**MONITORING REPORT FORM (CDM-MR)**
**Version 01 - in effect as of: 28/09/2010**

**CONTENTS**

**MONITORING REPORT**
**VERSION 1.1 – 28/10/2010**

**"N2O EMISSION REDUCTION IN PAULÍNIA, SP, BRAZIL"**
**UNFCCC 0116**
**MONITORING REPORT # 40 (from 01/10/2010 to 24/10/2010)**

## SECTION A. General description of the project activity

### A.1. Brief description of the 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 #40 the destruction unit has been operated continuously. The emission reductions achieved in this period are: 492,530 tCO2e

### A.2. Project Participants

Rhodia Energy Brazil Ltda
Rhodia Energy SAS
Rhodia Energy GHG SAS
Société Générale
ORBEO
NATIXIS
NATIXIS Environnement & Infrastructures
Noble Carbon Credits Limited
Rhodia Japan Ltd

## A.3. Location of the project activity:

The N2O decomposition unit is located in the Rhodia site at the municipality of Paulínia, state of São Paulo, Brazil.
GPS coordinates: -22.753611 -47.158889

## A.4. Technical description of the project

A thermal oxidizer with 2 chambers is the technology used to decompose N2O at the Rhodia Paulínia site.

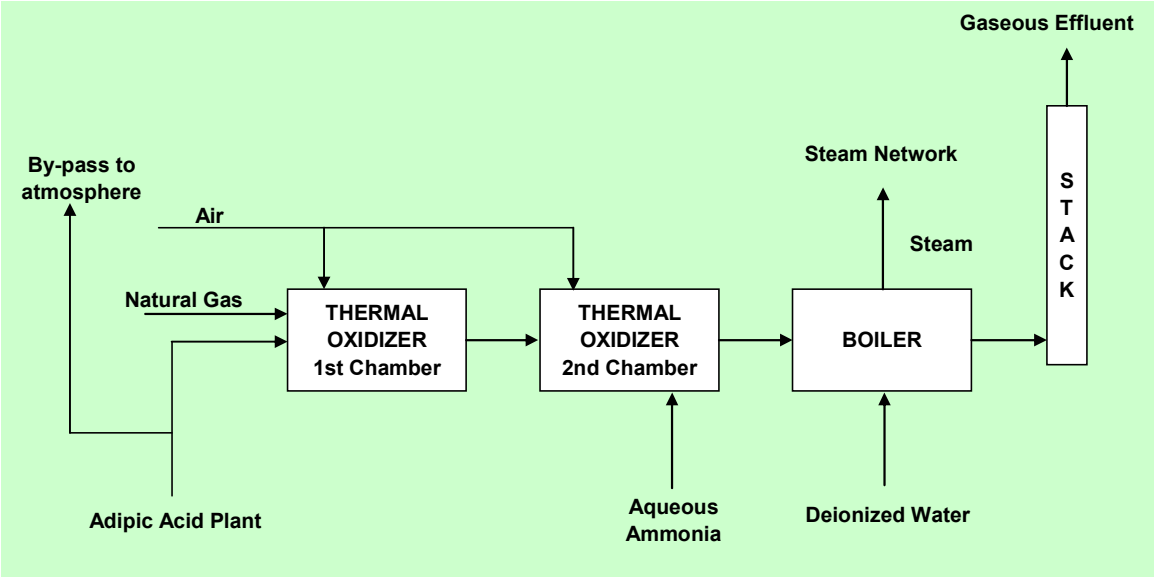
Natural gas is fed with the off gas from the adipic acid production containing N2O and a controlled amount of air in a reduction chamber, where it burns (oxidizes) to carbon dioxide (CO2) and water vapour. N2O is used as an oxidizer. Being oxygen deficient, the oxidation is not complete and carbon monoxide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

$CH4 + 4\ N2O \rightarrow CO2 + 2\ H2O + 4\ N2$

The temperature in the furnace is kept at about 1300°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.



**A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:**

Approved baseline and monitoring methodology:
AM0021/version 1 - "Baseline Methodology for decomposition of N2O from existing adipic acid production plants"

Referenced Tools:
- EB 47 Annex 10 "Tool to determine the mass flow for GHG gaseous streams" version 1, 28/05/2009
- ACM0002/version 2 – "Consolidated methodology for Grid-Connected electricity generation from renewable resources" – Calculation of the CO2 emission factor of the power generation

Project Design Document (PDD):
N2O Emission Reduction in Paulinia, SP, Brazil.Version number of the document: 4
Date: 12/10/2005

Related EB guidance:
EB45 Annex13 "Guidance to calculate adipic acid production in cases where it cannot be measured directly" version 1, 13/02/2009

**A.6. Registration date of the project activity:**

The project was registered by the UNFCCC on 25/12/2005.

**A.7. Crediting period of the project activity and related information (start date and choice of crediting period):**

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

**A.8. Name of responsible person(s)/entity(ies):**

Pascal Siegwart, Rhodia Energy GHG
Tour La Pacific. 11, cours Valmy La Defense 7
92977 Paris La Defense, France
TEL : +33 1 53 56 61 02
FAX : +33 1 53 56 61 10

## SECTION B. Implementation of the project activity

### B.1. Implementation status of the 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.

During this monitoring period # 40 the N2O destruction unit was fully operational and no particular event occurred that could impact the applicability of the methodology.

### B.2. Revision of the monitoring plan

No revision to the monitoring plan has been sought since the beginning of project activity.

### B.3. Request for deviation applied to this monitoring period

No request for deviation of the monitoring plan was applied to this monitoring period.

### B.4. Notification or request of approval of changes

No changes to the project activity as described in the registered CDM-PDD have been requested.

## SECTION C. Description of the 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.

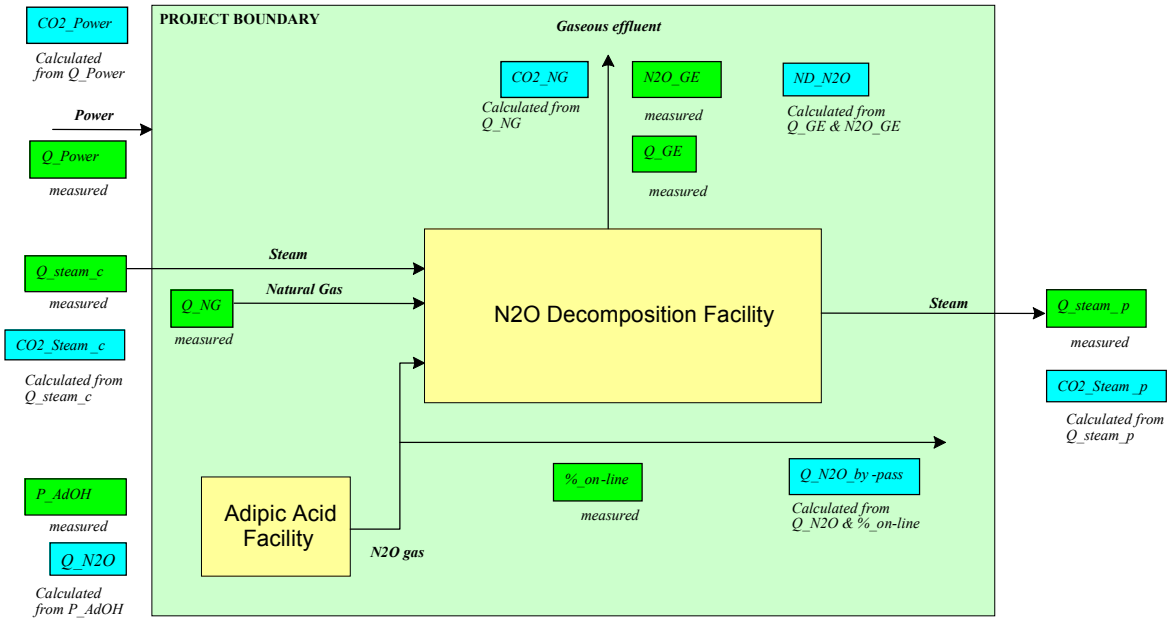



Figure 1. Project Boundary

All data collection procedures, the organizational structure, the rules 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 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 is with 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:
(a) Process data (flow rates, pressures, temperatures etc.) are continuously acquired by the DCS (Distributed Control System) and automatically stored by the PIMS;

(b) 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:

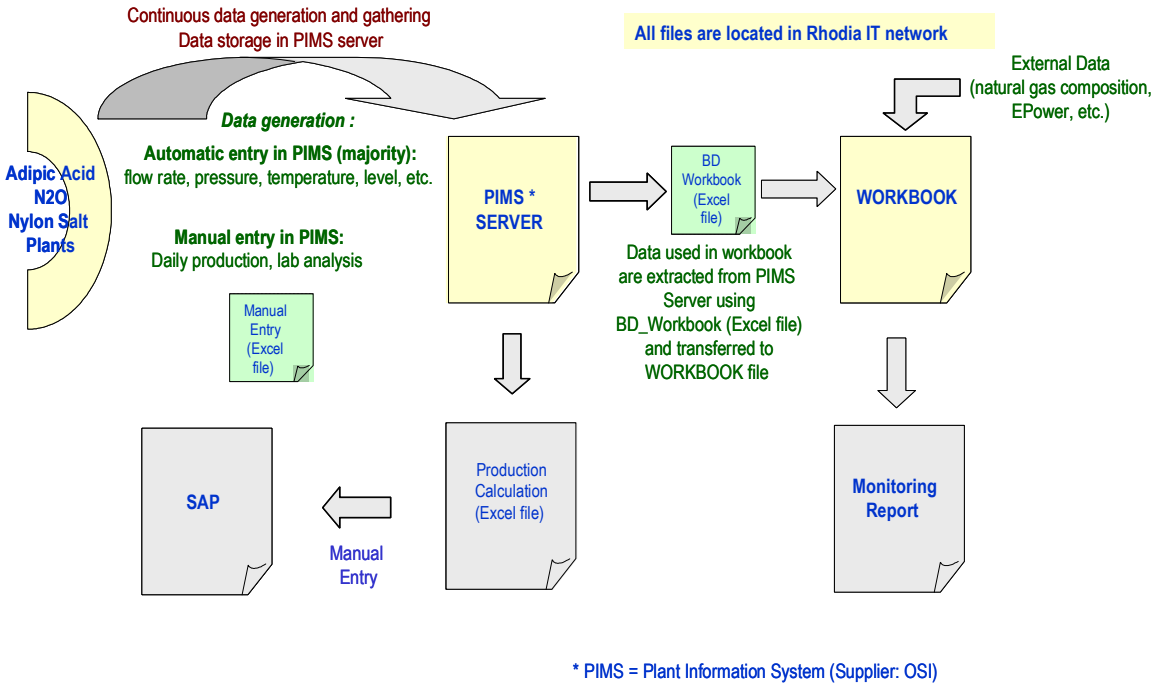



Figure 2. Data Flow Diagram

## SECTION D. Data and parameters

| D.1 Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors | |
|---|---|
| **Data / Parameter:** | **GWP_N2O** |
| Data unit: | $tCO_2e$ per $tN_2O$ |
| Description: | Global Warming Potential of N2O |
| Source of data used | Kyoto Protocol (Decision 2/CP.3) and IPCC |
| Value(s) : | 310 |
| Data used for: | Baseline and Project Emissions |
| Additional comment: | |

| **Data / Parameter:** | **KE_N2O** |
|---|---|
| Data unit: | t $N_2O$ per tonne of adipic acid produced |
| Description: | Lowest emission factor |
| Source of data used | IPCC Good Practice Guidance |
| Value(s) : | 0.27 |
| Data used for: | Baseline Emissions |
| Additional comment: | Cap value for N2O_/AdOH emission factor |

| **Data / Parameter:** | **$\Delta H$** |
|---|---|
| Data unit: | kJ/t of steam |
| Description: | Enthalpy of steam at a pressure level of 40 Bar |
| Source of data used | Monitoring Plan Section B.3 |
| Value(s) : | 2,624,000 |
| Data used for: | Baseline Emissions |
| Additional comment: | Not Applicable |

| **Data / Parameter:** | **$\eta$** |
|---|---|
| Data unit: | % |
| Description: | Operational efficiency of the natural gas steam boiler |
| Source of data used | Monitoring Plan Section B.3 |
| Value(s) : | 97 |
| Data used for: | Baseline Emissions |
| Additional comment: | Not Applicable |

| D.2 Data and parameters monitored | | | | | | |
|---|---|---|---|---|---|---|
| **Data / Parameter:** | **P_AdOH** | | | | | |
| Data unit: | Tonnes | | | | | |
| Description: | Amount of adipic acid production | | | | | |
| Measured /Calculated /Default: | Measured | | | | | |
| | 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: | 01/10/2010 | 24/10/2010 | 5,887.248 | 5,887.248 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 5,887.248 | 5,887.248 | |
| | P_AdOH Current year | | 80,514 | | | |
| | P_AdOH Annual Cap: | | 87,308 | | | |
| | * Adipic acid production for baseline emission calculation, after cap application | | | | | |
| Data used for: | Baseline and Project Emissions | | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | **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 01/10/2010 Valid until 31/10/2010 | |
| | Weigh scale (G-2532) Serial Number 94423508 | Load cell 100 kg | +/- 0.02 kg | 1/month | Last calibration 01/10/2010 Valid until 31/10/2010 | |
| | Weigh scale (Z-3120) Serial Number 104BA4 | Load cell 1,000 kg | +/- 0.5 kg | 4/year | Last calibration 06/08/2010 Valid until 05/11/2010 | |
| | Truck weigh scale (BB-0090) Serial Number 7597 | Load cell 80,000 kg | +/- 15 kg | 2/year | Last calibration 04/06/2010 Valid until 03/12/2010 | |

| | | | | | |
|---|---|---|---|---|---|
| | Truck weigh scale (BB-0335) Serial Number 28812 | Load cell 80,000 kg | +/- 15 kg | 2/year | Last calibration<br>07/06/2010<br>Valid until<br>06/12/2010 |
| | Level tank R-5300 (LT-4500) Serial Number DB5322MUB14 | Pressure bubbling level – differential. Pressure | +/- 0.25 % | Yearly | Last calibration<br>21/07/2010<br>Valid until<br>20/07/2011 |
| | Level tank R-5310 (LT-4509) Serial Number 1958202-4 | Pressure bubbling level – differential Pressure | +/- 0,075 % | Yearly | Last calibration<br>12/03/2010<br>Valid until<br>11/03/2011 |
| | Lab equipment RFM-340 Serial Number BT9934 | Refractometer | +/- 0.02 % | Weekly (Rhodia verification) | Last calibration<br>20/10/2010<br>Valid until<br>following week |
| | | | | 2/year (Third party calibration) | Last calibration<br>13/09/2010<br>Valid until<br>12/03/2011 |
| | Level tank RE-2422 (LI-2422) Serial Number 6/3419210001 | Radar level device | +/- 0.3 % | Yearly | Last calibration<br>10/09/2010<br>Valid until<br>09/09/2011 |
| 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.<br>The dry adipic acid is the product packed determined by weigh scales.<br>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).<br><br>The cumulated production of Adipic acid over the current year (starting last November 18th and ending with the last day of this period) is below the cap value of 87,308 t as stated by the EB 47th meeting decision.<br><br>The value of 87,308 t 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 17th of July 2009. 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. |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **Nitric acid consumption (HNO3_consumption)** | | | |
|---|---|---|---|---|
| Data unit: | tonnes | | | |
| Description: | Nitric acid consumption for the calculation of HNO3 chemical | | | |
| Measured /Calculated /Default: | Measured<br>Several instruments are used | | | |
| Source of data | DCS data and Production log sheets | | | |
| Value(s) of monitored parameter: | | | HNO3_consumption | |
| | Rolling year | 24/10/2010 | 76,748 | |
| | From | To | | |
| | 01/10/2010 | 24/10/2010 | 5,117 | |
| Data used for: | Baseline and Project Emissions | | | |

| | Equipment | Type | Accuracy class | Calibration frequency | Calibration Information |
|---|---|---|---|---|---|
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | Nitric acid mass flow meter (FQ-2179) Serial number 12014009 | Mass flow meter | +/- 0.1 % | 2 years | Last calibration 21/07/2010 Valid until 20/07/2012 |
| | Fresh nitric acid concentration analyzer (AI-2179) Serial number 12014009 | Device integrated to mass flow meter FQ-2179 | +/- 0.5 % | 2 years | Last calibration 03/08/2010 Valid until 02/08/2012 |
| | Level of nitric acid storage tank F-1769 (LI-3350) Serial number 91F345787 | Air bubble gauge (back-up from FQ-2179) | +/- 0.065 % | Yearly | Last calibration 28/07/2010 Valid until 27/07/2011 |
| | Flow meter of fresh nitric acid to storage (FQ-3318) Serial number 07FM-C203 (Flow meter) 07TM-C203 (Transmitter) | Magnetic Flow Meter (back-up from FQ-2179) | +/- 1 % | Yearly | Last calibration 16/09/2010 Valid until 15/09/2011 |
| 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 imported (purchased) during given period, and the holding volume and concentration variation of the storage tank (R92000, R92010) and 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 applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |

<table>
<tr><td>Data / Parameter:</td><td colspan="5">Physical losses in the adipic acid production process (HNO3_physical)</td></tr>
<tr><td>Data unit:</td><td colspan="5">tonnes</td></tr>
<tr><td>Description:</td><td colspan="5">Physical losses in the adipic acid production process data required for calculation of HNO3 chemical and the N2O emission factor N2O_AdOH</td></tr>
<tr><td>Measured /Calculated /Default:</td><td colspan="5">Measured<br>Several instruments are used</td></tr>
<tr><td>Source of data</td><td colspan="5">DCS data and lab data</td></tr>
<tr><td rowspan="4">Value(s) of monitored parameter:</td><td colspan="2"></td><td colspan="2">HNO3_physical</td><td rowspan="4"></td></tr>
<tr><td>Rolling year</td><td>24/10/2010</td><td colspan="2">1,595</td></tr>
<tr><td>From</td><td>To</td><td colspan="2"></td></tr>
<tr><td>01/10/2010</td><td>24/10/2010</td><td colspan="2">97</td></tr>
<tr><td>Data used for:</td><td colspan="5">Baseline and Project Emissions</td></tr>
<tr><td rowspan="13">Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity):</td><td>Equipment</td><td>Type</td><td>Accuracy class</td><td>Calibration frequency</td><td>Calibration Information</td></tr>
<tr><td rowspan="4">Flow meter of effluent to biological WWT (FQ-2973) Serial number 91F321071-608</td><td rowspan="4">Orifice plate flow - Differential pressure</td><td rowspan="4">+/- 0.65 %</td><td rowspan="4">Yearly</td><td>Last calibration</td></tr>
<tr><td>28/07/2010</td></tr>
<tr><td>Valid until</td></tr>
<tr><td>27/07/2011</td></tr>
<tr><td rowspan="4">Flow meter of effluent to neutralization (FQ-2974) Serial Number 91F321074-608</td><td rowspan="4">Orifice plate flow - Differential pressure</td><td rowspan="4">+/- 0.85 %</td><td rowspan="4">Yearly</td><td>Last calibration</td></tr>
<tr><td>28/07/2010</td></tr>
<tr><td>Valid until</td></tr>
<tr><td>27/07/2011</td></tr>
<tr><td rowspan="4">Waste gas flow meter (FQ-3450) Serial Number 91G511075-720</td><td rowspan="4">Orifice plate flow - Multivariable transmitter</td><td rowspan="4">+/- 1.6 %</td><td rowspan="4">Yearly</td><td>Last calibration</td></tr>
<tr><td>16/12/2009</td></tr>
<tr><td>Valid until</td></tr>
<tr><td>15/12/2010</td></tr>
<tr><td rowspan="4">Waste gas flow meter (FIC-3401) Serial Number JEJAAR772-625</td><td rowspan="4">Pitot tube flow meter - Differential pressure (back-up from FQ-3450)</td><td rowspan="4">+/- 1.45 %</td><td rowspan="4">Yearly</td><td>Last calibration</td></tr>
<tr><td>18/10/2010</td></tr>
<tr><td>Valid until</td></tr>
<tr><td>17/10/2011</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| | Nitric analyzer on effluent to neutralization (AI-2974) Serial Number 35718 | pHmeter | +/- 0.05 % | 2/month | Last calibration<br>21/10/2010<br>Valid until<br>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<br>14/10/2010<br>Valid until<br>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 (NO2) | +/- <1 % | 1/week | Last calibration<br>21/10/2010<br>Valid until<br>Following week |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly and yearly | | | | |
| Calculation method (if applicable): | Physical losses (HNO3_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 applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **HNO3_Chemical** |
|---|---|
| Data unit: | tonnes |
| Description: | Chemical consumption of Nitric acid required for the calculation of the N2O emission factor N2O_AdOH |
| Measured /Calculated /Default: | Measured<br>Several instruments are used |
| Source of data | Excel Workbook based on HNO3_consumption and HNO3_physical |

| | | | | | |
|---|---|---|---|---|---|
| Value(s) of monitored parameter: | | | HNO3_consumption | HNO3_ physical | HNO3_ chemical |
| | Rolling year | 24/10/2010 | 76,748 | 1,595 | 75,153 |
| | From | To | | | |
| | 01/10/2010 | 24/10/2010 | 5,117 | 97 | 5,020 |
| Data used for: | Baseline and Project Emissions | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Calculated and recorded monthly and yearly | | | | |
| Calculation method (if applicable): | To obtain the chemical consumption (HNO3_chemical), the physical losses are deducted from the nitric acid consumption.<br>HNO3_chemical = HNO3_consumption - HNO3_physical | | | | |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Data / Parameter:** | **N2O_/AdOH** | | | | |
| Data unit: | t N2O/t adipic acid | | | | |
| Description: | Actual N2O emission factor for adipic acid production | | | | |
| Measured /Calculated /Default: | Calculated | | | | |
| Source of data: | Excel Worbook based on HNO3 chemical and P_AdOH | | | | |
| Value(s) of monitored parameter: | | From | To | N2O_/AdOH Calculated | N2O_/AdOH Applied |
| | Period Value: | 01/10/2010 | 24/10/2010 | 0.291 | 0.270 |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 0.291 | 0.270 |
| | P_AdOH Rolling Year (t) | | 86,508 | | |
| | HNO3_Chemical Rolling Year (t) | | 75,153 | | |
| | N2O_/AdOH capped at | | 0.270 | | |
| Data used for: | Baseline and Project Emissions | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly and yearly | | | | |

| | |
|---|---|
| Calculation method (if applicable): | The N2O emission factor is calculated monthly using the 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. |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **Q_N2O** | | | |
|---|---|---|---|---|
| Data unit: | kg | | | |
| Description: | Quantity of N2O produced | | | |
| Measured /Calculated /Default: | Calculated value | | | |
| Source of data: | Excel Workbook based on P_AdOH and N2O_/AdOH data | | | |
| Value(s) of monitored parameter: | | From | To | Q_N2O |
| | Period Value: | 01/10/2010 | 24/10/2010 | 1,589,556 |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 1,589,556 |
| Data used for: | Baseline Emissions | | | |
| Monitoring equipment | Not applicable | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly | | | |
| Calculation method (if applicable): | Q_N2O = P_AdOH x N2O_/AdOH<br>Only the adipic acid production after cap application is used to determine the baseline emission | | | |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | |

| **Data / Parameter:** | **Q_N2O reg** |
|---|---|
| Data unit: | kg |
| Description: | Allowed N2O emission |
| 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 applied: | 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 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 CETESB (local environmental agency). |

| **Data / Parameter:** | **N2O reg/AdOH** |
|---|---|
| Data unit: | kg/kg |
| Description: | Allowed N2O emission / kg de adipic acid produced |
| 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 applied: | 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 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 CETESB (local environmental agency). |

| **Data / Parameter:** | **$r_y$** |
|---|---|
| Data unit: | % |
| Description: | Share of N2O 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 applied: | 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 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 CETESB (local environmental agency). |

| **Data / Parameter:** | **P N2O** |
|---|---|
| Data unit: | €/t |
| Description: | Market price of N2O |
| Measured /Calculated /Default: | Estimated |
| Source of data: | Market Survey (last up-date September 2010) |
| Value(s) of monitored parameter: | Zero (0) (there is no N2O market for the N2O produced as by-product of adipic acid in Paulinia) |
| Data used for: | Baseline Emissions |
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Annual update based on permanent market survey |

| | |
|---|---|
| Calculation method (if applicable): | Not applicable |
| QA/QC procedures applied: | Not applicable |

| | | | | | |
|---|---|---|---|---|---|
| **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: | 01/10/2010 | 24/10/2010 | 6,646,100 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 6,646,100 | |
| Data used for: | Baseline Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | **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 % | Yearly | Last calibration 05/10/2010 Valid until 04/10/2011 |
| | Boiler feed water flow meter (FQ-3410) Serial number 91F348990612 | Orifice plate flow - Differential pressure (back-up from FQ-3470) | +/- 0.65 % | Yearly | Last calibration 04/10/2010 Valid until 03/10/2011 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **E_Steam** |
|---|---|
| Data unit: | kg CO2/kg of steam |
| Description: | CO2 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: | 0.145 |
| Data used for: | Baseline Emissions |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/ Updated for each monitoring period |
| Calculation method (if applicable): | 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:<br>E_Steam = (QNG_tsteam/1,000) * E_NGy<br>QNG_steam = ΔH (kJ/t) / (LHV (kJ/Nm3) x η (%))<br>Where:<br>QNG_steam: amount of natural gas required to generate steam (Nm3/t)<br>The LHV data is the yearly average value for the gas supplied by COMGAS.<br>The yield η (%) of the boiler is conservatively taken as 97%, while the yield is generally below 90%<br>E_NGy: yearly average value for the gas supplied by COMGAS (kg CO2/Nm3) |

| Year Ending on: | 01/10/2010 | | | |
|---|---|---|---|---|
| LHV kJ/Nm3 | △H kJ/t | η % | QNG_tsteam Nm3/t of steam | E_NGy kg-CO2/Nm3 |
| 38,571 | 2,624,000 | 97 | 65.99 | 2.198 |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **CO2_Steam_p** | | | | |
|---|---|---|---|---|---|
| Data unit: | t CO2e | | | | |
| Description: | CO2 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 | CO2_Steam_p | |
| | Period Value: | 01/10/2010 | 24/10/2010 | 963 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 963 | |
| Data used for: | Baseline Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | CO2_Steam_p = Q_Steam_p x E_Steam | | | | |
| QA/QC procedures applied: | Data Handling Protocol - ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **Q_GE** | | | | |
|---|---|---|---|---|---|
| Data unit: | Nm3 | | | | |
| 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: | 01/10/2010 | 24/10/2010 | 7,538,796 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 7,538,796 | |
| Data used for: | Project Emissions | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | **Equipment** | **Type** | **Accuracy class** | **Calibration frequency** | **Calibration Information** |
| | Gas flow meter (FQ-3490) Serial number 6340144 | Annubar gas flow meter-Multivariable transmitter on wet basis | +/- 2.5 % | Yearly | Last calibration |
| | | | | | 08/10/2010 |
| | | | | | Valid until |
| | | | | | 07/10/2011 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Data / Parameter:** | **N2O_GE** | | | | |
| Data unit: | vppm | | | | |
| Description: | Concentration of N2O 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 | N2O_GE | |
| | Period Value: | 01/10/2010 | 24/10/2010 | 5.0 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 5.0 | |
| Data used for: | Project Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity): | **Equipment** | **Type** | **Accuracy class** | **Calibration frequency** | **Calibration Information** |
| | N2O analyzer (AI-3490B) Serial number 17007 | Gas analyzer, type in-situ and laser diode on wet basis | +/- 5 % of reading | 2/year | Last calibration |
| | | | | | 19/10/2010 |
| | | | | | Valid until |
| | | | | | 18/04/2011 |
| | N2O analyzer (AI-3490G) Serial number '450561464363 | Back-up Analyzer Gas analyzer, type extractive and infrared | +/- <1.0 % | 1/week | Last calibration |
| | | | | | 21/10/2010 |
| | | | | | 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:<br>N2O_GE = Σ (Q_GE x N2O_GE ) / Q_GE |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **ND_N2O** | | | | |
|---|---|---|---|---|---|
| Data unit: | kg | | | | |
| Description: | Quantity of N2O 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_N2O | |
| | Period Value: | 01/10/2010 | 24/10/2010 | 74 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 74 | |
| Data used for: | Project Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | 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 D of EB47 – "Tool to determine the mass flow of a greenhouse gas in a gaseous stream") :<br>ND_N2O = Q_GE x N2O_GE x Specific_gravity_of_N2O<br>The specific gravity of N2O = $44/22.414 \times 10^{-6}$ is used to transform vppm in $kg/Nm^3$<br><br>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. | | | | |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **Q_NG** | | | | |
|---|---|---|---|---|---|
| Data unit: | Nm3 | | | | |
| 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: | 01/10/2010 | 24/10/2010 | 510,470 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 510,470 | |
| Data used for: | Project Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | **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 19/03/2010 Valid until 18/03/2012 |
| | Gas flow meter (FQ-3460) (back-up from FQ-3408) Serial number CG3425037 K4381502,09 | Gas flow meter | +/- 0.5 % | 2 years | Last calibration 03/03/2010 Valid until 02/03/2012 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **E_NGy** |
|---|---|
| Data unit: | kg CO2/Nm3 |
| 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 |
| Data used for: | Project Emissions |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | 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 CO2 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 Nm3 over the same 12 months period. The CO2 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 applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **NGC** |
|---|---|
| Data unit: | kg CO2 |
| Description: | Natural gas composition required for the calculation of E_NG |
| Measured /Calculated /Default: | Measured |
| Source of data: | Natural gas supplier COMGAS |

| | | | | | |
|---|---|---|---|---|---|
| Value (s) of monitored parameter: | **Component** | **Number of C** | **Oct-10** | | |
| | CH4 (Methane) | 1 | 88.30 | | |
| | C2H6 (Ethane) | 2 | 6.35 | | |
| | C3H8 (Propane) | 3 | 1.99 | | |
| | I-C4H10 (i-Isobutane) | 4 | 0.29 | | |
| | N-C4H10 (n-Butane) | 4 | 0.42 | | |
| | C5H12 (i-Pentane) | 5 | 0.12 | | |
| | C5H12 (n-Pentane) | 5 | 0.08 | | |
| | C6H14 (Hexane) | 6 | 0.10 | | |
| | N2 (Nitrogen) | 0 | 0.76 | | |
| | CO2 (Carbon dioxide) | 1 | 1.58 | | |
| | Average number of C | | 1.13 | | |
| | **$E\_NG_m$ (kg CO2/Nm3)** | | 2.222 | | |
| Data used for: | Project Emissions | | | | |
| Monitoring equipment | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Recorded monthly | | | | |
| Calculation method (if applicable): | 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 standard state is 1.965 kg/Nm3.<br>E_NG = 1.965 x (average number of C)<br><br>For this monitoring period, natural gas composition from October 2010 is not yet available, so to be conservative, the NGC of the month of August 2008 was used for October as it gives the highest E_NG value since the beginning of the crediting period (19/11/2006). | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **CO2_NG** | | | | |
|---|---|---|---|---|---|
| Data unit: | t CO2 | | | | |
| Description: | CO2 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 | CO2_NG | |
| | Period Value: | 01/10/2010 | 24/10/2010 | 1,135 | |
| | Monthly values: | 01/10/2010 | 24/10/2010 | 1,135 | |
| Data used for: | Project Emissions | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | Not applicable | | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | | |
| Calculation method (if applicable): | CO2_NG is calculated monthly using the monthly values of Q_NG and E_NG<br>$CO2\_NG_m = Q\_NG_m \times E\_NG_m$<br>The value of the period is the sum of the monthly values of the period | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **%_on-line** | | | | |
|---|---|---|---|---|---|
| Data unit: | % of production time | | | | |
| Description: | % of production time the position switch on the by-pass valve is closed | | | | |
| 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: | 01/10/2010 | 24/10/2010 | 100.000 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 100.000 | |
| Data used for: | Project Emissions | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | **Equipment** | **Type** | **Accuracy class** | **Calibration frequency** | **Calibration Information** |
| | By-pass valve (HV-3402) Serial number not applicable | Butterfly valve | Not applicable | Yearly | Last calibration |
| | | | | | 12/03/2010 |
| | | | | | Valid until |
| | | | | | 11/03/2011 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | 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.<br>At the end of the month/period (y), %_on-line is calculated as:<br>$\%\_on\text{-}line_y = 1 - (Q\_N2O\_by\text{-}pass_y/(P\_AdOH_y \times N2O\_/AdOH)$ | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| | | | | |
|---|---|---|---|---|
| **Data / Parameter:** | **Q_N2O_by-pass** | | | |
| Data unit: | kg | | | |
| Description: | N2O 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 |
| | Period Value: | 01/10/2010 | 24/10/2010 | 0 |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 0 |
| Data used for: | Project Emissions | | | |
| Monitoring equipment | Not applicable | | | |
| Measuring/ Reading/ Recording frequency: | Calculated and recorded daily/Aggregated monthly | | | |
| Calculation method (if applicable): | The quantity of N2O that by-pass the facility is calculated following AM0021/version1.<br>· $Q\_N2O\_by\text{-}pass_d = Q\_N2O_d \times (1 - \%\_on\text{-}line)$ for each day (d)<br>· $Q\_N2O\_by\text{-}pass_d = P\_AdOH_d \times N2O\_/AdOH \times (1 - \%\_on\text{-}line)$<br>At the end of the month the quantity of N2O that by-passed the facility is summed for all days:<br>· $Q\_N2O\_by\text{-}pass_y = \Sigma (Q\_N2O\_by\text{-}pass_d)$ | | | |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| | | | | | |
|---|---|---|---|---|---|
| **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: | 01/10/2010 | 24/10/2010 | 38,688.2 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 38,688.2 | |
| Data used for: | Leakage | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | **Equipment** | **Type** | **Accuracy class** | **Calibration frequency** | **Calibration Information** |
| | Electricity meter (JI-3461) Serial number 40072320-4 | Electricity meter | +/- 0.20 % | 2 years | Last calibration 27/07/2010 Valid until 26/07/2012 |
| 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 applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| | |
|---|---|
| **Data / Parameter:** | **E_Power** |
| Data unit: | kg CO2/kWh |
| Description: | CO2 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:<br>1. ONS (Operador Nacional do Sistema Elétrico)<br>http://www.ons.com.br/biblioteca_virtual/publicacoes_operacao_sin.aspx<br>2. Brazilian Ministry of Mines and Energy (MME)<br>http://www.mme.gov.br/mme/menu/todas_publicacoes.html |

| | |
|---|---|
| Value (s) of monitored parameter: | 0.756 |
| Data used for: | Leakage |
| 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 2008. 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 7% of the total electricity supplied to the grid is generated using fossil fuels in 2008 (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. |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **CO2_Power** | | | |
|---|---|---|---|---|
| Data unit: | t CO2 | | | |
| Description: | CO2 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 | CO2_Power |
| | Period Value: | 01/10/2010 | 24/10/2010 | 30 |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 30 |
| Data used for: | Leakage | | | |
| Monitoring equipment | Not applicable | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | |
| Calculation method (if applicable): | CO2_Power= Q_Power x E_Power | | | |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **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: | 01/10/2010 | 24/10/2010 | 29,000 | |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 29,000 | |
| Data used for: | Leakage | | | | |
| Monitoring equipment (type, accuracy class, calibration frequency, date of last calibration, validity) | **Equipment** | **Type** | **Accuracy class** | **Calibration frequency** | **Calibration Information** |
| | 6,5 bar steam flow meter (FQ-3409) Serial number 6270424 | Orifice plate flow - Multivariable transmitter | +/- 1.25 % | Yearly | Last calibration 14/01/2010 Valid until 13/01/2011 |
| Measuring/ Reading/ Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 | | | | |

| **Data / Parameter:** | **E_Steam_c** |
|---|---|
| Data unit: | kg CO2/kg of steam |
| Description: | CO2 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 |
| Data used for: | Leakage |

| | |
|---|---|
| Monitoring equipment | Not applicable |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Updated for each period |
| Calculation method (if applicable): | 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<br>The E_Steam_c is obtained by rounding up the following calculation:<br>E_Steam_c = E_Steam_c_NG x %GEN_NG + E_Steam_c_chem&oil x (1-%GEN_NG) |

| Year ending | E_Steam_c_NG kg CO2 / kg of steam | E_Steam_c_chem&oil kg CO2 / kg of steam | %GEN_NG | E_Steam_c kg CO2 / kg of steam |
|---|---|---|---|---|
| 01/10/2010 | 0.210 | 0.283 | 94.9 | 0.214 |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| **Data / Parameter:** | **CO2_Steam_c** | | | |
|---|---|---|---|---|
| Data unit: | t CO2 | | | |
| Description: | CO2 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 | CO2_Steam_c |
| | Period Value: | 01/10/2010 | 24/10/2010 | 7 |
| | Monthly Values: | 01/10/2010 | 24/10/2010 | 7 |
| Data used for: | Leakage | | | |
| Monitoring equipment | Not applicable | | | |
| Measuring/ Reading/ Recording frequency: | Measuring not applicable/Calculated monthly | | | |
| Calculation method (if applicable): | CO2_Steam_c= Q_Steam_c x E_Steam_c | | | |

| | |
|---|---|
| QA/QC procedures applied: | Data Handling Protocol ISAL-ADOH-QA-007 |

| | | | | | |
|---|---|---|---|---|---|
| **Data / Parameter:** | **NOx** | | | | |
| Data unit: | **vppm** | | | | |
| Description: | NO + NO2 concentration in the stack gas<br>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 40 and less than 300 for 100 % of time | |
| Data used for: | Compliance with local regulation on NOx | | | | |
| Monitoring equipment (type, accuracy class, Calibration frequency, date of last calibration, validity) | **Equipment** | **Type** | **Accuracy Class** | **Calibration frequency** | **Calibration information** |
| | AI-3490A (NO) serial number 450561464363 | 3490A (Infrared) | +/- <1 % | 1x/week | Last calibration<br>30/09/2010<br>Valid until<br>29/10/2010 |
| | AI-3490F (NO2) serial number 450561464363 | 3490F (Ultraviolet) | +/- <1 % | 1x/week | Last calibration<br>30/09/2010<br>Valid until<br>29/10/2010 |
| Measuring/Recording frequency: | Measured continuously and recorded daily/Aggregated monthly | | | | |
| Calculation method (if applicable): | Not applicable | | | | |
| QA/QC procedures applied: | Procedure UQP-3-ADO-QA-006 | | | | |

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

The amount of baseline emissions in the given period y (measured in tCO2e) is calculated using the following formula according to AM0021/version 1, equation (1):

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

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 $Q\_N2O_y$ of N2O emitted over the period can then be calculated by (AM0021/version 1 equation (2)):

$$Q\_N2O_y = P\_AdOH_y \text{ x } N2O\_/AdOH_y$$

Over the period of reference the emission factor of the adipic acid plant was above the capped value of 0.27 kg N2O/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 |
|---|---|---|
| $Q\_N2O_y$ | 1,589,556 | kg |
| $P\_AdOH_y$ (eligible) | 5,887.248 | t |
| N2O_/AdOH | 0.27 | kg N2O/kg AdOH |
| $Q\_N_2O$ reg | No limit | |
| $N_2O$_reg / AdOH | No limit | |
| $r_y$ | NA | |
| GWP_N2O | 310 | kgCO2e/kg N2O |
| $Q\_Steam\_p_y$ | 6,646,100 | kg of Steam |
| $E\_Steam_y$ | 0.145 | kg CO2/kg of Steam |
| **BEy** | **493,725** | **tCO2e** |

By manual calculation of BEy the result may differ slightly from the more accurate value of the workbook shown above due to rounding down effects applied to remain conservative.

### E.2. Project emissions calculation

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

- the N2O that has not been sent to the decomposition process (i.e. the N2O that by-passed the decomposition facility)
- the N2O non-destroyed by the decomposition process
- the emissions due to the use of natural gas.

$PE_y$ is calculated as follows:

PEy = (Q_N2O_by-passy + ND_ N2Oy) x GWP_ N2O + Q_NGy x E_NGy (AM0021/version 1 equation (5))

With CO2_NG = Q_NG x E_NG (PDD section E.1) we get:

PEy = (Q_N2O_by-passy + ND_ N2Oy) x GWP_ N2O + CO2_NGy, where:

$Q\_N2O\_by\text{-}pass_y = P\_AdOH_y$ x (1 - $\%\_on\text{-}line_y$) x N2O_/AdOH

$ND\_N2O_y = Q\_GE_y$ x $N2O\_GE_y$ x Specific gravity of_N2O x $10^{-6}$

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 |
|---|---|---|
| $P\_AdOH_y$ | 5,887.248 | t |
| $N2O\_/AdOH_y$ | 0.27 | kg N2O/kg AdOH |
| $\%\_on\text{-}line_y$ | 100.000 | % |
| $Q\_N2O\_by\text{-}pass_y$ | 0.000 | kg |
| $Q\_GE_y$ | 7,538,796 | Nm3 |
| $N_2O\_GE_y$ | 5.0 | vppm |
| Specific gravity of_N2O | 1.963 | kg/Nm3 |
| ND_ $N_2O_y$ | 74 | kg N2O |
| GWP_N2O | 310 | kgCO2e/kg N2O |
| CO2_NGy | 1,135 | tCO2e |
| **PEy** | **1,158** | tCO2e |

Q_N2O_by-pass and ND_N2O in kg need to be divided by 1,000 to get PE in t CO2e

By manual calculation of PEy the result may differ slightly from the more accurate value of the workbook shown above due to rounding up effects to remain conservative.

## E.3. Leakage calculation

Leakage emissions $L_y$ 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)):

$L_y = Q\_Power_y \times E\_Power + Q\_steam\_c_y \times E\_steam\_c_y$

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 |
|---|---|---|
| $Q\_Power_y$ | 38,688.2 | kWh |
| E_Power | 0.756 | kg CO2/kWh |
| $Q\_Steam\_ c_y$ | 29,000 | kg |
| $E\_Steam\_c_y$ | 0.214 | kg CO2/kg of steam |
| **Ly** | **37** | tCO2e |

By manual calculation of Ly the result may differ slightly from the more accurate value of the workbook shown above due to rounding up effects to remain conservative.

## E.4. Emission reductions calculation / table

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:

$$\mathbf{ER_y = BE_y - PE_y - L_y}$$

where:

- **BEy** = Q_N2Oy × GWP_N2O + Q_Steam_py × E_Steamy
- **PEy** = (Q_N2O_by-passy + ND_ N2Oy) x GWP_ N2O + CO2_NGy
- $\mathbf{L_y} = Q\_Power_y \times E\_Power + Q\_steam\_c_y \times E\_steam\_c_y$

For this project activity, during this monitoring period, was achieved:

$\mathbf{ER_y}$ = (**493,725 – 1,158 – 37)** tCO2e

$\mathbf{ER_y}$ = **492,530** tCO2e

## E.5. Comparison of actual emission reductions with estimates in the CDM-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 24 days is around 391,966 tCO2e.

| Item | Values applied in ex-ante calculation of the registered CDM-PDD | Actual values reached during the monitoring period |
|---|---|---|
| BEy (tCO2e) | 468,781 | 493,725 |
| PEy (tCO2e) | 76,735 | 1,158 |
| Ly (tCO2e) | 81 | 37 |
| **Emission reductions (tCO2e)** | **391,965** | **492,530** |

## E.6. Remarks on difference from estimated value

| **BE:** PDD value = 468,781 tCO2e | Period = 493,725 tCO2e |
|---|---|
| Variance | Explanation |
| 24,959.3 | 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 (245.3 t/d) than the estimate of the PDD during this period to supply the market demand. |
| -15.3 | Steam produced in period was lower than in PDD estimate |
| **24,944** | **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 = 76,734 tCO2e | Period = 1,158 tCO2e |
|---|---|
| Variance | Explanation |
| 70,181 | 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. |
| 5,032 | A higher destruction rate of the N2O which is in excess of 99.99% during this period versus 99% taken conservatively in the PDD. |
| 363 | Difference in the natural gas consumption estimate and actual in the period |
| **75,576** | **Total PE variance** |

| **L:** | PDD value = 81 tCO2eq | Period = 37 t CO2eq |
|---|---|---|
| Variance | Explanation | |
| 44 | Difference mainly due to the quantity of steam consumed | |
| **44** | **Total L variance** | |

The actual emission reductions determined in this monitoring period are higher than the *pro rata* estimation based on the *ex-ante* calculation made in the PDD, as explained above. This is to be expected because, 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.