

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

Title of the project activity	Omnia N ₂ O Abatement Project II
Reference number of the project activity	6083
Version number of the monitoring report	01
Completion date of the monitoring report	22/09/2012
Registration date of the project activity	30/04/2012
Monitoring period number and duration of this monitoring period	Monitoring Period 1 30/04/2012 – 30/08/2012 Duration (123 days)
Project participant(s)	Omnia Fertilizer, Division of Omnia Group (Pty) Ltd., South Africa (“Omnia”)
Host Party(ies)	Republic of South Africa
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope: 05 Applied Methodology: ACM0019 v01.0.0.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	101,676
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	96,829.43

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

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- a) The increasing demand for fertilizer in South Africa induces the development of new and additional facilities related to fertilizer manufacturing. Omnia Fertilizer, a division of Omnia Group (Pty) Ltd. (hereafter “Omnia”) is a leading Nitrogen Fertilizer producer in South Africa. Omnia operates nitric acid plants in Sasolburg, South Africa including N₂O Abatement registered as CDM Project 0752 for the first plant. A new second nitric acid plant was commissioned second quarter 2012, designed by Uhde GmbH with a confirmed production capacity of 400,000 ton 100% concentrated nitric acid per year.

Nitrous Oxide (N₂O) is an undesired by-product of the nitric acid (HNO₃) production process at the synthetic fertilizer production facility. However, N₂O emissions from nitric acid production are not regulated in South Africa. No N₂O abatement system was designed into the plant. Without the incentive of the proposed CDM project activity, approx. 800,000 t CO₂e per year¹ would be emitted at Omnia Nitric Acid Plant II. Therefore the baseline scenario without the CDM project would be the operation of the nitric acid plant without N₂O reduction catalyst.

- b) The aim of the project activity is to reduce N₂O emissions in the tail gas by installing a tertiary catalyst after the absorption unit. It is expected that the N₂O abatement catalyst reduces 98 % of the N₂O². Against the standardized baseline emissions factor the project would generate an estimated 3,481,376 t CO₂e emission reductions during a 10 year crediting period.
- c) The N₂O abatement system consists of a tertiary N₂O catalyst unit, which is installed downstream of the HNO₃ absorber and before the tail gas turbine. It was designed and constructed by Uhde and is called the EnviNoxTM system. The tertiary catalyst consists of an additional catalysts containment facility that was erected at the plant.

¹ An estimated business-as-usual emissions factor of 6.45kgN₂O/tHNO₃ (Average Baseline Emission factor of the first 5 monitoring periods of the first N₂O abatement project at Omnia’s existing nitric acid plant) and annual confirmed capacity of 400,000tHNO₃/year was taken into account.

² While the calculations are based on this conservative assumption it should be noted that from experience from Omnia’s first N₂O reduction project as well as from other similar projects with the same technology even higher abatement efficiencies of up to 99.9 % were observed.

d) Relevant Dates for the Project Activity

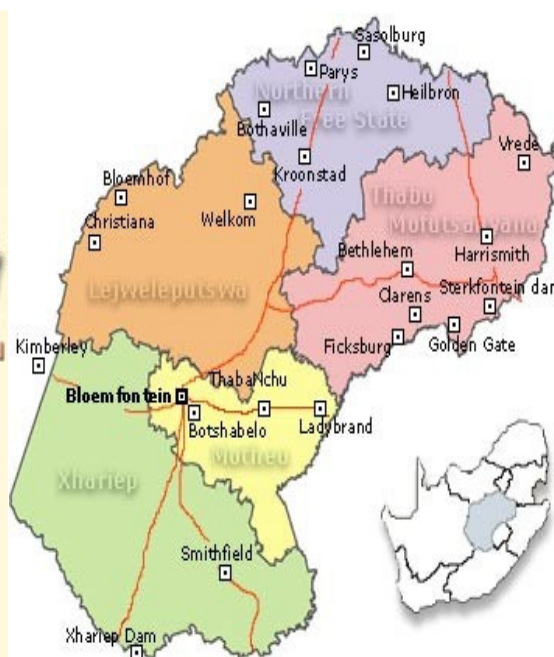
Date	Event
14 September 2009	Basic Engineering Nitric Acid Plant
09 March 2010	Detailed engineering Design Nitric Acid Plant
04 June 2011	Approval of ACM0019 by UNFCCC
18 July 2011	Change Order UHDE from De-NOx to EnviNox TM
31 March 2012	Commission Nitric Acid Plant
31 March 2012	Commission Project
30 April 2012	Project registered at UNFCCC
30 April 2012	Start Crediting period

e) The total emission reductions achieved in this monitoring period **96,829.43 tCO₂e**.

A.2. Location of project activity

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- Host Party: Republic of South Africa
- Free State Province, Sasolburg, Metsimaholo Municipality
- Omnia's plant is located at latitude of approximately 26°48'48" South and a longitude of 27°51'23" East.



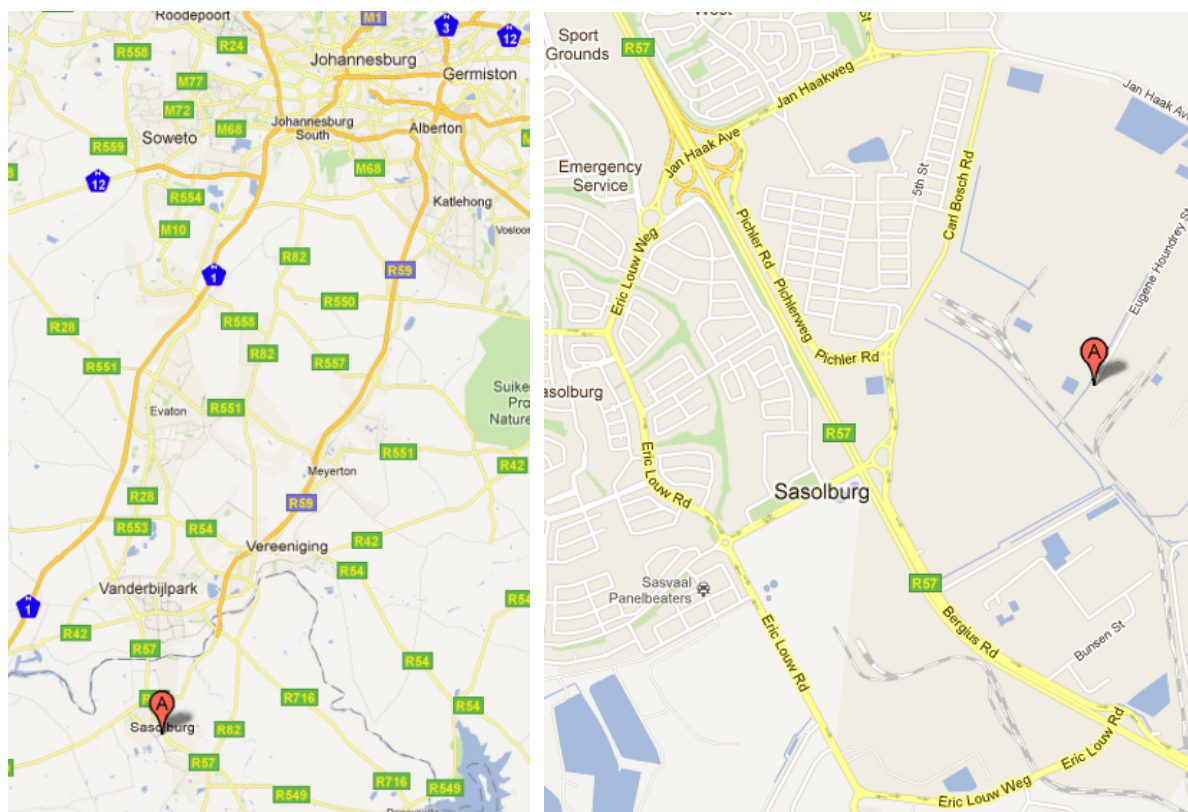


Figure 1: Physical location of the Omnia II nitric acid plant in Sasolburg, South Africa

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)
South Africa (Host)	Omnia Fertilizer, Division of Omnia Group (Pty) Ltd., (Owner and operator of the nitric acid plant)	No

A.4. Reference of applied methodology

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(a) Applied methodology: ACM0019 Version 01.0.0: “N₂O abatement from nitric acid production”

(b) Applied tools:

- “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02)
- “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)

A.5. Crediting period of project activity

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(a) Type of Crediting Period: Non-renewable 10 years and 0 months

(b) Start date of Crediting Period: 30/04/2012

(c) Start of this Monitoring Period: 30/04/2012

(d) End date of this Monitoring Period: 30/08/2012

(e) Length of this Monitoring Period: **123 days****SECTION B. Implementation of project activity****B.1. Description of implemented registered project activity**

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a)

The project activity entails the installation of:

- Tertiary N₂O abatement technology,
- Specialized monitoring equipment that is installed at the tail gas stream after the abatement of N₂O emissions (see Monitoring Plan in this PDD for further information).

Catalyst Technology

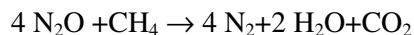
In the production process of nitric acid (HNO₃), NO₂ is produced as an intermediate material from ammonia (NH₃). The associated chemical reactions of oxidizing ammonia and simultaneous unwanted reactions are as follows:

- | | | | |
|---|---|---|--|
| 1. NH ₃ + 2 O ₂ | → | HNO ₃ + H ₂ O | (overall desirable reaction) |
| 2. 4 NH ₃ + 5 O ₂ | → | 4 NO + 6 H ₂ O | (desirable in the NH ₃ oxidization process) |
| 3. 2NO + O ₂ | → | 2 NO ₂ | (desirable in the NO oxidization process) |
| 4. 3 NO ₂ + H ₂ O | → | 2 HNO ₃ + NO | (desirable in the NO ₂ absorption process) |
| 5. 4 NH ₃ + 3 O ₂ | → | 2 N ₂ + 6 H ₂ O | (undesirable) |
| 6. 4 NH ₃ + 4 O ₂ | → | 2 N ₂ O + 6 H ₂ O | (undesirable) |
| 7. 2 NH ₃ + 8 NO | → | 5 N ₂ O + 3 H ₂ O | (undesirable) |

Through the sixth and seventh reactions, some N₂O is generated in the process.

The N₂O abatement technology will be installed in the tail gas downstream after the HNO₃ absorber and before the tail gas turbine. A tertiary catalyst reduces N₂O that is formed in the primary ammonia oxidation

reaction. A wide range of metals (e.g. Cu, Fe, Mn, Co and Ni) have been shown to be of varied efficiency in N₂O abatement catalysts. The abatement efficiency of this pelleted catalyst has been shown to be up to 99.9% in the following reaction³:



In the tertiary abatement system N₂O is removed by catalytic reduction with a hydrocarbon, such as methane from natural gas.

The applied technology is chosen because it has negligible risk of decreasing HNO₃ production and a high expected N₂O reduction.

The expected lifetime of the N₂O reduction unit is at least 10 years. It is expected to be in the range of 25 years. However the installed catalyst itself may need to be replaced after a few years, depending on the achieved abatement performance.

In addition NO_x is reduced in a separate catalyst bed by reduction with ammonia.

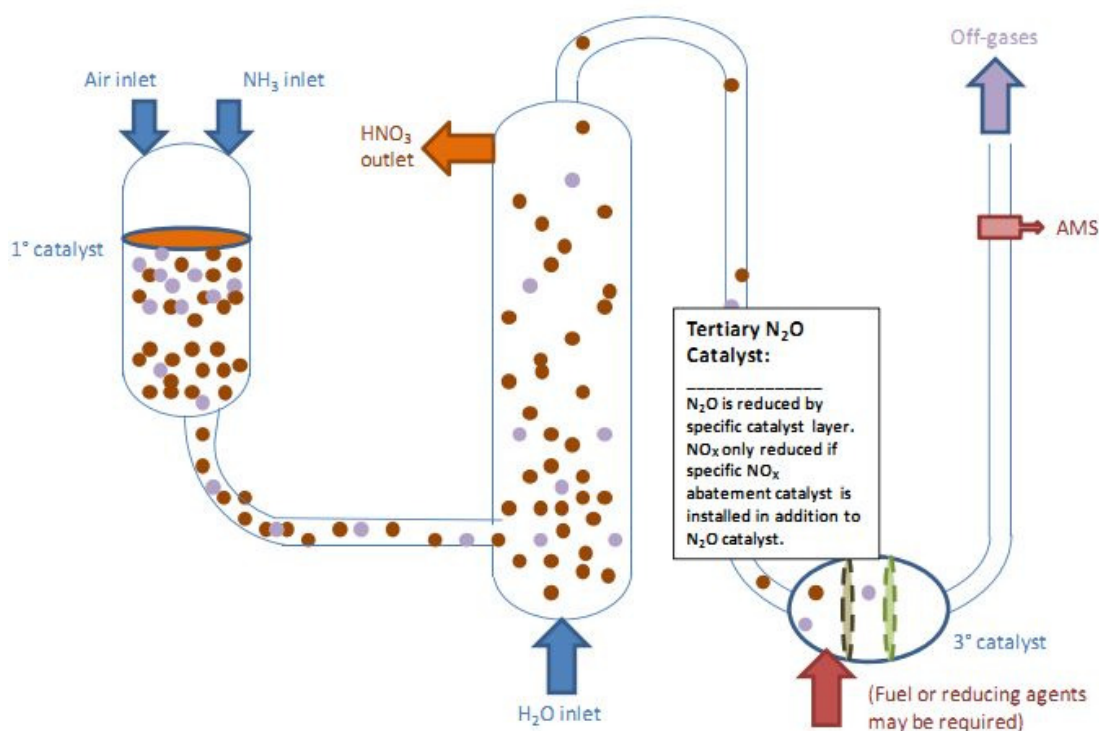


Figure 2: Image flow of tertiary catalyst unit

³ While the calculations of estimated emission reductions are based on the conservative estimation of an abatement efficiency of 98 %, it should be noted that from experience from Omnia's first N₂O reduction project as well as from other similar projects with the same technology even higher abatement efficiencies of up to 99.9 % were observed.

Events or situations during this monitoring period

b)

From	To	Event	Explanation/Action
01 May 2012		Plant Trip	
23 June 2012		Plant Trip	
24 June 2012		Plant Trip	
07 August 2012		Plant Trip	
18 August 2012		Plant Trip	
23 August 2012		Plant Trip	Had to rectify steam reticulation

c) Description of:

i. Events or situations that may have impacted the applicability of the applied methodology:

None

ii. The following describes how these events or situations have been addressed:

N/A

B.2. Post registration changes**B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

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Have there been any temporary deviations from the monitoring plan during this monitoring period?

No

B.2.2. Corrections

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Have there been any corrections to the project information or parameters fixed at validation approved during this monitoring period or submitted in this monitoring report?

No

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

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No

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

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No

B.2.5. Changes to start date of crediting period

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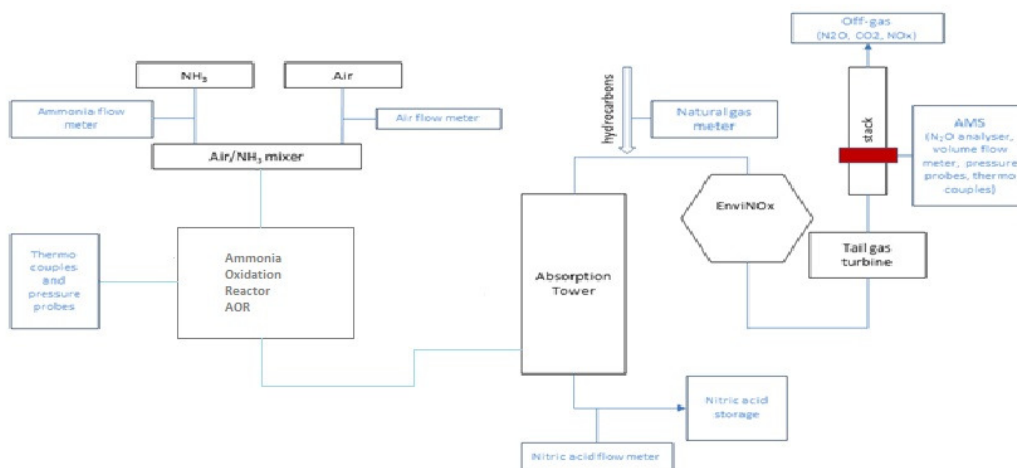
No

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

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Not Applicable

SECTION C. Description of monitoring system



Sample points

The sample points were chosen in accordance with the AMS requirements, EN 14181 requirements and the plant design specifications to allow an optimum of data collecting quality.

The location of the sample point was selected to provide ease of access and a location close to the analyser. The most suitable position is in the horizontal section of the exit stack. At this point, the gas is still hot (above dew point) and well mixed. The graph above shows the location of the sample point schematically.

Analyser

The Emerson D-EMS 2000 is capable of analysing N₂O concentration in gas mixtures. The continuous NDIR industrial photometer can selectively measure concentrations of up to four sample components. In this case it is equipped for the measurement of N₂O and NO. The analyser features gas-filled opto-pneumatic detectors. The detector provides optimum sensitivity and high selectivity compared with the other gas components in the sample. Gas-filled calibration cells are used for automatic calibration. The Analyser is QAL1 tested for the measurement of N₂O.

Sample Conditioning System

The gas sample is extracted at the sampling point particles are removed with a heated filter unit and the clean sampling gas is delivered through a heated sampling line to the analyser cabinet. Before being fed to the analyser, moisture is removed by a sample conditioning system that is installed in the analyser cabinet. The minimum flow rate to the analyser is controlled and connected to an alarm.

Stack gas flow meter

The Durag annubar measuring system operates according to the differential pressure principle. The probe has two separate chambers, between which the flow builds up a differential pressure. Taking into account the other flow parameters such as, e.g. absolute pressure and temperature, the volume flow is converted from operating to standard conditions with the help of the D-FL 100-10 microprocessor evaluation unit.

The D-FL 100 is type tested to the guidelines of the German Federal Ministry for the Environment, Nature Conservation and Reactor Safety on suitability testing of measuring equipment for continuous measuring of emissions and is therefore officially QAL1 approved (see below).

Accuracy and Calibration of Instruments

All meters are maintained to ensure a high level of accuracy. The exact specifications of each meter have been included in procedures to maintain those levels of accuracy. These procedures can be found for each parameter in section D.2.

ACM0019 requires all key meters to be subject to a quality control regime that will include regular maintenance and calibration according to the European Norm EN 14181. A record is being maintained showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration).

In the following, it is described how the procedures given in EN 14181 for QAL1-3 have been applied at the plant.

QAL1

In accordance with EN 14181, the monitoring system for N₂O concentration measurements shall have been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL1 procedure as specified by EN ISO 15267 or equivalent standards. This standard's objective is to prove that the total uncertainty of the results obtained from the AMS meets the specification for uncertainty stated in the applicable regulations. Such suitability testing has to be carried out under specific conditions by an independent third-party on a specific testing site.

QAL2

QAL2 is a procedure for the determination of the calibration function and its variability. According to EN 14181, the QAL2 test including the SRM need to be conducted by an independent testing house or laboratory which has to be accredited to EN ISO/IEC 17025. The QAL2 tests are performed on suitable AMS that have been correctly installed and commissioned on-site (as opposed to QAL1 which is conducted off-site).

A calibration function is established from the results of a number of parallel measurements performed with a Standard Reference Method (SRM). The variability of the measured values obtained with the AMS is then evaluated by the independent qualified "testing house".

QAL2 tests are to be performed at least every 5 years according to EN 14181.

Details on QAL2-tests can be found in the parameter section within D.2.

AST

In addition, Annual Surveillance Tests (AST) should be conducted in accordance with EN 14181; these are a series of measurements with independent measurement equipment in parallel to the existing AMS. The AST tests are performed annually. If a full QAL2 test is performed (at least every 5 years), an additional AST test is not necessary in that same year.

Details on AST-tests can be found in the parameter section within D.2.

QAL3

QAL3 describes the ongoing quality assurance and maintenance procedures and documentation for the AMS conducted by the plant operator. With this documentation it can be demonstrated that the AMS is in control during its operation so that it continues to function within the required specifications.

In essence, staff performs QAL3 procedures through the established calibration procedures as outlined for the applicable parameter in section D.2.

N₂O-Analyser Zero Calibration



Conditioned ambient air is used as reference gas for zero calibration. The zero calibration is conducted automatically every 24 hours.

N₂O-Analyser Span calibration

For automatic span calibrations the Emerson D-EMS- 2000 Analyser is equipped with automatic calibration, installed as part of the analyser. The Automatic calibration is done after every second automatic zero point calibration. Manual calibration checks are done with certified calibration gas at least every 2 weeks. The calibration results and subsequent actions are all documented as part of the CDM procedure. In addition, the analyser room and equipment is visually inspected on a regular basis.

Flow meter calibration procedures

The flow meter itself does not need to be calibrated since it is a physical device which will not have drift. Therefore, it is sufficient to regularly inspect its physical condition by means of visual and electric checks of the probe. It shall be cleaned if deemed necessary. In addition the flow meter is checked during the QAL2 and AST tests by an independent laboratory by comparison to a standard reference method (SRM) as stated above.

Organization Structure with Management & Operation Process

As an operator of nitric acid plants since many years, the plant's staff in general and its instrument department in particular have been accustomed to operating technical equipment adhering to high quality standards.

Omnia has trained the staff selected for the operation of the relevant monitoring systems and ensures that the operational standards required for the appropriate handling of the equipment will be maintained throughout the crediting period. Measuring instruments will be calibrated by the instrumentation engineer in accordance with the requirements of the instrument suppliers. The operations and equipment engineers of the nitric acid plant are responsible for the daily operation and maintenance of the systems.

The monitoring of the parameters for the determination of the mass flow of the N₂O will be the responsibility of the monitoring department. All relevant data will be recorded automatically and stored on electronic media.

Data Processing

Archiving of data

In accordance with the PDD, all of the data collected for the project activity must be stored in electronic format for the duration of the crediting period + 2 years. To meet these criteria, Omnia provides an extensive data storage system covering both the raw data received by the Delta V DCS as well as the output reports from the Durag system and drives and the main server as follows:

- All data collected by the Delta V DCS is stored on its internal hard drive for 1 month.
- Raw data collected by the DCS is downloaded weekly and stored, in MDI file format that cannot be tampered, on CDs a copy of which is stored in Omnia's on site safe. UHDE requests CDs from the system and sent to them, the technology provider, on a quarterly basis.
- All data is also backed up on one of the three hard drives on the plant's computer server and retained there for the duration of the year crediting period + 2 years.
- The EnviNox data are stored on the plant durag system and is designed to carry the full crediting + 2 years. This system comprises of two hard disc drives, as a backup to the process.
- The durag is further backed up as read only via the network to the factory server and back-up device which is stored off-site.
- The EnviNox data on the server is backed also, up to an external USB HDD which is kept at the parent company's head office and also retained there for the duration of the crediting period + 2 years.

Audit function and management review

The Project Manager arranges for an internal audit of the management system once per year. The auditor will not be involved in the daily operation of the plant and if necessary, may be sourced from a third party. The auditor will assess the implementation of the monitoring procedure, quality assurance steps and data collection and archiving. Audit findings, and steps taken to address findings will be recorded and reviewed in a Management Review meeting (convened at least annually) at which time the effectiveness of these procedures will be reviewed and necessary changes implemented.

SECTION D. Data and parameters

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

Data/Parameter	$EF_{\text{default},y}$																																						
Unit	kgN ₂ O/tHNO ₃																																						
Description	Default N ₂ O baseline emissions factor in the calendar year y of the monitoring period n																																						
Source of data	<p>According to ACM0019 Version 01.0.0, the default N₂O baseline emission factor will vary every year. In year 2005, the emission factor will be 5.1 and then it will decrease every year until it reaches a final value of 2.5 in the year 2020. The value of 2.5 will remain constant after 2020, as provided in the following table:</p> <table border="1"> <thead> <tr> <th>Year</th><th>Emissions factor (kgN₂O/tHNO₃)</th></tr> </thead> <tbody> <tr><td>2005</td><td>5.10</td></tr> <tr><td>2006</td><td>4.90</td></tr> <tr><td>2007</td><td>4.70</td></tr> <tr><td>2008</td><td>4.60</td></tr> <tr><td>2009</td><td>4.40</td></tr> <tr><td>2010</td><td>4.20</td></tr> <tr><td>2011</td><td>4.10</td></tr> <tr><td>2012</td><td>3.90</td></tr> <tr><td>2013</td><td>3.70</td></tr> <tr><td>2014</td><td>3.50</td></tr> <tr><td>2015</td><td>3.40</td></tr> <tr><td>2016</td><td>3.20</td></tr> <tr><td>2017</td><td>3.00</td></tr> <tr><td>2018</td><td>2.80</td></tr> <tr><td>2019</td><td>2.70</td></tr> <tr><td>2020</td><td>2.50</td></tr> <tr><td>2021</td><td>2.50</td></tr> <tr><td>Year n</td><td>2.50</td></tr> </tbody> </table>	Year	Emissions factor (kgN ₂ O/tHNO ₃)	2005	5.10	2006	4.90	2007	4.70	2008	4.60	2009	4.40	2010	4.20	2011	4.10	2012	3.90	2013	3.70	2014	3.50	2015	3.40	2016	3.20	2017	3.00	2018	2.80	2019	2.70	2020	2.50	2021	2.50	Year n	2.50
Year	Emissions factor (kgN ₂ O/tHNO ₃)																																						
2005	5.10																																						
2006	4.90																																						
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2017	3.00																																						
2018	2.80																																						
2019	2.70																																						
2020	2.50																																						
2021	2.50																																						
Year n	2.50																																						
Value(s) applied	Not applicable																																						
Purpose of data	No measurement procedures, specified in the methodology.																																						



Additional comment	The decrease in the value for the baseline emission factor over time is to reflect the technological development. Please note that the factual business as usual emissions are estimated to be 6.45 kgN ₂ O/tHNO ₃ .
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Data/Parameter	GWP_{N_2O}
Unit	tCO ₂ e/tN ₂ O
Description	Global warming potential of the nitrous oxide
Source of data	Relevant decisions by the CMP
Value(s) applied	310
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	-

Data/Parameter	R_u
Unit	Pa,m ³ /kmol.K
Description	Universal ideal gas constant
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	8,314
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	-

Data/Parameter	MM_i
Unit	kg/mol
Description	Molecular mass of greenhouse gas i (N ₂ O)
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	44.02
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	-



Data/Parameter	P_n
Unit	Pa
Description	Total pressure at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	101,325
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	-

Data/Parameter	T_n
Unit	K
Description	Temperature at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Value(s) applied	273.15
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	-

Data/Parameter	$T_{open,n}$
Unit	%
Description	Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N ₂ O abatement facility was open to vent the gas directly to the atmosphere.
Source of data	ACM0019 v.01.0.0
Value(s) applied	0
Purpose of data	Calculation of Baseline emissions or baseline net GHG removal by sinks
Additional comment	No by-pass is foreseen in the project design and therefore no by-pass valve will be installed from the beginning of the project activity. If necessary, plant will shut down.

**D.2. Data and parameters monitored**

Data/Parameter	$P_{NA,n}$
Unit	tHNO ₃
Description	Nitric Acid Produced
Measured/Calculated /Default	Measured and Calculated
Source of data	Volume of HNO ₃ is continuously measured by a flow meter. Density & acid concentration are determined by laboratory analysis.
Value(s) of monitored parameter	82,716.69
Monitoring equipment	Coriolis Meter Density & acid concentration are determined by laboratory analysis.
Measuring/Reading/ Recording frequency	HNO ₃ : continuously Density & concentration analysis: approximately 12 samples per day are collected, which is sent to the plant laboratory for analysis. Another sample is taken daily to the central laboratory for analysis.
Calculation method (if applicable)	Flow measurements (Nm ³ /h) are multiplied with density - and concentration readings to determine the PNA,n mass flow in tHNO ₃ /h
QA/QC procedures	Maintenance and calibration of the flow meter and density meter has been applied under the internal QA/QC procedures implemented for this project activity. Omnia is accredited with ISO9001, ISO 14001 and OHS18000. All plant equipment and piping are designed as per ASME standards and their maintenance/QAQC is based on relevant API standards, vendor recommendations and prevailing practices in fertilizer industry. TAG number/ model specification of meter: FIT 6291/ IFC 100 KROHNE



Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	Calibration according to plant internal



Data/Parameter	$F_{N_2O, Tailgas, h}$
Unit	kgN ₂ O/h
Description	Mass Flow of N ₂ O in the gaseous stream of the tail gas in hours h
Measured/Calculated /Default	Measured and Calculated
Source of data	N ₂ O concentration: Emerson N ₂ O Analyzer Stack gas volume flow: Durag Annubar D-FL 100 flow meter
Value(s) of monitored parameter	Average value for this monitoring period: 4.77 Applied for the determination of QN ₂ O,tailgas,n and overall Project Emissions. See calculation sheet and sample calculation of section E.2.
Monitoring equipment	N ₂ O concentration: Emerson N ₂ O Analyzer Stack gas volume flow: Durag Annubar D-FL 100 flow meter
Measuring/Reading/ Recording frequency	Continuously

**Calculation method
(if applicable)**

- ☐ The monitoring system should provide separate hourly average values for the N₂O concentration and the volume or mass flow of the tail gas based on 2 seconds (or shorter) interval readings that are recorded and stored electronically. These N₂O data sets shall be identified by means of a unique time / date key indicating when exactly the values were observed;
- ☐ The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN 14181 must be applied to both the N₂O concentration and the volume or mass flow of the tail gas. This can either be applied automatically to the raw data recorded by the data storage system at the plant or it can be applied to the calculated hourly averages as part of the calculation of project emissions.

If data for either the N₂O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N₂O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N₂O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N₂O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values.

The hourly values are then aggregated as follows:

$$1) Q_{N_2O, \text{ by-pass}; n} = EF_{BL, N_2O, n} * P_{NA, n} * T_{open, n} * 10^{-3}$$

$Q_{N_2O, \text{ tailgas}, n}$ = Amount of N₂O released through the tail gas of the project plant to the atmosphere in monitoring period n (tN₂O)

$FN_{2O, \text{ tailgas}, h}$ = Mass flow of N₂O in the gaseous stream of the tail gas in the hour h (kgN₂O/h)

h_n = Number of hours in monitoring period n during which the plant was in operation



QA/QC procedures	<p>Overall measurement accuracy +/- 0.5% of the adjusted range</p> <p>Serial Number SN:9910103055428</p> <p>Tag No. AI-95005 Outlet Analyser</p> <p>QAL 2</p> <p>Calibration Frequency Once per 5 years</p> <p>Date of last Calibration June 2012</p> <p>Date of next calibration June 2017</p>
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	<p>According to EN 14181, the flow meter and the analyser will be tested and calibrated by an external laboratory with EN ISO IEC 17025 Accreditation. The QAL2 test is conducted once every 5 years; the AST test is conducted once per year. Every 5 years the AST test is part of the QAL2 test.</p> <p>QAL2-3 calibration schedules are performed according to plant internal procedures:</p>



Data/Parameter	H _n
Unit	Hours
Description	Number of hours in monitoring period n the plant was in operation
Measured/Calculated /Default	Measured
Source of data	Omnia production log and continuous monitoring according to operational parameters
Value(s) of monitored parameter	2545
Monitoring equipment	The total operating hours are logged continuously in the production log
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	-



Data/Parameter	$T_{open,n}$
Unit	%
Description	Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N ₂ O abatement facility was open to vent the gas directly to the atmosphere.
Measured/Calculated /Default	Measured
Source of data	N/A
Value(s) of monitored parameter	0
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	N/A
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	No by-pass is foreseen in the project design and therefore no by-pass valve will be installed from the beginning of the project activity. If necessary, plant will shut down.



Data/Parameter	$PE_{FF,n}$
Unit	tCO ₂ e
Description	Project emissions related to fossil fuel input to the destruction facility and/or re-heater in monitoring period n (tCO ₂)
Measured/Calculated /Default	Calculated
Source of data	The emissions related to the operation of the N ₂ O destruction facility include only on-site emissions due to fossil fuel use as input to the N ₂ O destruction facility. Natural gas consumption will be measured by a mass-flow meter
Value(s) of monitored parameter	276.66
Monitoring equipment	-
Measuring/Reading/ Recording frequency	Continuously

Calculation method (if applicable)	<p>Calculated based on measurement of natural gas consumption according to the following formula, as provided in the applicable tool</p> <p>“Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02):</p> <p>2) $PE_{FF,n} = PE_{FC,i,j}$</p> <p>3) $PE_{FC,j,n} = \sum_i FC_{i,j,n} * COEF_{i,n}$</p> <p>4) $COEF_{i,n} = NCV_{i,n} * EF_{CO2,i,n}$</p> <p>Where:</p> <p>$PE_{FC,j,n}$ = CO₂ emissions from fossil fuel combustion in process <i>j</i> in monitoring period <i>n</i> (tCO₂/n)</p> <p>$FC_{i,j,n}$ = Quantity of fuel type <i>i</i> combusted in the process <i>j</i> during the monitoring period <i>n</i> (mass or volume unit/n)</p> <p>$COEF_{i,n}$ = CO₂ emission coefficient of fuel type <i>i</i> in monitoring period <i>n</i> (tCO₂/mass or volume unit)</p> <p><i>i</i> = fuel types combusted in process <i>j</i> during monitoring period <i>n</i></p> <p>$W_{c,i,y}$ = Weighted mass average fraction of carbon in fuel type <i>i</i> in year <i>y</i></p>
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QA/QC procedures	<p>Maintenance and calibration of the mass flow meter is applied under the internal QA/QC procedures.</p> <p>Overall measurement accuracy +/- 0.5% of the adjusted range</p> <p>Serial Number SN:9910103055428</p> <p>Tag No. AI-95005 Outlet Analyser</p> <p>QAL 2</p> <p>Calibration Frequency Once per 5 years</p> <p>Date of last Calibration June 2012</p> <p>Date of next calibration June 2017</p>
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	Calibration procedures are performed according to plant internal procedure



Data/Parameter	W _{c,i,n}	
Unit	tC/mass unit of fuel type natural gas	
Description	Weighted average mass fraction of carbon in fuel type <i>i</i> in year <i>y</i>	
Measured/Calculated /Default	Measured	
Source of data	The following data source may be used if the relevant conditions apply:	
	Data Source	Conditions for using the data source
	a) Values provided by the fuel supplier in invoices	This is the preferred source
	b) Measurements by the project participants	If a) is not available
	Option a) has been applied since values from the supplier have not been available.	
Value(s) of monitored parameter	0.9141	
Monitoring equipment		
Measuring/Reading/Recording frequency	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.	
Calculation method (if applicable)		
QA/QC procedures	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.	
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks	



Additional comment	
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Data/Parameter	$FC_{i,j,y}$
Unit	Mass unit per year (ton/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Measured/Calculated /Default	Measured
Source of data	Measurements from khrono flowmeter
Value(s) of monitored parameter	94.15
Monitoring equipment	Khrono
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	Overall measurement accuracy +/- 0.5% of the adjusted range Serial Number SN:14257727 Tag No. FI-95060 New Installation
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	Calibration schedules are performed according to plant internal procedure



Data/Parameter	V _{t,wb}
Unit	Nm ³ wet gas/h
Description	Volumetric Flow of the gaseous stream in time interval t on a wet basis
Measured/Calculated /Default	Measured
Source of data	Measurements from Durag Annubar flow meter
Value(s) of monitored parameter	Average Value: 109,901.6
Monitoring equipment	Durag Annubar Flow meter
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	<p>Overall measurement accuracy +/- 0.5% of the adjusted range</p> <p>Serial Number SN:9084944</p> <p>Tag No. FI-95014</p> <p>QAL 2</p> <p>Calibration Frequency Once per 5 years</p> <p>Date of last Calibration June 2012</p> <p>Date of next calibration June 2017</p>
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	Calibration schedules are performed according to plant internal procedures



Data/Parameter	$V_{i,t,db}$
Unit	m ³ gas i/m ³ dry gas
Description	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis
Measured/Calculated /Default	Continuously
Source of data	-
Value(s) of monitored parameter	
Monitoring equipment	Emerson N2O Analyser
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	Calibration includes zero verification with an inert gas (e.g. N ₂) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases have a certificate provided by the manufacturer and are under their validity period.
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	Calibration schedules are performed according to plant internal procedures



Data/Parameter	T_t
Unit	°C
Description	Temperature in the gaseous stream in time interval t
Measured/Calculated /Default	Measured
Source of data	Tail Gas temperature measurement
Value(s) of monitored parameter	N/A
Monitoring equipment	Thermocouples
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	As parameters are converted to normal conditions during the monitoring process, this parameter is not needed. Calibration schedules are performed according to plant internal procedures



Data/Parameter	P_t
Unit	Pa
Description	Pressure of the gaseous stream in time interval t
Measured/Calculated /Default	Measured
Source of data	Pressure probe
Value(s) of monitored parameter	-
Monitoring equipment	Pressure probe
Measuring/Reading/ Recording frequency	Continuously
Calculation method (if applicable)	-
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	As parameters are converted to normal conditions during the monitoring process, this parameter is not needed. Calibration schedules are performed according to plant internal procedures



Data/Parameter	ER _n
Unit	tCO ₂ e
Description	Emission reduction in monitoring period
Measured/Calculated/Default	Calculated
Source of data	-
Value(s) of monitored parameter	96,829.43
Monitoring equipment	-
Measuring/Reading/Recording frequency	-
Calculation method (if applicable)	5) $ER_n = BE_n - PE_n$
QA/QC procedures	
Purpose of data	Calculation of project emissions or actual net GHG removals by sinks
Additional comment	

D.3. Implementation of sampling plan

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Not applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Baseline emissions:

The calculation of the baseline emissions or baseline net GHG removals sinks has been established in accordance with ACM0019 Version 01.0.0. The formulae are numbered according to the according to the numbering in the registered PDD.

$$(1) \quad BE_n = P_{NA,n} * EF_{BL, N2O,n} * GWP_{N2O} * 10^{-3}$$



Where:

BE_n = Baseline emissions in monitoring period n (tCO_2e)

$P_{NA,n}$ = Nitric acid produced in the monitoring period n ($tHNO_3$)

$EF_{BL, N_2O,n}$ = Baseline N_2O emission factor for nitric acid production in the monitoring period n ($kgN_2O/tHNO_3$).

GWP_{N_2O} = Global Warming Potential of N_2O valid for the commitment period (310 tCO_2e)

Sample calculation applying summed-up values of the whole monitoring period

BE_n	P_{NA}	$EF_{BL,N_2O,n}$	GWP_{N_2O}	
100,004.5	82,716.69	3.90	310	

Determination of the baseline N_2O emission factor ($EF_{BL,N_2O,n}$)

The baseline N_2O emission factor in the monitoring period n ($EF_{BL,N_2O,n}$) shall be determined as a default emission factor $EF_{default,y}$ given for each calendar year y for which BE_n is calculated (see monitoring table for $EF_{default,y}$), as follows:

$$(2) \quad EF_{BL, N_2O,n} = EF_{default, y}$$

Where:

$EF_{BL, N_2O,n}$ = Baseline N_2O emission factor for nitric acid production in the monitoring period n ($kgN_2O/tHNO_3$).

$EF_{default,y}$ = Default N_2O baseline emissions factor in the calendar year of the monitoring period n ($kgN_2O/tHNO_3$) (see list of $EF_{default, y}$ values under B.6.2).

Year	$EF_{BL,N_2O,2012}$	$EF_{Default,2012}$
2012	3.90	3.90

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

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Project emissions include emissions of N₂O which have not been destroyed by the project activity and, in case of the installation of a tertiary N₂O abatement facility, CO₂ emissions resulting from the operation of the N₂O abatement facility.

Project emissions are calculated using the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02) referred to in ACM0019.

Project emissions are calculated as follows:

$$(3) \quad PE_n = PE_{N_2O,n} + PE_{CO_2,tertiary,n}$$

Where:

PE _n	=	Project emissions in monitoring period <i>n</i> (tCO ₂ e)
PE _{N₂O,n}	=	Project emissions of N ₂ O from the project plant in monitoring period <i>n</i> (tCO ₂ e)
PE _{CO₂,tertiary}	=	Project emissions of CO ₂ from the operation of the tertiary N ₂ O abatement facility in monitoring period <i>n</i> (tCO ₂)

Sample calculation applying summed-up values of the whole monitoring period:

PE _n	PE _{N₂O}	PE _{CO₂,tertiary,n}
3,175.09	2,898.42	276.67

The amount of N₂O emissions from the project activity includes two emission sources:

- The N₂O contained in the tail gas stream of the plant which is released to the atmosphere and;
- In the case of a tertiary N₂O abatement, the N₂O contained in any by-pass streams to the tertiary N₂O abatement facility.

$$(4) \quad \text{PEN}_{\text{N}_2\text{O},n} = (\text{QN}_{\text{N}_2\text{O},\text{tail gas},n} + \text{QN}_{\text{N}_2\text{O},\text{by-pass},n}) * \text{GWPN}_{\text{N}_2\text{O}}$$

Where:

$\text{PEN}_{\text{N}_2\text{O},n}$ = Project emissions of N_2O from the project plant in monitoring period (tCO₂e)

$\text{QN}_{\text{N}_2\text{O},\text{tail gas},n}$ = Amount of N_2O released through the tail gas of the project plant to the atmosphere in monitoring period n (tN₂O)

$\text{QN}_{\text{N}_2\text{O}, \text{by-pass},n}$ = Amount of N_2O released through the by-pass to a tertiary N_2O abatement system to the atmosphere in monitoring period n (tN₂O)³

$\text{GWPN}_{\text{N}_2\text{O}}$ = Global warming potential of N_2O valid for the commitment period (310 tCO₂e)

Sample calculation applying summed-up values of the whole monitoring period:

$\text{PE}_{\text{N}_2\text{O}}$	$\text{QN}_{\text{N}_2\text{O},\text{tail gas},n}$	$\text{QN}_{\text{N}_2\text{O},\text{bypass},n}$	$\text{GWP}_{\text{N}_2\text{O}}$
2,898.43	9.35	0	310

the methodology and for keeping up flexibility in the event of a possible by-pass installation at a later point of time the parameter $\text{T}_{\text{open},n}$ will be monitored throughout the crediting period and has been added to section B.7.1.

Determination of $\text{QN}_{\text{N}_2\text{O},\text{tail gas},n}$

The amount of N₂O emissions from the tail gas stream of the project plant shall be determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream.” In applying the tool, the following provisions apply:

- Throughout the crediting periods of the project activity, the N₂O concentration and volume or mass flow of the tail gas are to be monitored continuously. The monitoring system is to be installed and maintained throughout the crediting period based on the European Norm 14181 (2004), or any more recent update of that standard;
- The monitoring system should provide separate hourly average values for the N₂O concentration and the volume or mass flow of the tail gas based on 2 seconds (or shorter) interval readings that are recorded and stored electronically. These N₂O data sets shall be identified by means of a unique time / date key indicating when exactly the values were observed;
- The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN 14181 must be applied to both the N₂O concentration and the volume or mass flow of the tail gas. This can either be applied automatically to the raw data recorded by the data storage system at the plant or it can be applied to the calculated hourly averages as part of the calculation of project emissions;
- If data for either the N₂O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour shall be replaced with the maximum value of N₂O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N₂O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N₂O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down shall not be used for the determination of the maximum values.

According to the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0) the mass flow of greenhouse gas *i* in the gaseous stream in time interval *t* (F_{i,t}) is calculated based on measurements of

- a) The total volume flow or mass flow of the gas stream and
- b) The volumetric fraction of the gas in the gaseous stream and
- c) The water content and gas composition.

The tool covers possible measurement options, providing six different calculation options to determine the volume or mass flow of a particular greenhouse gas (A-F).

Furthermore, the tool provides two options for the determination of the moisture content of the gaseous stream, while **Option 2** (simplified calculation without measurement of the moisture content) will be applied.

This option provides a simple and conservative approach to determine the absolute humidity by assuming the gaseous stream is dry or saturated depending on which is the conservative situation.

In order to follow a conservative approach for the determination of the project emissions the gaseous stream is assumed to have a moisture content of “0” and is therefore considered dry.

As the gaseous stream is assumed to be dry **Option B** is chosen for the calculation of the mass flow of greenhouse gas i ($F_{i,t}$), which is calculated as follows:

$$(5) F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t}$$

With

$$(6) \rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t}$$

Where:

$F_{i,t}$ = mass flow of greenhouse gas N_2O in the gaseous stream in time interval t (kg gas /h)

$V_{t,db}$ = Volumetric flow of the gaseous stream in time interval t on dry basis (m³ dry gas/h)

$v_{i,t,db}$ = Volumetric fraction of greenhouse gas N_2O in the gaseous stream in a time interval t on a dry basis (m³ gas N_2O /m³ dry gas)

$\rho_{i,t}$ = Density of greenhouse gas N_2O in the gaseous stream in a time interval t (kg gas N_2O /m³ gas N_2O)

P_t = Absolute pressure of the gaseous stream in time interval t (Pa)

MM_i = Molecular mass of greenhouse gas N_2O (kg/kmol)

R_u = Universal ideal gases constant (Pa.m³/kmol.K)

T_t = Temperature of the gaseous stream in time interval t (K)



Sample calculation for equation (5) applying values from 29/08/2012 00:00:

$F_{i,t}$	$V_{t,db}$	$V_{i,t,db}$	pi,t
0.38	129,318.34	0	1.964

Calculation for equation (6) applying summed up values for the whole of the monitoring period:

pi,t	P_t	MM_{N_2O}	R_u	T_t
1.964	101,325	44.02	8.314	273.15

The volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) is determined by converting the measured volumetric flow from wet basis to dry basis. The absolute humidity of the gaseous stream (mH_2O,t,db) is determined using **Option 2** above and accordingly **set to be 0**. Consequently, equation (8) will result in 0 and thus equation (7) will result in:

$$(7) \quad Q_{N_2O,tailgas,n} = \sum_{h=1}^{h=h_n} F_{N_2O,tailgas,h} * 10^{-3}$$

Where:

$Q_{N_2O,tailgas,n}$ = Amount of N_2O released through the tail gas of the project plant to the atmosphere in monitoring period n (t N_2O)

$F_{N_2O,tailgas,h}$ = Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kg N_2O/h)

h_n = Number of hours in monitoring period n during which the plant was in operation

Sample calculation applying summed-up values of the whole monitoring period:

$Q_{N_2O,tailgas,n}$	$\Sigma FN_2O,tail gas,h$	
9.35	4.77	

During any periods in which a tertiary abatement system is by-passed, $F_{N_2O, tailgas, h}$ is set to zero in order to avoid double counting of project emissions.

$$(8) \quad Q_{N_2O, by-pass; n} = EF_{BL, N_2O, n} * P_{NA, n} * T_{open, n} * 10^{-3}$$

Where:

$Q_{N_2O, by-pass; n}$ = Amount of N_2O released through the by-pass to a tertiary N_2O abatement system to the atmosphere in monitoring period n (t N_2O)

$EF_{BL, N_2O, n}$ = Default N_2O baseline emissions factor in the calendar year y of the monitoring period n (kg N_2O /t HNO_3)

$P_{NA, n}$ = Nitric acid produced in the monitoring period n (t HNO_3)

$T_{open, n}$ = Fraction of time in monitoring period n during which the by-pass valve on the line feeding the tertiary N_2O abatement facility was open to vent the gas directly to the atmosphere.

Sample calculation applying summed-up values of the whole monitoring period:

$Q_{N_2O, bypass, n}$	$EF_{BL, N_2O, n}$	P_{NA}	$T_{open, n}$	
0	3.90	82,716.69	0	

The emissions related to the operation of the N_2O destruction facility include only on-site emissions due to the fossil fuel use as input to the N_2O destruction facility:

Project emissions from the operation of the tertiary N_2O abatement facility ($PE_{CO_2, tertiary, n}$)

The emissions related to the operation of the N_2O destruction facility include only on-site emissions due to the fossil fuel use as input to the N_2O destruction facility:

$$(9) \quad PE_{CO_2, tertiary, n} = PE_{FF, n}$$

Where:

$PE_{CO_2, tertiary, n}$ = Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in monitoring period n (t CO_2)

$PE_{FF,n}$ = Project emissions related to fossil fuel input to the destruction facility and/or re-heater in monitoring period n (t CO₂)

For the determination of the project emissions related to the operation of the tertiary abatement system in monitoring period n the project proponents are required to use the latest version of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion.”

The parameter $PE_{FC,j}$ used in the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” corresponds to the parameter $PE_{FF,n}$ in the applied methodology:

$$(10) \quad PE_{FF,n} = PE_{FC,i,j}$$

CO₂ emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels, as follows:

$$(11) \quad PE_{FC,j,n} = \sum_i FC_{i,j,n} * COEF_{i,n}$$

Where:

$PE_{FC,j,n}$ = CO₂ emissions from fossil fuel combustion in process j in monitoring period n (tCO₂/n)

$FC_{i,j,n}$ = Quantity of fuel type i combusted in the process j during the monitoring period n (mass or volume unit/n)

$COEF_{i,n}$ = CO₂ emission coefficient of fuel type i in monitoring period n (tCO₂/mass or volume unit)

i = fuel types combusted in process j during monitoring period n

Sample calculation applying summed-up values of the whole monitoring period:

$P_{CO_2,tertiary,n}$	$\Sigma FC_{i,j,n}$	$COEF_{i,n}$
276.66	94.15	3.3517

As data about the chemical composition of the fuel type i is available $COEF_{i,n}$ is calculated based on its chemical composition of the fossil fuel type i using Option A of the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02):

$$(12) \quad COEF_{i,n} = W_{c,i,n} * 44/12 w_{C,i,y} * 44/12$$

Where:

$COEF_{i,n}$ = CO_2 emission coefficient of fuel type i in monitoring period n (tCO_2 /mass or volume unit)

$w_{C,i,n}$ = Is the weighted average mass fraction of carbon in fuel type i in monitoring period n (tC/mass unit of the fuel)

Sample calculation applying summed-up values of the whole monitoring period:

$COEF_{i,n}$	$W_{c,i,n}$	
3.3517	91.44	44/12

$w_{C,i,y}$ is calculated according to a mass fraction calculation of carbon in the fuel type applied

Name	Molecular Weight	Unit	Percentage Fraction
M_c	12.0107	g/mol	
M_{CH_4}	16.043	g/mol	91.41
$M_{C_2H_6}$	30.07	g/mol	3.18
M_{CO_2}	44.01	g/mol	1.68

E.3. Calculation of leakage

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Any leakage emissions sources are deemed to be negligible.

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

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	100,004.5	3,175.09	0	96,829.43

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

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO₂e)	101,676	96,829.43

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

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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		