters N ₂ O _{reg} / AdOH, Q _{N₂O reg} , or ry as part of the ISO 14000 requirements. Experts on environmental matters from Rhodia Brazil follow closely any project or change in the laws and regulations. They participate in external organizations such as ABIQUIM (Brazilian Association of Chemical Industries) and meetings organized by CETESB (local environmental agency). |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional Comment: | |

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|---|---|
| Data / Parameter: | P N₂O |
| Data unit: | €/t |
| Description: | Market price of N ₂ O |
| Measured /Calculated /Default: | Estimated |
| Source of data: | Market Survey (last up-date August 2012) |
| Value(s) of monitored parameter: | Zero (0) (there is no N ₂ O market for the N ₂ O produced as by-product of adipic acid in Paulinia) |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Annual update based on permanent market survey |
| Calculation method (if applicable): | Not applicable |
| QA/QC procedures: | Not applicable |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; |
| Additional Comment: | |

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|----------------------------------|---|------------|------------|------------|
| Data / Parameter: | Q_Steam_p | | | |
| Data unit: | kg of steam | | | |
| Description: | Amount of steam produced by the decomposition process | | | |
| Measured /Calculated /Default: | Measured | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | |
| Value(s) of monitored parameter: | | From | To | Q_Steam_p |
| | Period Value: | 01/10/2012 | 18/11/2012 | 10,919,800 |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 6,565,800 |
| | | 01/11/2012 | 18/11/2012 | 4,354,000 |



| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
|--|--|---|----------------|-----------------------|-------------------------|
| | 40 bar steam flow meter (FQ-3470) Serial number 7072986 | Orifice plate flow – Multi variable transmitter | +/- 1.2 % | 1/year | Last calibration |
| | | | | | 11/09/2012 |
| | | | | | Valid until |
| | | | | | 10/09/2013 |
| | Boiler feed water flow meter (FQ-3410) Serial number 91F348990612 | Orifice plate flow - Differential pressure (back-up from FQ-3470) | +/- 0.65 % | 1/year | Last calibration |
| | | | | | 10/09/2012 |
| | | | | | Valid until |
| 09/09/2013 | | | | | |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|---|---|
| Data / Parameter: | E_Steam |
| Data unit: | kg CO ₂ /kg of steam |
| Description: | CO ₂ emission factor of steam produced by facility |
| Measured /Calculated /Default: | Calculated |
| Source of data: | Excel Workbook based on QNG_tsteam and E_NG |
| Value(s) of monitored parameter: | 0.144 |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/ Updated for each monitoring period |
| Calculation method (if applicable): | <p>The rolling year value of E_Steam is calculated with the data available for the 12 months prior to the beginning of the period in order to assure to have the data. The emission factor is obtained by the formula below:</p> $E_Steam = (QNG_tsteam/1,000) * E_NGy$ $QNG_steam = \Delta H \text{ (kJ/t)} / (LHV \text{ (kJ/Nm}^3\text{)} \times \eta \text{ (\%)})$ <p>Where:</p> <p>QNG_steam: amount of natural gas required to generate steam (Nm³/t)</p> <p>The LHV data is the yearly average value for the gas supplied by COMGAS.</p> <p>The yield η (%) of the boiler is conservatively taken as 97%, while the yield is generally below 90%</p> |



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|----------------------------|---|------------|--------|---|--|
| | E_NGy: yearly average value for the gas supplied by COMGAS (kg CO ₂ /Nm ³) | | | | |
| | Year Ending on: 01/10/2012 | | | | |
| | LHV kJ/Nm ³ | ΔH kJ/t | η % | QNG_tsteam Nm ³ /t of steam | E_NGy kg-CO ₂ /Nm ³ |
| | 38,624 | 2,624,000 | 97 | 65.90 | 2.198 |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|---|---|------------|------------|--------------------------|--|
| Data / Parameter: | CO₂_Steam_p | | | | |
| Data unit: | t CO ₂ e | | | | |
| Description: | CO ₂ Emissions from Steam Production | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Excel Workbook based on Q_Steam_p and E_Steam data | | | | |
| Value(s) of monitored parameter: | | From | To | CO ₂ _Steam_p | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 1,571 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 945 | |
| | | 01/11/2012 | 18/11/2012 | 626 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | Calculated monthly and expressed in tonnes, using Q_Steam_p and E_Steam CO ₂ _Steam_p = Q_Steam_p x E_Steam | | | | |
| QA/QC procedures: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (a) Calculation of baseline emissions or baseline net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|---|--|------------|------------|------------|--|
| Data / Parameter: | Q_GE | | | | |
| Data unit: | Nm ³ | | | | |
| Description: | Volume of effluent gas leaving the stack | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS | | | | |
| Value(s) of monitored parameter: | | From | To | Q_GE | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 13,659,868 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 8,117,776 | |
| | | 01/11/2012 | 18/11/2012 | 5,542,092 | |



| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
|---|---|---|----------------|-----------------------|-------------------------|
| | Gas flow meter (FQ-3490) Serial number 7072985 | Annubar gas flow meter-Multivariable transmitter on wet basis | +/- 2.5 % | 1/year | Last calibration |
| | | | | | 12/09/2012 |
| | | | | | Valid until |
| | | | | | 11/09/2013 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|--|---|--|--------------------|-----------------------------|-------------------------|
| Data / Parameter: | N ₂ O_GE | | | | |
| Data unit: | vppm | | | | |
| Description: | Concentration of N ₂ O in the effluent gas | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS | | | | |
| Value(s) of monitored parameter: | | From | To | N ₂ O_GE | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 38.5 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 49.6 | |
| | | 01/11/2012 | 18/11/2012 | 22.2 | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | N ₂ O analyzer (AI-3490B) Serial number 17008 | Gas analyzer, type in-situ and laser diode on wet basis | +/- 5 % of reading | 2/year | Last calibration |
| | | | | | 28/03/2012 |
| | | | | | Valid until |
| | N ₂ O analyzer (AI-3490G) Serial number 450561464363 | Back-up Analyzer Gas analyzer, type extractive and infrared | +/- <1.0 % | 1/week (Rhodia calibration) | 27/09/2012 |
| | | | | | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| | | | | following week | |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | The daily average concentration on wet basis is calculated in the DCS as the flow averaged value of instantaneous concentration values measured every 10 sec: N ₂ O_GE = Σ (Q_GE x N ₂ O_GE) / Q_GE | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |



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| Additional Comment: | The N ₂ O analyzer (AI3490B) is out of service since 25/08/2012. It is currently under repair at the supplier. The calibration will be done when it will put in place in the unit |
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|---|---|------------|------------|---------------------|--|
| Data / Parameter: | ND_N₂O | | | | |
| Data unit: | kg | | | | |
| Description: | Quantity of N ₂ O in the effluent gas leaving the stack | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS | | | | |
| Value(s) of monitored parameter: | | From | To | ND_N ₂ O | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 1,033 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 791 | |
| | | 01/11/2012 | 18/11/2012 | 242 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | <p>The daily value of non destroyed N₂O (N₂O_ND) is calculated on-line in the DCS by integrating the product of the instantaneous concentration of N₂O by the flow rate of the gaseous effluent, both measured on a wet basis (Method C of EB61 – “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”) :</p> $ND_N_2O = Q_GE \times N_2O_GE \times Specific_gravity_of_N_2O$ <p>The specific gravity of N₂O = 44/22.414 x 10⁻⁶ is used to transform vppm in kg/Nm³</p> <p>When the instant value indicated by AI-3490B is lower than 5 vppm (detection limit), the value of 5 vppm is used in the equation above.</p> | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|---|---|------------|------------|---------|--|
| Data / Parameter: | Q_NG | | | | |
| Data unit: | Nm ³ | | | | |
| Description: | Amount of natural gas used by the decomposition process | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value(s) of monitored parameter: | | From | To | Q_NG | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 870,372 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 526,948 | |
| | | 01/11/2012 | 18/11/2012 | 343,424 | |



| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Date of last calibration |
|--|---|----------------|----------------|-----------------------|--------------------------|
| | Gas flow meter (FQ-3408) Serial number IB-2298 | Gas flow meter | +/- 0.5 % | 2 years | Last calibration |
| | | | | | 29/02/2012 |
| | | | | | Valid until |
| | | | | | 27/02/2014 |
| | Gas flow meter (FQ-3460) (back-up from FQ-3408) Serial number IB-2095 | Gas flow meter | +/- 0.5 % | 2 years | Last calibration |
| | | | | | 03/10/2011 |
| | | | | | Valid until |
| | | | | | 02/10/2013 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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| Data / Parameter: | E_NGy |
| Data unit: | kg CO ₂ /Nm ³ |
| Description: | Emissions coefficient for natural gas combustion |
| Measured /Calculated /Default: | Calculated |
| Source of data: | Excel Workbook based on NGC |
| Value(s) of monitored parameter: | 2.198 |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Updated each period |
| Calculation method (if applicable): | The emissions coefficient is calculated according to the PDD Monitoring Plan. For the 12 months preceding the monitoring period, the CO ₂ quantity emitted by the combustion of the natural gas from all the gas boilers is summed up and divided by the total quantity of natural gas consumed in Nm ³ over the same 12 months period. The CO ₂ quantity emitted is obtained by multiplying the emission factor of the month (based on the gas composition of the month) by the quantity of natural gas burned in the same month, using the formulae described in section E1 of the PDD. |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 |



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| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; |
| Additional Comment: | |

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|---|---|--------------------|---------------|---------------|--|
| Data / Parameter: | NGC | | | | |
| Data unit: | % vol | | | | |
| Description: | Natural gas composition required for the calculation of E_NG | | | | |
| Measured /Calculated /Default: | Measured by COMGAS (supplier company) | | | | |
| Source of data: | Natural gas supplier COMGAS | | | | |
| Value(s) of monitored parameter: | Component | Number of C | Oct-12 | Nov-12 | |
| | CH ₄ (Methane) | 1 | 89.28 | 88.30 | |
| | C ₂ H ₆ (Ethane) | 2 | 5.74 | 6.35 | |
| | C ₃ H ₈ (Propane) | 3 | 1.84 | 1.99 | |
| | I-C ₄ H ₁₀ (i-Isobutane) | 4 | 0.28 | 0.29 | |
| | N-C ₄ H ₁₀ (n-Butane) | 4 | 0.40 | 0.42 | |
| | C ₅ H ₁₂ (i-Pentane) | 5 | 0.12 | 0.12 | |
| | C ₅ H ₁₂ (n-Pentane) | 5 | 0.10 | 0.08 | |
| | C ₆ H ₁₄ (Hexane) | 6 | 0.08 | 0.10 | |
| | N ₂ (Nitrogen) | 0 | 0.74 | 0.76 | |
| | CO ₂ (Carbon dioxide) | 1 | 1.42 | 1.58 | |
| | Average number of C | | 1.12 | 1.13 | |
| | E_NG_m (kg CO₂/Nm³) | | 2.201 | 2.222 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly | | | | |
| Calculation method (if applicable): | <p>NGC is use to calculate the E_NG monthly value. The average number of C in a mole of NG is calculated from the composition = Σ (number of C in each mole) x (volume ratio). The CO₂ specific gravity in normal conditions is 1.965 kg/Nm³. $E_NG = 1.965 \times (\text{average number of C})$</p> <p>For this monitoring period, natural gas composition from November 2012 is not yet available, so to be conservative, the NGC of the month of August 2008 was used for November as it gives the highest E_NG value since the beginning of the crediting period (19/11/2006).</p> | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |



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| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; |
| Additional Comment: | |

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|---|---|------------|------------|---------------------|--|
| Data / Parameter: | CO₂_NG | | | | |
| Data unit: | t CO ₂ | | | | |
| Description: | CO ₂ Emissions for Natural Gas | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Excel Workbook calculated from Q_NG and E_NG | | | | |
| Value(s) of monitored parameter: | | From | To | CO ₂ _NG | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 1,924 | |
| | Monthly values: | 01/10/2012 | 31/10/2012 | 1,160 | |
| | | 01/11/2012 | 18/11/2012 | 764 | |
| | | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | CO ₂ _NG is calculated monthly and expressed in tonnes using the monthly values of Q_NG and E_NG $\text{CO}_2\text{NG}_m = \text{Q_NG}_m \times \text{E_NG}_m$ The value of the period is the sum of the monthly values of the period | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |

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|---|---|-----------------|---|------------------------------|--------------------------------|
| Data / Parameter: | %_on-line | | | | |
| Data unit: | % of production time | | | | |
| Description: | % of production time that N ₂ O is feeding the destruction facility | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value(s) of monitored parameter: | | From | To | %_on-line | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 99.998 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 99.996 | |
| | | 01/11/2012 | 18/11/2012 | 100.000 | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | By-pass valve (HV-3402) Serial number not applicable | Butterfly valve | below 1% relative accuracy on %_on-line parameter | 1/year | Last calibration |
| | | | | | 15/02/2012 |
| | | | | | Valid until |
| | | | | | 14/02/2013 |



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| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly |
| Calculation method (if applicable): | <p>The %_{on-line} is recorded on a daily basis and is the ratio between the time of production of adipic acid while the unit is connected to the N₂O destruction facility and the time of production.</p> <p>At the end of the month/period (y), %_{on-line} is calculated as:</p> $\%_{on-line}_y = 1 - (Q_{N_2O_by-pass}_y / (P_{AdOH}_y \times N_2O_{/AdOH}_y))$ <p>where N₂O_{/AdOH}_y is the actual value of the month/period</p> |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; |
| Additional Comment: | |

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|---|--|------------|------------|-------------------------------------|---|
| Data / Parameter: | Q_{N₂O}_by-pass | | | | |
| Data unit: | kg | | | | |
| Description: | N ₂ O by passing the decomposition facility | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value(s) of monitored parameter: | | From | To | Q _{N₂O} _bypass | N ₂ O _{/AdOH} Calculated (Actual) |
| | Period Value: | 01/10/2012 | 18/11/2012 | 68 | 0.300 |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 68 | 0.299 |
| | | 01/11/2012 | 18/11/2012 | 0 | 0.301 |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Calculated and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | <p>The quantity of N₂O that by-pass the facility is calculated following AM0021/version1:</p> <p>· Q_{N₂O}_by-pass_d = Q_{N₂O}_d x (1 - %_{on-line}) for each day (d)</p> <p>Q_{N₂O}_d = P_{AdOH}_d x N₂O_{/AdOH} where N₂O_{/AdOH} is the actual value (considering that it is higher than 0.27) following the final ruling regarding the request for issuance of CERs "N₂O decomposition project of PetroChina Company Limited Liaoyang Petrochemical Company" (EB61).</p> <p>· Q_{N₂O}_by-pass_d = P_{AdOH}_d x N₂O_{/AdOH} x (1 - %_{on-line})_d</p> <p>At the end of the month or period the quantity of N₂O that by-passed the facility is summed for all days:</p> <p>· Q_{N₂O}_by-pass_y = Σ (Q_{N₂O}_by-pass_d)</p> | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (b) Calculation of project emissions or actual net GHG removals by sinks; | | | | |
| Additional Comment: | | | | | |



| | | | | | |
|--|---|-------------------|----------------|-----------------------|-------------------------|
| Data / Parameter: | Q_Power | | | | |
| Data unit: | kWh | | | | |
| Description: | Electric consumption of the decomposition facility | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value(s) of monitored parameter: | | From | To | Q_Power | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 49,091.2 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 29,109.1 | |
| | | 01/11/2012 | 18/11/2012 | 19,982.1 | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | Electricity meter (JI-3461) Serial number 40072320-4 | Electricity meter | +/- 0.20 % | 2 years | Last calibration |
| | | | | | 11/04/2012 |
| | | | | | Valid until |
| | | | | | 10/04/2014 |
| | Electricity meter (JI-3461) Serial number 40115317 | Electricity meter | +/- 0.20 % | 2 years | Last calibration |
| | | | | | 25/04/2012 |
| | | | | | Valid until |
| | | | | | 24/04/2014 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | The daily values are automatically generated in the DCS, the monthly values are obtained in the workbook by the sum of the daily values | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (c) Calculation of leakage | | | | |
| Additional Comment: | | | | | |

| | |
|---------------------------------------|--|
| Data / Parameter: | E_Power |
| Data unit: | kg CO ₂ /kWh |
| Description: | CO ₂ intensity for electric generation |
| Measured /Calculated /Default: | Calculated |
| Source of data: | Excel Workbook based on the data provided by Department of Utilities from Paulínia Site, considering the two sources of data obtained with: 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 |



| | |
|---|---|
| Value (s) of monitored parameter: | 0.993 |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated and recorded yearly |
| Calculation method (if applicable): | The E_Power was done using the latest available data from 2011. It is 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 around 4% of the total electricity supplied to the grid is generated using fossil fuels in 2011 (around 96% of Hydro and Nuclear). The detailed calculation is available in the Excel file “Workbook ER Paulinia” of this period (in the worksheet “E_Power”) which is a confidential document communicated to the DOE and to the CDM Executive Board. |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |
| Purpose of data: | (c) Calculation of leakage |
| Additional Comment: | |

| | | | | | |
|---|--|------------|------------|------------------------|--|
| Data / Parameter: | CO₂_Power | | | | |
| Data unit: | t CO ₂ | | | | |
| Description: | CO ₂ Emissions from Electricity consumption | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Excel workbook based on Q_Power and E_Power data | | | | |
| Value(s) of monitored parameter: | | From | To | CO ₂ _Power | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 49 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 29 | |
| | | 01/11/2012 | 18/11/2012 | 20 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | Calculated monthly and expressed in tonnes, using Q_Power and E_Power CO ₂ _Power= Q_Power x E_Power | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (c) Calculation of leakage | | | | |
| Additional Comment: | | | | | |

| | |
|--------------------------|------------------|
| Data / Parameter: | Q_Steam_c |
|--------------------------|------------------|



| | | | | | |
|---|---|---------------------------|-----------------------|------------------------------|--------------------------------|
| Data unit: | kg | | | | |
| Description: | Amount of steam consumed by the decomposition facility | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value(s) of monitored parameter: | | From | To | Q_Steam_c | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 56,500 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 34,900 | |
| | | 01/11/2012 | 18/11/2012 | 21,600 | |
| Monitoring equipment | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
| | 6.5 bar steam flow meter (FQ-3409) | Orifice plate flow - | | | Last calibration |
| | Serial number 6270424 | Multivariable transmitter | +/- 1.25 % | 1/year | 03/01/2012 |
| | | | | | Valid until |
| | | | | | 02/01/2013 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (c) Calculation of leakage | | | | |
| Additional Comment: | | | | | |

| | |
|---|---|
| Data / Parameter: | E_Steam_c |
| Data unit: | kg CO ₂ /kg of steam |
| Description: | CO ₂ intensity for steam consumed in the facility |
| Measured /Calculated /Default: | Calculated |
| Source of data: | Excel workbook based on the E_Steam_c_NG, %GEN_NG, and E_Steam_c_chem&oil supplied by the Rhodia Paulínia Industrial Platform |
| Value(s) of monitored parameter: | 0.214 |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Updated for each period |



| | | | | | |
|--|---|--|--|---------|---|
| Calculation method (if applicable): | <p>The steam consumed in the facility is supplied by existing boilers on site. E_Steam_c is calculated on a rolling year basis following the PDD in three steps. First we calculate E_Steam_c_NG, the CO₂ emission per kg of steam produced by the natural gas boilers. Second we calculate E_Steam_c_chem&oil, which is the CO₂ emission per kg of steam produced by the boilers running on by-products and fuel oil. Finally E_Steam_c is calculated by weighting E_Steam_c_NG and E_Steam_c_chem&oil with their real share in the total steam production</p> <p>The E_Steam_c is obtained by rounding up the following calculation: $E_Steam_c = E_Steam_c_NG \times \%GEN_NG + E_Steam_c_chem\&oil \times (1 - \%GEN_NG)$</p> | | | | |
| | 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 | E_Steam_c kg CO ₂ / kg of steam |
| | 01/10/2012 | 0.210 | 0.275 | 94.8 | 0.214 |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (c) Calculation of leakage | | | | |
| Additional Comment: | | | | | |

| | | | | | |
|---|---|------------|------------|--------------------------|--|
| Data / Parameter: | CO₂_Steam_c | | | | |
| Data unit: | t CO ₂ | | | | |
| Description: | CO ₂ Emissions from Steam consumption | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Calculated from Q_Steam_c and E_Steam_c data | | | | |
| Value(s) of monitored parameter: | | From | To | CO ₂ _Steam_c | |
| | Period Value: | 01/10/2012 | 18/11/2012 | 13 | |
| | Monthly Values: | 01/10/2012 | 31/10/2012 | 8 | |
| | | 01/11/2012 | 18/11/2012 | 5 | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | Calculated monthly and expressed in tonnes, using Q_Steam_c and E_Steam_c $CO2_Steam_c = Q_Steam_c \times E_Steam_c$ | | | | |
| QA/QC procedures: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |
| Purpose of data: | (c) Calculation of leakage | | | | |
| Additional Comment: | | | | | |

| | |
|--------------------------|-----------------------|
| Data / Parameter: | NO_x |
|--------------------------|-----------------------|



| | | | | | |
|-------------------------------------|--|---------------------|------------------------------|--|-------------------------|
| Data unit: | vppm | | | | |
| Description: | NO + NO ₂ concentration in the stack gas 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. | | | | |
| Measured /Calculated /Default: | Measured | | | | |
| Source of data: | The data are automatically acquired continuously by DCS and stored in the PIMS. | | | | |
| Value (s) of monitored parameter: | Parameter | Unit | Limit | Analytical results in this period | |
| | NOx | vppm | 300 max at least 95% of time | Average of 33 and less than 300 for 99.38% of time | |
| Monitoring equipment | Equipment | Type | Accuracy Class | Calibration frequency | Calibration information |
| | AI-3490A (NO) serial number 450561464363 | 3490A (Infrared) | +/- <1 % | 1/week (Rhodia calibration) | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| | | | | | following week |
| | AI-3490F (NO ₂) serial number 450561464363 | 3490F (Ultraviolet) | +/- <1 % | 1/week (Rhodia calibration) | Last calibration |
| | | | | | 15/11/2012 |
| | | | | | Valid until |
| following week | | | | | |
| Measuring/Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures: | Procedure UQP-3-ADO-QA-006 | | | | |
| Purpose of data: | Compliance with local regulation on NOx | | | | |
| Additional Comment: | | | | | |

For other additional informations about the equipments cited above consult the Annex 1.

D.3. Implementation of sampling plan

Not applicable: AM0021 methodology version 1 does not specify any requirement on sampling

SECTION E. Calculation of emission reductions or GHG removals by sinks**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

The amount of baseline emissions in the given period y is calculated using the following formula according to AM0021/version 1 equation (1):

$$BE_y = Q_{N_2O_y} \times GWP_{N_2O} + Q_{Steam_{py}} \times E_{Steam_y}$$

It has been checked that there are no Brazilian regulation in 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 $Q_{N_2O_y}$ of N_2O emitted over the period can then be calculated by (AM0021/version1 – equation (2)):

$$Q_{N_2O_y} = P_{AdOH_y} \times N_2O_{/AdOH}$$

Over the period of reference the emission factor of the adipic acid plant was above the capped value of 0.27 kg N_2O /kg AdOH (see: D.2). So the capped value is being used according to AM 0021/version 1. The baseline emissions in this monitoring period are calculated in the table below using the values detailed in section D.1 and D.2 above:

| Parameter | Value | Unit |
|-------------------------|------------|-------------------------------|
| $Q_{N_2O_y}$ | 2,455,192 | kg |
| P_{AdOH_y} (eligible) | 9,093.307 | t |
| $N_2O_{/AdOH}$ | 0.270 | kg N_2O /kg AdOH |
| GWP_{N_2O} (1) | 310 | kgCO ₂ e/kg N_2O |
| $Q_{Steam_{py}}$ | 10,919.800 | t of Steam |
| E_{Steam_y} | 0.144 | tCO ₂ /t of Steam |

(1) Kyoto Protocol Rule, Decision 2/CP.3 and IPCC

The Baseline Emissions over this monitoring period are calculated as:

$$\begin{aligned} BE_y &= P_{AdOH_y} \times N_2O_{/AdOH} \times GWP_{N_2O} + Q_{Steam_{py}} \times E_{Steam_y} \\ &= 9,093.307 \times 0.270 \times 310 + 10,919.800 \times 0.144 \\ &= 761,110 + 1,572 \\ &= \mathbf{762,682 \text{ tCO}_2e} \end{aligned}$$

BE_y calculated in BE worksheet of the workbook is 762,680 tCO₂e due to rounding down effects in the workbook calculations to be conservative in the final calculation of ER.

(See Section D2 for details)

E.2. Calculation of project emissions or actual net GHG removals by sinks

According to AM0021, version 1, the project emissions PE_y are the emissions in the period y due to:

- the N_2O that has not been sent to the decomposition process (i.e. the N_2O that by-passed the decomposition facility)
- the N_2O non-destroyed by the decomposition process
- the emissions due to the use of natural gas.

PE_y is calculated as follows:

$$PE_y = (Q_N_2O_by-pass_y + ND_N_2O_y) \times GWP_N_2O + Q_NG_y \times E_NG_y \text{ (AM0021/version 1 equation (5))}$$

With $CO_2_NG_y = Q_NG_y \times E_NG_y$ (PDD section E.1) we get:

$$PE_y = (Q_N_2O_by-pass_y + ND_N_2O_y) \times GWP_N_2O + CO_2_NG_y, \text{ where:}$$

$$Q_N_2O_by-pass_y = P_AdOH_y \times (1 - \%_on-line_y) \times N_2O_/AdOH_y$$

As a conservative interpretation of the methodology $Q_N_2O_by-pass_y$ is calculated using the actual value of $N_2O_/AdOH_y$

$$ND_N_2O_y = Q_GE_y \times N_2O_GE_y \times \text{Specific gravity of } N_2O \times 10^{-6}$$

The project emissions in this monitoring period are calculated in the table below using the values presented in detail in section D:

| Parameter | Value | Unit |
|-----------------|-----------|------------------------------------|
| P_AdOH_y | 9,093.307 | t |
| $N_2O_/AdOH_y$ | 0.300 | t N_2O /t AdOH |
| $\%_on-line_y$ | 100.00 | % |
| $ND_N_2O_y$ | 1.033 | t N_2O |
| GWP_N_2O (1) | 310 | tCO ₂ e/t N_2O |
| Q_NG_y | 870,372 | Nm ³ |
| E_NG_y | 2.198E-03 | tCO ₂ e/Nm ³ |

(1) Kyoto Protocol Rule, Decision 2/CP.3 and IPCC

The Project Emissions over this monitoring period are calculated as:

$$\begin{aligned} PE_y &= (P_AdOH_y \times (1 - \%_on-line_y) \times N_2O_/AdOH_y) + ND_N_2O_y \times GWP_N_2O + CO_2_NG_y \\ &= ((9,093.307 \times (1 - 1.00) \times 0.300) + 1.033) \times 310 + (870,372 \times 0.002198) \\ &= 341 + 1,913 \\ &= \mathbf{2,256 \text{ tCO}_2\text{e}} \end{aligned}$$

PE_y calculated in PE worksheet of the workbook is 2,268 tCO₂e due to rounding-up effects in the workbook calculations to be conservative in the final calculation of ER.

E.3. Calculation of leakage

Leakage emissions in a given period y comprise the emissions associated with the energy sources used to generate any steam and electricity used by the decomposition plant.

Leakage is calculated according to AM0021/version 1, equation (7):

The leakage emissions in this monitoring period are calculated in the table below using the values presented in the detail in section D:

| Parameter | Value | Unit |
|----------------|----------|---------------------------------|
| Q_Power_y | 49,091.2 | kWh |
| E_Power | 0.993 | kg CO ₂ /kWh |
| Q_Steam_cy | 56,500 | kg |
| E_Steam_cy | 0.214 | kg CO ₂ /kg of steam |

The Leakage Emissions over this monitoring period are calculated as:

$$\begin{aligned} L_y &= Q_Power_y \times E_Power + Q_Steam_cy \times E_Steam_cy \\ &= (49,091.2 \times 0.993) + (56,500 \times 0.214) \\ &= 48,748 \text{ kg} + 12,091 \text{ kg} \\ &= 61 \text{ tCO}_2\text{e} \end{aligned}$$

L_y calculated in L worksheet of the workbook is 62 tCO₂e due to rounding-up effects in the workbook calculations to be conservative in the final calculation of ER.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Following the methodology AM0021/version 1 and the PDD section D.2.4, the total emission reductions achieved by this project activity during this monitoring period is:

$$ER_y = BE_y - PE_y - L_y$$

| Time Period | Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e) | Project emissions or actual net GHG removals by sinks (tCO ₂ e) | Leakage (tCO ₂ e) | Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e) |
|-------------|---|--|------------------------------|---|
| Total | 762,680 | 2,268 | 62 | 760,350 |

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

In the PDD section E the emission reduction is estimated to be 5,961,165 tCO₂e. So the PDD-estimated emission reduction relative to the monitoring period of 49 days is 800,263 tCO₂e higher than the emission reductions of the current monitoring period.

| Item | Values applied in ex-ante calculation of registered PDD | Actual values achieved during this monitoring period |
|---|---|--|
| Emission reductions or GHG removals by sinks (tCO ₂ e) | 800,263 | 760,350 |

E.6. Remarks on difference from estimated value in registered PDD

The actual amount of Emission Reductions for this period is below the amount calculated using the PDD data.

| | | |
|------------------|---|-------------------------------------|
| BE: | PDD value = 957,094 tCO ₂ e | Period = 762,680 tCO ₂ e |
| Variance | Explanation | |
| - 193,988 | The daily average production for this period was lower (around 185.6 t/d) than the estimate of the PDD. | |
| - 426 | The steam produced in this period was lower than in PDD estimate. | |
| - 194,414 | Total BE 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 refer to item E.1 for details.

| | | |
|----------------|---|-----------------------------------|
| PE: | PDD value = 156,666 tCO ₂ e | Period = 2,268 tCO ₂ e |
| Variance | Explanation | |
| 143,264 | The significant higher performance of the N ₂ O abatement unit (the actual %_on-line of 99.998% in this period is significantly higher than the value of 85% estimated in the PDD due to excellent operational performance). | |
| 9,999 | A higher destruction rate of the N ₂ O which is around 99.96% during this period versus 99% taken conservatively in the PDD. | |
| 1,135 | Difference in the natural gas consumption estimate and actual in the period | |
| 154,398 | Total PE variance | |

| | | |
|------------|---|---------------------------------|
| L: | PDD value = 165 tCO ₂ e | Period = 62 t CO ₂ e |
| Variance | Explanation | |
| 103 | Difference mainly due to the quantity of steam consumed | |
| 103 | Total L variance | |

The actual emission reductions determined in this monitoring period are lower than the *pro rata* estimation based on the *ex-ante* calculation made in the PDD, as explained above.



Annex 1. Table of Equipments/General Information – Instrument Calibration & Maintenance Status

| Related PDD parameter | Instrument Location/Description | Tag Number | Parameter in PDD | Reference | Frequency | Work Done by | Previous calibration dates | Last calibration date | Remarks |
|----------------------------|---|-----------------------|----------------------------|---|-----------|--------------|--|-----------------------|--|
| P_AdOH | Packaging machine 25 kg | Z-3110 | Dry AA (P_AdOH) | INMETRO - Brazil Standard Portaria no. 236 (22December1994) | 1/month | Third party | 31/08/2012 27/09/2012 | 25/10/2012 | |
| P_AdOH | Packaging machine 25 kg | G-2532 | Dry AA (P_AdOH) | INMETRO - Brazil Standard Portaria no. 236 (22December1994) | 1/month | Third party | 31/08/2012 27/09/2012 | 25/10/2012 | |
| P_AdOH | Weigh scale 1000 kg | Z-3120 | Dry AA (P_AdOH) | INMETRO - Brazil Standard Portaria no. 236 (22December1994) | 4/year | Third party | 22/12/2011 15/03/2012 06/06/2012 | 31/08/2012 | |
| P_AdOH | Trucks weigh scale | BB-0090 | N-salt production (P_AdOH) | INMETRO - Brazil Standard Portaria no. 236 (22December1994) | 2/year | Third party | 07/04/2012 23/09/2012 | 15/10/2012 | During corrective maintenance on 15/10/2012 a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |
| P_AdOH | Trucks weigh scale | BB-0335 | N-salt production (P_AdOH) | INMETRO - Brazil Standard Portaria no. 236 (22December1994) | 2/year | Third party | 15/04/2012 07/10/2012 | 15/10/2012 | During corrective maintenance on 15/10/2012 a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |
| P_AdOH | Level of tank R-5300 | LT-4500 | N-salt production (P_AdOH) | Manufacturer Specifications | 1/year | Rhodia | 14/07/2011 11/07/2012 | 06/11/2012 | During corrective maintenance on 06/11/2012 a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |
| P_AdOH | Level of tank R-5310 | LT-4509 | N-salt production (P_AdOH) | Manufacturer Specifications | 1/year | Rhodia | 03/03/2011 | 23/02/2012 | |
| P_AdOH | Refractometer | Lab equipment RFM-340 | N-salt production (P_AdOH) | Manufacturer Specifications | 1/week | Rhodia | 20/09/2012 27/09/2012 04/10/2012 11/10/2012 18/10/2012 25/10/2012 01/11/2012 08/11/2012 | 15/11/2012 | |
| | | | | Manufacturer Specifications | 2/year | Third party | 23/02/2012 | 14/08/2012 | |
| HNO ₃ _cons | Nitric acid mass flowmeter | FQ-2179 | Nitric Cons | Manufacturer Specifications | 2 years | Third party | 21/07/2010 | 30/05/2012 | Preventive maintenance was anticipated and was done during the Adipic Acid and Abatement N ₂ O plants shutdown. |
| HNO ₃ _cons | Fresh nitric acid conc analyzer | AI-2179 | Nitric Cons | Manufacturer Specifications | 2 years | Third party | 03/08/2010 | 30/05/2012 | Preventive maintenance was anticipated and was done during the Adipic Acid and Abatement N ₂ O plants shutdown. |
| HNO ₃ _physical | Flowmeter of effluent to biological WWT | FQ-2973 | Nitric Loss | Manufacturer Specifications | 1/year | Rhodia | 21/07/2011 | 11/07/2012 | |
| HNO ₃ _physical | Flowmeter of effluent to neutralization | FQ-2974 | Nitric Loss | Manufacturer Specifications | 1/year | Rhodia | 21/07/2011 | 11/07/2012 | |
| HNO ₃ _physical | Waste gas flowmeter | FQ-3450 | Nitric Loss | Manufacturer Specifications | 1/year | Rhodia | 08/12/2010 | 30/11/2011 | |
| HNO ₃ _physical | Nitric analyzer on effluent to neutralization | AI-2974 | Nitric Loss | Manufacturer Specifications | 2/month | Rhodia | 06/09/2012 20/09/2012 04/10/2012 18/10/2012 01/11/2012 | 15/11/2012 | |
| HNO ₃ _physical | Nitric analyzer on effluent to neutralization | AI-2974B | For failure of AI-2974 | Manufacturer Specifications | 2/month | Rhodia | 13/09/2012 27/09/2012 11/10/2012 25/10/2012 | 08/11/2012 | |
| HNO ₃ _physical | NOx analyzer in the waste gas stream | AI-2195AB | Nitric Loss | Manufacturer Specifications | 1/week | Rhodia | 20/09/2012 27/09/2012 04/10/2012 11/10/2012 18/10/2012 25/10/2012 01/11/2012 08/11/2012 | 15/11/2012 | |
| HNO ₃ _cons | Level of nitric acid storage tank F-1769 | LI -3350 | Nitric Cons (backup) | Manufacturer Specifications | 1/year | Rhodia | 18/07/2011 08/03/2012 | 19/04/2012 | During corrective maintenance on 19/04/2012 a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |

Annex 1. Table of Equipments/General Information– Instrument Calibration & Maintenance Status

| Related PDD parameter | Instrument Location/Description | Tag Number | Parameter in PDD | Reference | Frequency | Work Done by | Previous calibration dates | Last calibration date | Remarks |
|----------------------------|--|------------|---------------------------|--|-----------|--------------|--|---|--|
| HNO ₃ _cons | Flowmeter of fresh nitric acid to storage | FQ-3318 | Nitric Cons (backup) | Manufacturer Specifications | 1/year | Third party | 07/07/2011 | 29/02/2012 | |
| Q_NG | Natural gas flowmeter | FQ-3408 | Project emission | INMETRO - Brazil Standard Portaria no. 114 (16October1997) | 2 years | Third party | 19/03/2010 | 29/02/2012 | |
| Q_Steam_p | 40 bar steam flowmeter | FQ-3470 | Baseline emission | Manufacturer Specifications | 1/year | Rhodia | 28/09/2011 | 11/09/2012 | |
| Q_Steam_c | 6,5 bar steam flowmeter | FQ-3409 | Leakage | Manufacturer Specifications | 1/year | Rhodia | 05/01/2011 | 03/01/2012 | |
| Q_GE | Stack effluent gas flowmeter | FQ-3490 | Project emission | Manufacturer Specifications | 1/year | Rhodia | 29/06/2011 30/09/2011 | 12/09/2012 | * It was done a new calibration in the period #49, for keeping the frequency stated before the corrective maintenance done on the period #47 (28/06 to 29/06/2011). |
| N ₂ O_GE | Stack N ₂ O analyzer (in-situ, laser diode) | AI-3490B | Project emission | Manufacturer Specifications | 2/year | Rhodia | 04/10/2011 | 28/03/2012 | Equipment is out of service since 25/08/2012. It was sent to supplier for repairing. |
| N ₂ O_GE | Stack N ₂ O analyzer (extractive, infrared) | AI-3490G | Project emission (backup) | Manufacturer Specifications | 1/week | Rhodia | 20/09/2012 27/09/2012 04/10/2012 10/10/2012 (1) 11/10/2012 18/10/2012 25/10/2012 01/11/2012 08/11/2012 | 15/11/2012 | (1) During corrective maintenance on 10/10/2012 a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |
| %_on-line | By-pass valve leak test | HV-3402 | Project emission | PDD section D3 | 1/year | Third party | | 15/02/2012 | |
| Q_Power | Electricity meter | JI-3461 | Leakage | ONS - Brazil Standard Submódulo 12.3 (07July2008) | 2 years | Third party | 27/07/2010 11/04/2012 (1) 24/04/2012 (2) | Replaced on 10/05/2012 (calibration certificate dated 25/04/2012) (3) | (1) Anticipated planned calibration from July/2012 to April/2012, (2) Replaced the electricity meter on 24/04/2012 for measurement of electrical consumption, by another equipment calibrated on 11/04/2012. (3) On 10/05/2012, it was substituted the electricity meter by a new equipment calibrated on 25/04/2012. As defined previously, 25/04/12 was considered the calibration date. |
| HNO ₃ _physical | Waste gas flowmeter | FIC-3401 | For failure of FQ-3450 | Manufacturer Specifications | 1/year | Rhodia | 05/10/2011 | 26/09/2012 | |
| Q_NG | Natural gas flowmeter | FQ-3460 | For failure of FQ-3408 | INMETRO - Brazil Standard Portaria no. 114 (16October1997) | 2 years | Third party | 03/03/2010 | Replaced on 06/02/2012 (calibration certificate dated 03/10/2011) | * The flowmeter maintenance was performed on 06/02/2012, when the flowmeter was replaced by an instrument calibrated on 03/10/2011. For this reason, 03/10/2011 was considered the calibration date. |
| Q_Steam_p | Boiler feed water flowmeter | FQ-3410 | For failure of FQ-3470 | Manufacturer Specifications | 1/year | Rhodia | 27/09/2011 | 10/09/2012 | |
| P_AdOH | Level of tank RE-2422 | LI-2422 | Inventory variation | Manufacturer Specifications | 1/year | Third party | 31/08/2011 | 17/08/2012 | |
| | Stack NO analyzer (extractive, infrared) | AI-3490A | NOx emission control | Manufacturer Specifications | 1/week | Rhodia | 20/09/2012 27/09/2012 04/10/2012 09/10/2012 (1) 10/10/2012 (1) 11/10/2012 18/10/2012 25/10/2012 01/11/2012 08/11/2012 | 15/11/2012 | (1) During corrective maintenances on 09 and 10/10/2012, a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |
| | Stack NO ₂ analyzer (extractive, ultraviolet) | AI-3490F | | Manufacturer Specifications | 1/week | Rhodia | 20/09/2012 27/09/2012 04/10/2012 10/10/2012 (1) 11/10/2012 18/10/2012 25/10/2012 01/11/2012 08/11/2012 | 15/11/2012 | (1) During corrective maintenances on 10/10/2012, a new calibration was done. Independently of this event, the calibration frequency was kept as previously defined. |

* 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



History of the document

| Version | Date | Nature of revision |
|---|--------------------------------|--|
| 02.0 | EB 66 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | EB 54, Annex 34 28 May 2010 | Initial adoption. |
| Decision Class: Regulatory Document Type: Form Business Function: Issuance | | |