

Report № 2006-01	JI Project – Nitric Oxide Reduction at Agropolychim JSC	Date of issue:	Rev. №	Number of pages:
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Annual Monitoring Plan for the Nitrous Oxide Reduction in the Project of the Fertilizers Plant Agropolychim, Devnia, Bulgaria		Industrial area, Devnia, Bulgaria Tel.: +359-519-97-526 Fax: + 359-519-97-594 e-mail: ivanov@agropolychim.bg www.agropolychim.bg		
Name of plant:		Time period for monitoring:		
AGROPOLYCHIM JSC		15.09.05 – 31.12.05		

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Name of plant: AGROPOLYCHIM JSC		Time period for monitoring: 15.09.05 – 31.12.05		

INTRODUCTION

Agropolychim JSC is located in Devnia, near the city of Varna, in Northeast Bulgaria. Agropolychim was founded in 1974 and was privatized in November 1999. Acid & Fertilizers, USA acquired 63% of the company from the Bulgaria Privatization Agency. Acid & Fertilizers LLC, USA is a joint venture between DAVENPORT INDUSTRIES – 99% and CUMERIO – 1%.

A major restructuring program was implemented. Currently Acid & Fertilizers controls 97% of Agropolychim JSC. Board members are Vassil Alexandrov (CEO), Hristo Petrov (CEO), Philippe Rombaut (CEO), Krassimir Berbenkov (Vice CEO), Georgy Nakov (CFO), Martin Martinov (Chief Legal Advisor), Tom Beamish (CEO Cumerio).

1. NITRIC ACID PRODUCTION IN GENERAL

The crucial step in the nitric acid production, the catalytic combustion of ammonia, was developed by Ostwald around the beginning of this century. The first production facility employing the Ostwald process came on stream in 1906 at Gerthe, Germany.

All plants for the production of weak nitric acid (concentrations ranging from 30 to 70 percent nitric acid) are based on the Ostwald process and use the same basic chemical operations:

- oxidation of ammonia (NH_3) with air into nitric oxide (NO)
- oxidation of nitric oxide (NO) into nitrogen dioxide (NO_2)
- absorption of nitrogen dioxide (NO_2) in water to produce nitric acid (HNO_3)

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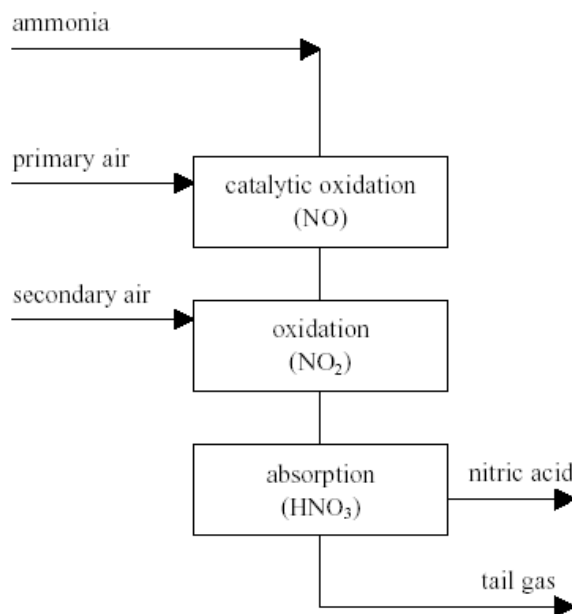


Figure 1 The Ostwald process

1.1. Raw material preparation

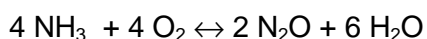
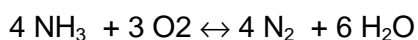
The liquid ammonia (NH_3) is evaporated and filtered. Air is purified by using two or three stage filtration and is pressurized. Both the ammonia filter and the air filter should remove all particles as good as possible. The air is split in two streams: one stream is led to the catalytic reactor, while the other stream is led to (the bleaching section of) the absorption column.

1.2. Oxidation of ammonia

The evaporated ammonia (NH_3) is mixed with the purified air in a ratio of approx. 1:10 and (optionally) filtered. This ammonia/air mixture is led across a catalyst. The mixture reacts according to the following equation:



Simultaneously nitrous oxide (N_2O), nitrogen (N_2) and water (H_2O) are formed as well, in accordance with the following equations:



Note: forming of laughing gas

Both reactions are undesirable, because they influence the yield of nitric oxide disadvantageously and they have great impact on the environment. The yield (percentage of ammonia that is converted to NO) depends on pressure and temperature as indicated in the following figure:

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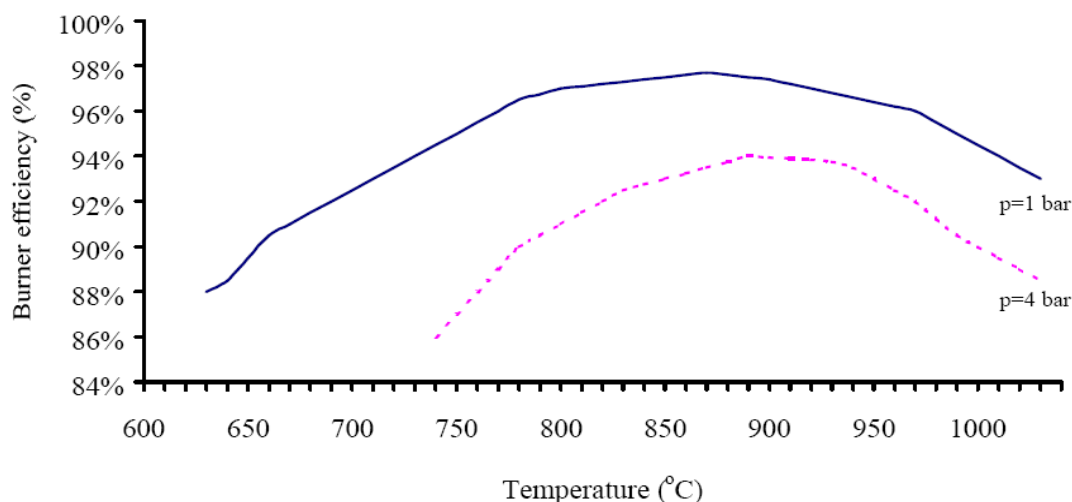


Figure 2 Possible conversion of NH_3 to NO on Platinum gauze as a function of temperature

The most universally preferred catalyst consists of platinum wire that is knitted into mesh gauze. Five to ten percent rhodium normally is added to the platinum to increase its strength and to reduce platinum costs, and up to 5% palladium is used to reduce cost. Catalyst poisoning (by air pollution or contamination from the ammonia) and unfavorable conditions (like poor ammonia/air mixing and poor gas distribution across the catalyst) may reduce the NO-yield.

During the reaction process, some of the platinum and rhodium from the catalyst vaporises. In most cases a platinum recovery system is installed below the catalyst, known as a "getter" or catchment. This system consists of a palladium alloy. A "getter" allows a 60 to 80% recovery of the total catalyst loss.

Due to loss of the platinum the efficiency of the catalyst drops over time. This leads to an increasing generation of N_2O over the campaign (time between change of platinum gauze). In general in the start of the campaign the generation of N_2O is approx. 20% below the average, while the generation is approx. 20% above the average at the end of a campaign. The generation of N_2O is shown in the following figure:

N_2O generation during a campaign

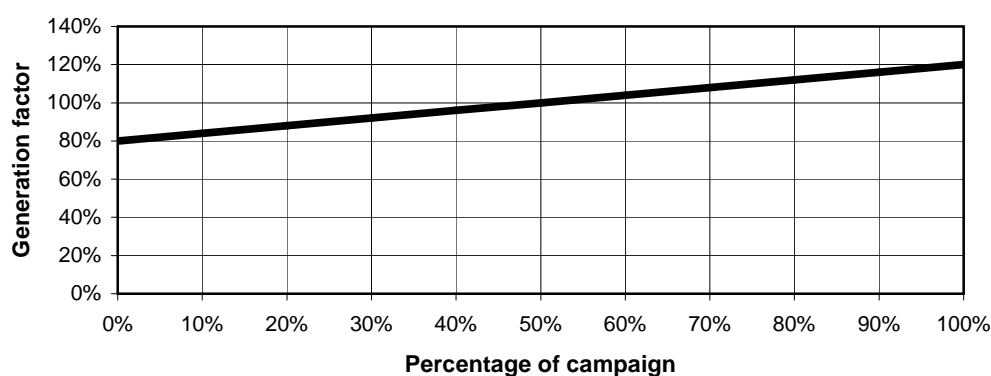


Figure 3 Typical N_2O generation as a function of time

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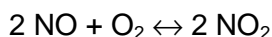
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The oxidation of ammonia (NH₃) is a strongly exothermic process. Transferring heat to a steam system cools down the gases from the catalytic reactor. Further cooling is obtained by transferring heat to the tail gas that leaves the absorbing column. The rest of the process heat is transferred to the cooling water circuit.

1.3. Oxidation of nitric oxide

After the catalytic formation of nitric oxide, the gases are cooled down in a cooler condenser and in some cases also compressed. This enhances the oxidation of nitric oxide to nitrogen dioxide. Due to the condensation of water, weak acid solution is formed. This solution is separated and led to the absorption tower. The nitrous gas from the cooler condenser is mixed with NO_x-bearing secondary air from the bleaching section, which is sometimes housed within the absorption column.

In the absorption section of the absorption column, the remaining nitric oxide (NO) reacts non-catalytically with oxygen (O₂) to form nitrogen dioxide (NO₂):



1.4. Absorption of nitrogen dioxide

Demineralised water or steam condensate is added at the top of the absorption column. The weak acid solution (approx. 43%) produced in the cooler condenser is also added to the absorption column. The nitrogen dioxide (NO₂) in the absorption column is led in counter-current flow with the water (H₂O), reacting to nitric acid (HNO₃) and nitric oxide (NO):



Both the reactions are favored by a higher pressure and lower temperature. Besides that, both reactions are exothermic so continuous cooling is necessary. The nitric acid produced is rich in dissolved nitrogen oxides and is passed to a bleaching tower (or bleaching section within the absorption tower) where it is contacted with a counter current flow of air. The air and the nitrogen oxides that have been stripped out are used as secondary air, mixed with the gases leaving the cooler condenser and recycled to the absorption section.

An aqueous solution of nitric acid is withdrawn from the bottom of the absorption tower. The acid concentration can vary depending on the temperature, pressure, number of absorption stages and the concentration of nitrogen oxides entering the absorber. The gases that were not absorbed in the nitric acid solution leave the absorption column at the top, at a temperature of approx. 20-30 °C.

This gas mixture is commonly referred to as tail gas and is heated in the heat recovery section. The hot tail gas is in certain cases led through a NO_x abatement system and through a tail gas expander for energy recovery. The resulting expanded tail gas is vented through the stack.

1.5. Plant types in general

In general, two types of nitric acid plants can be distinguished: mono pressure and dual pressure plants. In mono pressure (single pressure) processes, ammonia oxidation and NO₂ absorption take place at the same pressure. In the past, nitric acid plants worked at atmospheric pressure or low pressure (mono pressure below 1,7 bar).

Nowadays, mono pressure/low pressure plants hardly exist anymore. Mono pressure/medium pressure plants (pressure between 1,7 bar and 6,5 bar) and mono pressure/high pressure plants (pressure between 6,5 bar and 13 bar) are commonly present. Most plants operate with dual pressure due to a higher yield and less environmental impact.

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Older plants operate with low pressure/medium pressure, while more modern plants operate with medium pressure/high pressure. To make a higher pressure in the absorption section possible, a compressor is installed between the cooler condenser and the absorption column. The heat of compression is removed by heat exchange with the tail gas and/or by heat recovery in a steam boiler. A second cooler condenser reduces the temperature to 50 °C by cooling with water.

The next figure gives a simplified scheme of a typical dual pressure plant.

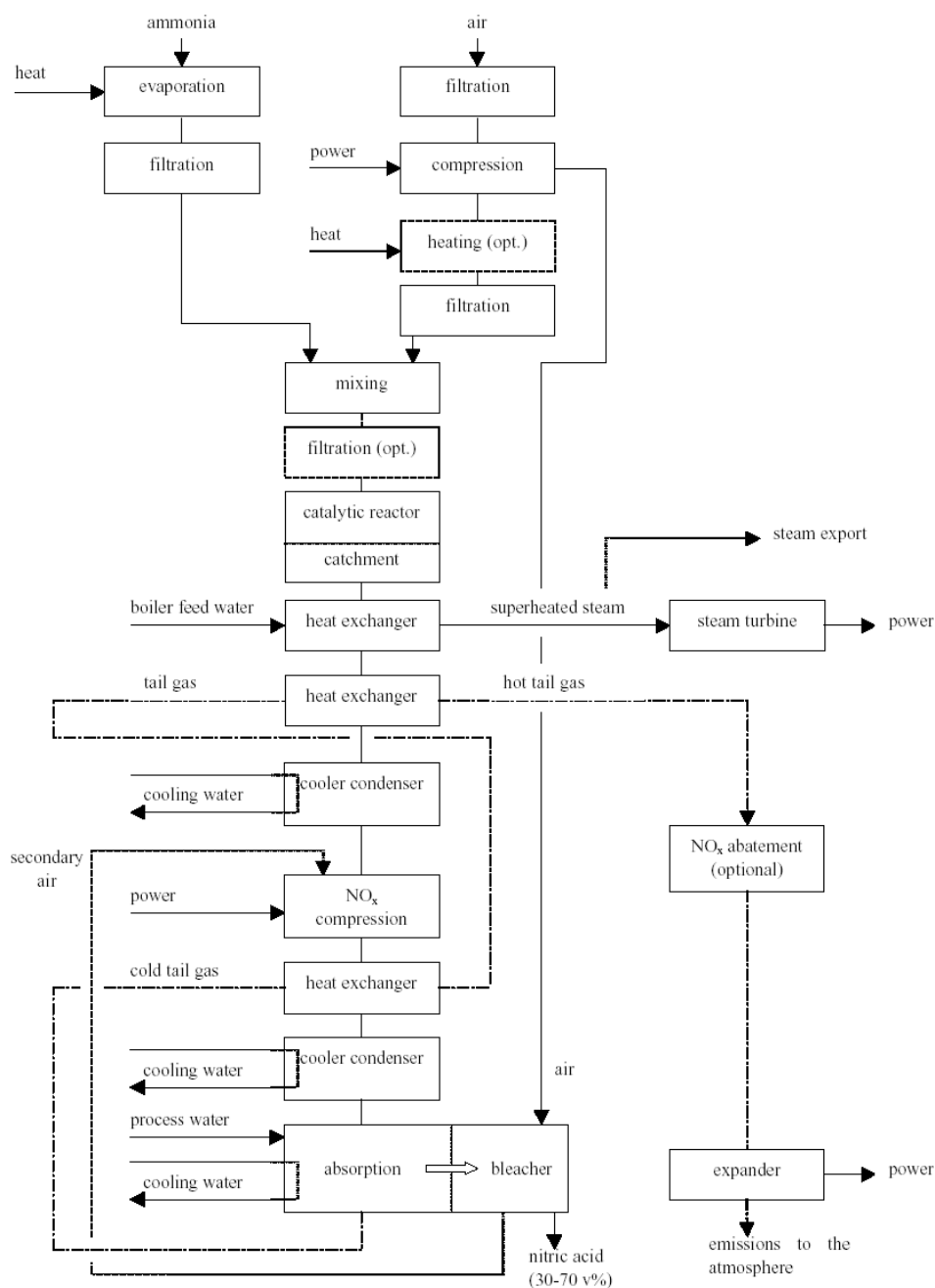


Figure 4 Dual pressure nitric acid plant

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1.6. Agropolychim's nitric acid plant

The nitric acid plant at Agropolychim is a French made dual pressure plant commissioned in 1974. Basic key information of the plant is summarized in the following table:

Parameter	Grand Paroisse plant
Production in 2005	311.265 tons of nitric acid 100 v%
Production in 2004	324.835 tons of nitric acid 100 v%
Production in 2003	223.815 tons of nitric acid 100 v%
Production in 2002	250.312 tons of nitric acid 100 v%
Production in 2001	325.728 tons of nitric acid 100 v%
Capacity	1.100 tons of nitric acid per day 100 v%
Oxidation	4 burners Pressure for catalytic oxidation is 3,5 bara Oxidation temperature is 835 °C Gauzes are knitted Burner diameter is 4,254 m Basket diameter is 4,254 m
Absorption	Pressure in absorption column is 12,8 bara Absorption temperature is 20-40 °C
Abatement Technologies	None
Tail gas	NOx concentration is around 170-200 ppm _{vol} N ₂ O concentration is 895 ppmv (average) The temperature is 20 °C The flow is 148.500 Nm ³ /h

Table 1 Key information for the plant (Grande Paroisse)

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Figure 5 Photo of two of the four reactors (NH_3 burners)

1.7. N_2O Emissions

N_2O emissions vary significantly from one nitric acid plant to another. The emissions depend very much on site-specific factors such as plant design, process conditions and abatement technologies employed.

The following specification of N_2O emission from the plant is based on actual measured emissions and stated productions of 100 % nitric acid.

Subject	Production of Nitric Acid (tons/year)	Emission of N_2O (tons/year)	GWP factor	Annual emission of CO_2 -equivalent (tons/year)
JI – Project	325.000	1.800	310	558.000

Table 2 Specifications of present N_2O emissions

The plant operate around the clock with planned shut down normally during the period June-August.

The N_2O generation at Agropolychim is 5,54 kg N_2O per ton 100% nitric acid, based on measurements.

The following figures show the N_2O generation from European nitric acid plants /9/:

European designed dual pressure plants:	2-10 kg N_2O / ton 100% HNO_3
Older plants pre 1975 without NSCR:	10-19 kg N_2O / ton 100% HNO_3

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2. OBJECTIVE

2.1. Project Stakeholders

The following key stakeholders are identified for the project:

- Agropolychim JSC
- Government of Bulgaria (Ministry of Environment and Water)
- Government of Denmark (Ministry of the Environment, Danish Environmental Protection Agency)

2.2. The Nitrous Oxide Reduction in the Project of Agropolychim

The objective for the project is to reduce the N_2O emission by utilizing new developed technology (i.e. a catalyst) that converts the Nitrous Oxide into Oxygen and Nitrogen, which have zero Global Warming Potentials.

The new technology is applied by introducing a new catalyst bed, which is installed directly under the Platinum Gauze in the reactors. This new catalyst does not have any effects on the present production (no yield loss).

The technology is owned and patented by Heraeus. The technology has been installed in a few plants and operated without problems. The supplier guarantees the performance of the catalyst technology. The pressure drop over the catalyst is not significant and is normally about 15 mbar. The lifetime of the catalyst is expected to be maximum 3 years. In case the performance throughout this period is not satisfactory it will be replaced at the next possible shutdown.

The formation of N_2O is unavoidable, since the NO yield is limited. From an environmental point of view, emissions of N_2O need to be prevented. N_2O has a global Warming Potential (GWP) of 310 times greater than CO_2 .

Only N_2O emissions from the nitric acid plant are determined, as only these emissions of Agropolychim are affected by the project. The project does not have any impact related to the energy consumption or generation, waste, raw material consumption and emissions other than N_2O .

A baseline N_2O emission factor (5.54 kg N_2O per tonne of nitric acid) was determined based on N_2O concentration measurements, tail gas flow rate, temperature and pressure and nitric acid production. The N_2O concentration of 860 ppmv measured in 2004 is comparable to the N_2O concentration measurements carried out at other plants (see Annex I "Data calculations for emission baseline" – JI PDD, DEPA file M124/000-0043t, April 2004).

The catalyst for converting N_2O was supplied by Heraeus. This product was installed and operated without problems and great success in the Nitric Acid Plant.

The design and the installation of the catalyst were ready on September 15th 2005. The reductions of N_2O emissions started immediately following the installation of the new technology.

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Figure 6 Installing of the catalyst for converting N_2O

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2.3. GHG Emission Accounting

The catalyst provided reduction of N_2O concentration in the tail gas from 860 ppmv to 120-180 ppmv and is expected to reduce Agropolychim's emissions by 11000 tonnes N_2O (i.e. about 3 410 000 tonnes $CO_2eq.$) within the period 2005-2012.

2.4. Project sustainability

The plant is functional and running and is well maintained. Many investments are under way. The sustainability of the project is related to future maintenance of the plant and the situation of the fertilizer market.

There are no significant risks related to the project in technical terms, but it is essential that the plant keeps on producing nitric acid in the future. The risks are more related to the prediction of the market situation for fertilisers in the future and the company's investment plans for rehabilitation of the plant.

3. DESCRIPTION OF PLANT PERFORMANCE

3.1. Production and Key figures

The plant operates around the clock with a planned shut down for the annual maintenance normally from June to August.

The reduction of N_2O emissions started immediately following the installation of the new selective catalyst (15th September 2005).

Within the period 15.09.2005 - 31.12.2005 were produced 101 004.9 t 100% HNO_3 under the conditions described below:

Subject	Value
Produced of HNO_3	101 004.9 tons of nitric acid 100 v%
Hour production of HNO_3	43,0541 tons of nitric acid 100 v%/hour
Real time operation period	2 330 h
Idle time of installation	248 h
O_2 in tail gas (average)	5,39 v. %
NO_x in tail gas (average concentration)	110,10 ppm _{vol}
N_2O in tail gas (average concentration)	124,4 ppm _{vol}
Tail gas temperature (average)	11,611 °C
Tail gas flow (average)	139.344 Nm ³ /h

Table 4 Operation conditions in Nitric Acid Plant for the period 15.09.2005 - 31.12.2005

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3.2. Results

The monitoring results give information about the GHG emission reductions and GHG emissions, generated for the period 15.09.2005 - 31.12.2005.

The baseline N₂O generation at Agropolychim is accepted to be 5,54 kg/N₂O per ton 100 % nitric acid.

The monitoring results are presented according to the requirements (Annex IV from PDD) shown in **Annex I and Annex II** (*Monitoring Data for the period 15.09.2005 - 31.12.2005 and N₂O Emission Reduction for the period 15.09.2005 - 31.12.2005*).

3.3. Environmental impact

Since the project does not affect the production and near surroundings, no environmental impacts are expected from the project.

The Nitric Acid Plant in Agropolychim JCS at Devnia complies with the relevant environmental legislation in Bulgaria.

4. MONITORING PLAN

4.1. Objective of the Monitoring Plan

The objective of the Monitor Plan (MP) is to provide a practical framework for collection and management of performance data, in order to monitor and verify the GHG emission reduction generated by the JI-project. The project comprises reduction of nitrous oxide by means of a new catalyst introduced to the reactors of the nitric acid plant.

The MP has been developed in accordance with the French standard BP X 30-331 "Protocol for quantification for nitrous oxide emissions in the manufacture of nitric acid".

This MP provides monitoring methodologies for monitoring and estimation of GHG emission reduction referring to the emission baseline.

The monitoring results are filled in the forms, according to requirement in Annex IV from PDD (Monitoring Plan) for the entire monitoring period.

The monitoring plan is based on an on-line measurement of the tail gas and the production flow. Emission factors are calculated in the baseline and measured on-line continuously. The on-line data are filed on a PC and two hard disk and monthly recording on a CD do a back up.

The proposed monitoring methodology, data collection, data management and guidelines can only be changed after agreement with the Bulgarian Government, the Danish Government and the Verifier.

4.2. Requirements for the Monitoring Activities

1. Monitoring of the GHG emission reduction generated by the project shall be performed by data collection at Agropolychim's nitric acid plant.
2. Monitoring reports include the actual GHG emission reduction and GHG emission generated by the project and should be issued annually during the entire crediting period.
3. Based on monitoring results the GHG emission reductions and GHG emissions shall be calculated and submitted for verification as approved ERUs.
4. Persons trained in the monitoring procedure shall conduct the monitoring.
5. QA system shall be implemented to secure accurate and transparent monitoring.

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6. The governing language is English in monitoring reports.
7. The outcome of the MP shall enable a legacy entity to accrediting the ERUs generated by the project according to requirements of the Executive Board/JI Supervisory Committee, the Bulgarian government and the Danish government.
8. The monitoring procedures shall follow the guidelines in the Marrakech Accords.
9. Draft versions of the annual monitoring reports shall be submitted to the Bulgarian government and the Danish Government or their representatives before issuing the final version. The annual monitoring reports shall be issued to:

Receiver of annual reports	Draft version monitoring report	Final version monitoring report
Bulgarian Government	2 copies	2 copies
Danish Government	2 copies	2 copies
Verifier	none	2 copies

Table 5 Monitoring reports

4.3. General information

The monitoring plan is based on an on-line measurement of the tail gas and the production flow. Emission factors are calculated in the baseline and measured on-line continuously. The on-line data are filed on a PC and two hard disk and monthly recording on a CD do a back up.

The emission reduction is calculated as the difference between the emission factor (baseline: 5,54 kg/N₂O per ton 100 % nitric acid) and the actual emission factor multiplied by the actual production.

The monitoring methodology reflects good practice and is in line with the approved monitoring methodologies for the Clean Development Mechanism.

4.4. Monitoring equipment

N₂O emissions are continuously measured after the installation of the catalyst. The monitoring methodology was built upon the on-line measurements of:

- i) N₂O concentration (IR measuring technology - Infrared Analyzer Module, manufactured by Hartmann & Braun, Frankfurt, Germany);
- ii) Tail gas flow (system for measuring of tail gas flow – Durag system D-FL 100, with transmitters for temperature and pressure);
- iii) Temperature of tail gas;
- iv) Absolute pressure of tail gas;
- v) Concentration of O₂ in tail gas;
- vi) Nitric acid production /as 100 % HNO₃/ (mass-flow meter, manufactured by Yokogawa).

Detailed description of monitoring equipment is present in **Annex III** (*Description of monitoring equipment*).

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4.5. Methodology

4.5.1. Emission baseline

The baseline is based on the assumptions of an annual production of 325.000 tons of 100% HNO₃ and an average concentration of N₂O of 250 ppm in the tail gas, after implementation.

A baseline N₂O emission factor (5.54 kg N₂O per tonne of nitric acid) was determined based on N₂O concentration measurements, tail gas flow rate, temperature and pressure and nitric acid production. The N₂O concentration of 860 ppmv measured in 2004 is comparable to the N₂O concentration measurements carried out at other plants (see Annex I "Data calculations for emission baseline" – JI PDD, DEPA file M124/000-0043t, April 2004).

4.5.2. Emission factors

The GWP used for N₂O is 310 times greater than CO₂.

The following conversion factors from ppm to mg/Nm³ (Nm³: 1 m³ air at 273 K, 101.3 kPa, dry) for various emissions to air:

Emission	Conversion factor
N ₂ O	1,96

Table 6 Conversion factors

4.5.3. Actual emission reduction

The emission reduction is calculated as the difference between the emission factor (baseline: 5,54 kg/N₂O per ton 100 % nitric acid) and the actual emission factor multiplied by the actual production.

The actual emission reduction (over a period of monitoring) is obtained by the following equations:

The *emission factors* are calculated as follows (both before and after the project):

$$F_{N_2O} = \frac{1}{t} \times \sum_0^t \frac{C_{N_2O} \times Q_s \times 44}{P_{N_2O} \times V_M} \times 10^{-6} \Delta t$$

Where

F_{N_2O}	kg/T	N ₂ O emission in kg per ton of 100% HNO ₃ produced
t	hours	Period of time
C_{N_2O}	ppm	N ₂ O concentration in tail gas
Q_s	Nm ³ /h	Output air flow (tail gas)
V_M	22,4 l/mol	Molar volume N ₂ O (normal conditions)
P_{N_2O}	T/h	Production of 100% HNO ₃

The actual *emission reduction* is calculated as follows:

$$ERU = \frac{GWP}{1.000} \times \sum_0^t (F_{N_2O \text{ baseline}} - F_{N_2O \text{ actual}}) \times P_{N_2O} \Delta t$$

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Where

ERU	CO ₂ eq.	Emission Reduction Units
GWP	310	Global Warming Potential for N ₂ O
F _{N2O baseline}	5,54 kg/T	N ₂ O emission in kg per ton of 100% HNO ₃ produced (baseline)
F _{N2O actual}	kg/T	N ₂ O emission in kg per ton of 100% HNO ₃ produced (actual)
t	hours	Period of time
P _{N2O}	T/h	Production of 100% HNO ₃ (actual)

The actual monitoring results are filled in the forms, according to requirement in Annex IV from PDD (Monitoring Plan) for the entire monitoring period (15.09.2005 - 31.12.2005) – **see Annex II.**

4.6. Responsibility

Agropolychim is responsible for the monitoring and reporting in accordance with the guidelines of the monitoring plan. The authority and the responsibility for the project management, operation, maintenance, monitoring and reporting are clearly defined.

The technology supplier (Heraeus) was responsible for ensuring the appropriate installation, operation and maintenance of the catalyst, including the necessary renewal of the catalyst.

The supplier of the monitoring equipment (ABB Automation Products, Germany) was responsible for the installation, test and check for compliance of the monitoring devices and whether the reporting of the emissions reductions were carried out according to the monitoring plan.

4.7. Quality Assurance System

The quality assurance system secures that monitoring procedures and requirements are followed. The QA system is not according to any ISO 9000 or similar standards. The QA system comprises inspection of the monitoring procedure by an independent third party. The management of Agropolychim is responsible for QA system.

The QA system can be changed according to request from the verifier.

QA – Procedure		Time for Inspection	Inspection
1.0	Calibration of meters and transmitters All flow meters and transmitters have to be calibrated and checked at least once every year during planned shut down. Calibration reports must be obtained, including name, official company registration number, address, phone and fax number.	Annual	Independent third party
2.0	Control of meters and transmitters	Weekly	Operational staff
3.0	Control of monitoring data The data and the calculations have to be	Daily	Operational staff

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	controlled every day, to secure minimum errors		
4.0	Observations, comments, control of calibration reports and measurements of N ₂ O concentration.	Annual	Independent third party
5.0	Training of staff members	Before commissioning of project and hereafter annually	Management

Table 7 Quality Assurance System

4.8. Training and instruction of operational staff

Training of operational staff members was conducted before commissioning of project. Training shall be replicated, when needed, in order to secure full understanding of the monitoring procedures and to secure the highest possible reliability of the monitoring results.

The management is responsible for training and instruction of operational staff.

4.9. Summary - Management of the monitoring plan

The summary aims to highlight the key elements and responsibilities of the management of the MP.

Obligations	Utility	Independent third party	Verifier
Monitoring Plan	Review of the MP and comments. Review management of monitoring plan Preparation of monitoring procedures Training of staff members performing monitoring procedures Updating of MP if necessary Preparation for data collection, data handling and data storing	Elaboration of inspection reports every 6 months	Review of MP and comments Review of management system
Data collection	Review of methods and system for data collection system including updating of these if necessary		Review of methods and system for data collection including comments
Data handling	Appointment of person(s) responsible for data handling		Review of data handling systems
Data storing	Establishment of data storing system for written and digital data Establishment of back-up system for data storing		Review of data storing system including backup systems
Monitoring	Timetable for monitoring activities		Review and assist elaborating timetables, monitoring sheets etc.
Reporting	Establish framework for reporting which fulfil requirements in MP		Review of framework for reporting
Instruction	Instruction of staff members		Assist during performance of the training

Table 8 Management of Monitoring Plan

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Annex I

Monitoring Data for the period 15.09.2005 - 31.12.2005

Date: 2005

№	date / hour	N ₂ O	N ₂ O	O ₂ (gas) Vol. %	Temperature °C	Flow Nm ³ /h	Pressure hPa
		meas.	meas.				
		mg/Nm ³	ppmv.				
(1)	(2)	(3)	(4)	(6)	(7)	(8)	(9)
1	15.09.2005 15:00	212	108.2	2.7	17.1	149292	1060
2	16.09.2005 00:00	193.1	98.5	2.57	17.6	148895	1059
3	17.09.2005 00:00	181.1	92.4	2.22	17.4	148119	1058
4	18.09.2005 00:00	176.2	89.9	2.09	18.7	147417	1062
5	19.09.2005 00:00	177.7	90.7	2.22	16.2	149076	1064
6	20.09.2005 00:00	184	93.9	2.1	14.1	149312	1059
7	21.09.2005 00:00	185.5	94.6	2.12	15.2	148490	1059
8	22.09.2005 00:00	189.4	96.6	2.03	14.6	148308	1060
9	23.09.2005 00:00	195.7	99.8	2.08	15.2	148026	1060
10	24.09.2005 00:00	201.2	102.7	2.06	15.2	148065	1061
11	25.09.2005 00:00	204.5	104.3	2.06	15.1	148256	1060
12	26.09.2005 00:00	207.6	105.9	2.14	15.5	148173	1064
13	27.09.2005 00:00	193.2	98.6	2.82	13.6	149393	1065
14	28.09.2005 00:00	189.4	96.6	3.16	12.4	149754	1063
15	29.09.2005 00:00	191	97.4	3.21	12.5	149635	1063
16	30.09.2005 00:00	193.6	98.8	3.15	14	148840	1061
17	01.10.2005 00:00	200.9	102.5	3.11	15.2	148402	1062
18	02.10.2005 00:00	205.1	104.6	3.02	16.1	147842	1060
19	03.10.2005 00:00	207.7	106	3.11	14.6	148798	1065
20	04.10.2005 00:00	208.3	106.3	3.01	13.9	149593	1068
21	05.10.2005 00:00	213.3	108.8	3.04	14.1	149528	1068
22	06.10.2005 00:00	210.9	107.6	3.17	12.8	149863	1068
23	07.10.2005 00:00	212.2	108.3	3.28	12.5	150583	1071
24	08.10.2005 00:00	218.6	111.5	3.2	13.1	150196	1070
25	09.10.2005 00:00	223.1	113.8	3	13.7	149492	1068
26	10.10.2005 00:00	223.7	114.1	3.13	13	149859	1069
27	11.10.2005 00:00	226.6	115.6	3.25	12.7	150114	1068
28	12.10.2005 00:00	227.5	116.1	3.13	12.1	150144	1066
29	13.10.2005 00:00	231.6	118.2	3.24	12.7	150325	1066
30	14.10.2005 00:00	233.4	119.1	3.08	13.5	149602	1066
31	15.10.2005 00:00	237.5	121.2	3.13	13.5	149562	1065
32	16.10.2005 00:00	239.1	122	3.16	12.1	149616	1059
33	17.10.2005 00:00	236.6	120.7	3.11	12.1	149415	1058
34	18.10.2005 00:00	251.1	128.1	2.74	11.9	150042	1061
35	19.10.2005 00:00	260.8	133.1	2.8	12.5	150401	1063
36	20.10.2005 00:00	262.5	133.9	2.67	12.8	150416	1066
37	21.10.2005 00:00	267.3	136.4	2.82	13.1	150057	1065
38	22.10.2005 00:00	265.5	135.5	2.59	13.7	149200	1064

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№	date / hour	N ₂ O	N ₂ O	O ₂ (gas)	Temperature	Flow	Pressure
		meas.	meas.				
		mg/Nm ³	ppmv.				
(1)	(2)	(3)	(4)	(6)	(7)	(8)	(9)
39	23.10.2005 00:00	268.8	137.1	2.6	14.6	148675	1064
40	24.10.2005 00:00	275.9	140.8	2.44	15.5	147946	1063
41	25.10.2005 00:00	279.8	142.8	2.75	13	149621	1069
42	26.10.2005 00:00	278.4	142	2.66	13.9	149169	1066
43	27.10.2005 00:00	283.5	144.6	2.58	14.3	148667	1064
44	28.10.2005 00:00	284.9	145.4	2.57	12.7	149816	1066
45	29.10.2005 00:00	288	146.9	2.66	11.5	150480	1070
46	30.10.2005 00:00	284.8	145.3	2.58	11.7	150130	1069
47	31.10.2005 00:00	288.5	147.2	2.57	11.9	149872	1066
48	01.11.2005 00:00	205.1	104.6	8.94	16.1	120944	1063
49	02.11.2005 00:00	0	0	21.48	7.1	64360	1060
50	03.11.2005 00:00	1	0.5	21.85	7.8	61574	1063
51	04.11.2005 00:00	0	0	22.48	9.5	60024	1062
52	05.11.2005 00:00	0	0	22.72	8.5	60912	1064
53	06.11.2005 00:00	0	0	22.94	9.6	59998	1066
54	07.11.2005 00:00	0	0	21.67	8.5	60746	1066
55	08.11.2005 00:00	0	0	20.95	7.7	61536	1067
56	09.11.2005 00:00	0	0	21.06	10.5	59187	1067
57	10.11.2005 00:00	0	0	20.79	9.8	60550	1067
58	11.11.2005 00:00	79.6	40.6	16.78	15.2	91692	1067
59	12.11.2005 00:00	139.7	71.3	13.67	21.5	100063	1065
60	13.11.2005 00:00	250.2	127.7	4.51	9.1	145055	1065
61	14.11.2005 00:00	245	125	4.9	7.7	147376	1068
62	15.11.2005 00:00	221.4	113	5.76	5.5	148087	1063
63	16.11.2005 00:00	215.6	110	5.88	5.9	146785	1054
64	17.11.2005 00:00	191.3	97.6	9.2	18.6	128673	1050
65	18.11.2005 00:00	287.5	146.7	3.88	10.8	149825	1056
66	19.11.2005 00:00	289.2	147.6	3.6	11.4	149661	1055
67	20.11.2005 00:00	293.2	149.6	3.71	10.6	150400	1057
68	21.11.2005 00:00	285.2	145.5	3.84	10.1	150962	1060
69	22.11.2005 00:00	298.6	152.3	4.22	9.1	152088	1065
70	23.11.2005 00:00	294.4	150.2	4.05	9.8	151529	1067
71	24.11.2005 00:00	285	145.4	4.12	11.2	146832	1060
72	25.11.2005 00:00	282.2	144	4.09	10.5	143806	1050
73	26.11.2005 00:00	288.9	147.4	4.19	9.6	145133	1057
74	27.11.2005 00:00	294	150	4.15	10.2	144609	1055
75	28.11.2005 00:00	293.2	149.6	4.18	11	144068	1053
76	29.11.2005 00:00	293.8	149.9	4.48	9.6	145165	1058
77	30.11.2005 00:00	287.2	146.5	4.78	9.3	144831	1060
78	01.12.2005 00:00	274.9	140.3	5.18	7.8	144493	1056

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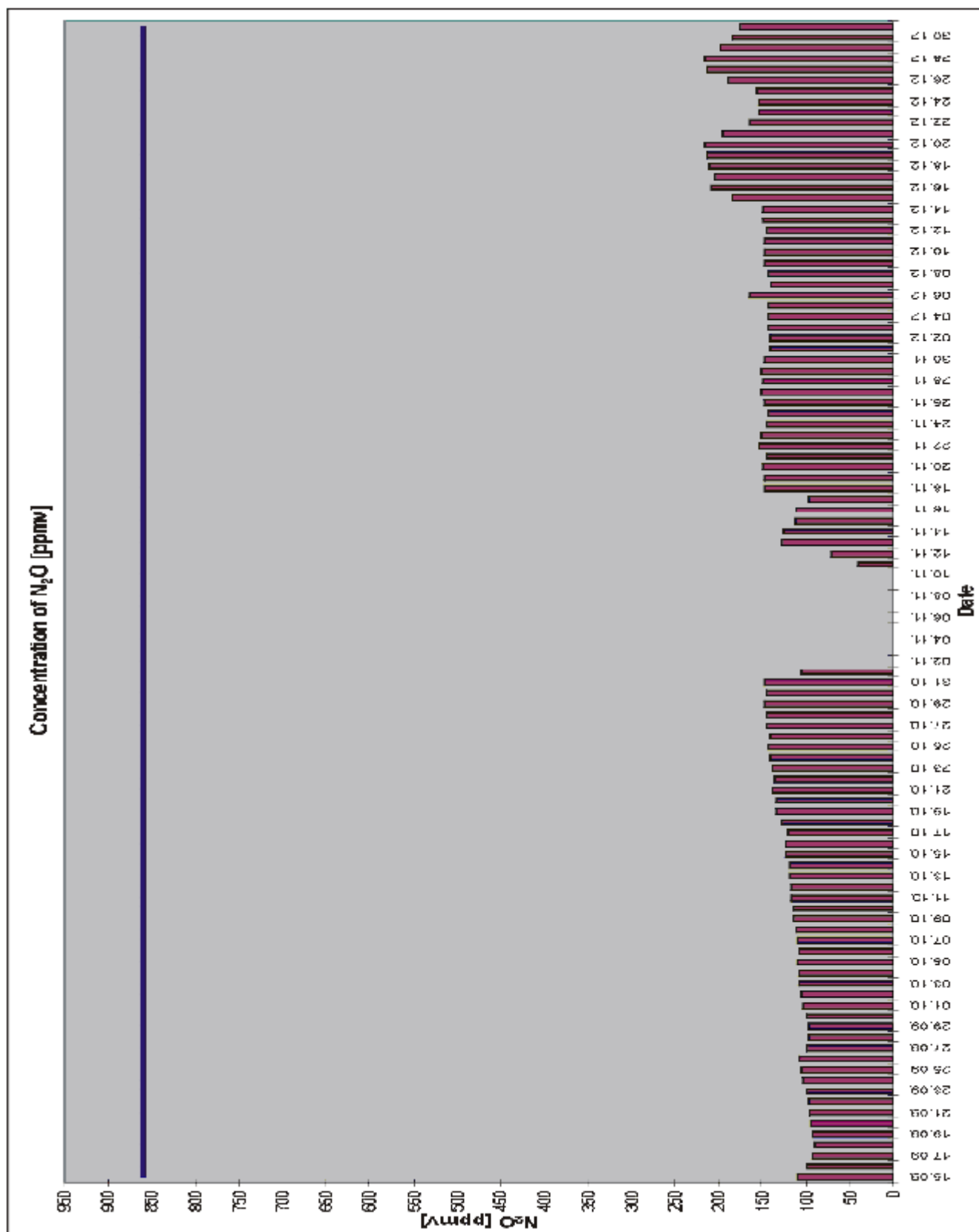
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№	date / hour	N ₂ O	N ₂ O	O ₂ (gas)	Temperature	Flow	Pressure
		meas.	meas.				
		mg/Nm ³	ppmv.				
(1)	(2)	(3)	(4)	(6)	(7)	(8)	(9)
79	02.12.2005 00:00	277.1	141.4	5.13	7.3	144727	1055
80	03.12.2005 00:00	279.3	142.5	5.29	7.2	145394	1059
81	04.12.2005 00:00	280.5	143.1	5.16	7.3	144751	1055
82	05.12.2005 00:00	281.8	143.8	5.19	7	145032	1057
83	06.12.2005 00:00	320.8	163.7	4.31	10.2	144878	1056
84	07.12.2005 00:00	274.5	140.1	5.43	8.2	143776	1057
85	08.12.2005 00:00	282.3	144	5.4	6.2	145596	1059
86	09.12.2005 00:00	287.8	146.8	5.34	6.7	146043	1065
87	10.12.2005 00:00	289	147.4	5.41	6.1	146860	1070
88	11.12.2005 00:00	286.6	146.2	5.58	5.1	147303	1072
89	12.12.2005 00:00	285.2	145.5	5.42	5.8	146569	1069
90	13.12.2005 00:00	290.5	148.2	5.26	6.2	145815	1064
91	14.12.2005 00:00	290.3	148.1	5.25	6.9	145191	1060
92	15.12.2005 00:00	358.7	183	3.61	10.7	146294	1054
93	16.12.2005 00:00	406.4	207.3	2.33	13.9	146737	1047
94	17.12.2005 00:00	398.9	203.5	2.24	14.5	146009	1044
95	18.12.2005 00:00	409.4	208.9	2.33	12.8	147219	1048
96	19.12.2005 00:00	416	212.2	2.49	12.6	148434	1058
97	20.12.2005 00:00	423	215.8	2.61	12.4	149413	1064
98	21.12.2005 00:00	382	194.9	3.6	10.7	148418	1060
99	22.12.2005 00:00	321.5	164	4.75	8	146175	1062
100	23.12.2005 00:00	304.4	155.3	5.21	7.2	144819	1059
101	24.12.2005 00:00	304.2	155.2	5.2	7	144938	1059
102	25.12.2005 00:00	305.5	155.9	4.99	8.5	143880	1055
103	26.12.2005 00:00	372.1	189.8	3.6	11.7	146539	1057
104	27.12.2005 00:00	414.6	211.5	2.76	14.8	148103	1057
105	28.12.2005 00:00	424.2	216.4	2.81	14.4	148178	1057
106	29.12.2005 00:00	387.5	197.7	3.54	12.7	148001	1061
107	30.12.2005 00:00	357.6	182.4	4.31	9.4	148407	1060
108	31.12.2005 00:00	344.7	175.9	4.54	7.7	148212	1060
TOTAL:		0	0	0	0	361179616	0
Average:		243.7	124.4	5.39	0	139344	0
Minimum:		0	0	0	0	0	0
Maximum:		424.2	216.4	0	0	0	0

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Annex II

N₂O Emission Reduction for the period 15.09.2005 - 31.12.2005

Date: 2005

Period	Production of 100 % HNO ₃ [ton]	N ₂ O emission [kg]	Emission factor actual [kg/ton]	Emission factor baseline [kg/ton]	Emission reduction N ₂ O [kg]	Emission reduction CO ₂ [eq. ton]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	measuring	measuring	= (3)/(2)	constant	= (2)x(5)-(2)x(4)	= [(6)x310]/1000
12.09.2005 - 18.09.2005	4389.6	2241.51	0.51	5.54	22076.87	6843.83
19.09.2005 - 25.09.2005	8107.2	4769.2	0.59	5.54	40144.69	12444.85
26.09.2005 - 30.09.2005	5572.8	3489.71	0.63	5.54	27383.6	8488.92
01.10.2005 - 02.10.2005	2188.8	1442.99	0.66	5.54	10682.96	3311.72
03.10.2005 - 09.10.2005	7740	5369.05	0.69	5.54	37510.55	11628.27
10.10.2005 - 16.10.2005	7723.2	5791.14	0.75	5.54	36995.39	11468.57
17.10.2005 - 23.10.2005	7876.8	6514.05	0.83	5.54	37123.42	11508.26
24.10.2005 - 30.10.2005	7912.8	7082.78	0.9	5.54	36754.13	11393.78
31.10.2005 - 31.10.2005	1130.4	1037.68	0.92	5.54	5224.74	1619.67
01.11.2005 - 06.11.2005	446.4	352.82	0.79	5.54	2120.24	657.27
07.11.2005 - 13.11.2005	1795.2	932.99	0.52	5.54	9012.42	2793.85
14.11.2005 - 20.11.2005	6470.4	6101.11	0.94	5.54	29744.91	9220.92
21.11.2005 - 27.11.2005	6559.66	7197.05	1.1	5.54	29143.47	9034.47
28.11.2005 - 30.11.2005	2837.84	3035.63	1.07	5.54	12686	3932.66
01.12.2005 - 04.12.2005	3622.89	3864.42	1.07	5.54	16206.39	5023.98
05.12.2005 - 11.12.2005	6384.56	7070.59	1.11	5.54	28299.87	8772.96
12.12.2005 - 18.12.2005	7032.26	8563.46	1.22	5.54	30395.26	9422.53
19.12.2005 - 25.12.2005	6930.02	8642.58	1.25	5.54	29749.73	9222.42
26.12.2005 - 31.12.2005	6284.11	8166.67	1.3	5.54	26647.3	8260.66
Note:	Sum	Sum	Average annual	Constant	Sum	Sum
TOTAL:	101004.9	88182.3	0.9	5.54	471384.8	146129.3

Notes:

1. Within the period 2.11-10.11.2005 the plant for the production of nitric acid has not been in operation, because of a forced emergency shut-down in Ammonia Plant.
2. In order to ensure the necessary authenticity of the monitoring data and elimination of the abnormal emission levels detected at a start-up and a shut-down of the Nitric Acid Plant in the monitoring system was integrated a filter, based on the indicative for the operation of the plant index "flow rate of the effluent gasses". At a limit value of the flow rate < 90 000 Nm³/h these abnormal emissions are excluded/ filtered (made equal to zero) and the same participate when making the calculations.

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Annex III Description of monitoring equipment

№	Index	Devices	Measurement method	Range	Certificate
1	N ₂ O	IR analyzer module URAS 14	IR spectroscopy	0...5 000 ppmv.	TÜV, for the system Advance Analyzer Module URAS 14
2	O ₂	Electrochemical sensor	Electrochemical	0..10/25 Vol.%	TÜV, for the system Advance Analyzer Module URAS 14
3	Gas volumetric flow	System Durag D-FL 100 with a transformer of differential pressure and measuring unit type: D-FL 100-10 Temperature transmitter, differential and static pressure	Calculated on the bases of the cross section of the gas outlet pipe, velocity, pressure and the temperature by means of microprocessor unit type D-FL 100-10	- - -	The system DURAG D-FL 100 tested for functional suitability by TÜV, according to the protocol №128CU11650 / 29.03.1996
4	Temperature	System Durag D-FL 100 Temperature transmitter Pt 100 type – FL 100 TM-H	Thermo-resistant	0 ÷ 50 °C	
5	Flow rate	System Durag D-FL 100 a probe cross-fitted to the gas outlet pipe type - FL 100 DS2	Calculated on the basis of the differential pressure through air- speed tube (Pito tube)	> 3,0 m/s	
6	Gas pressure	System Durag D-FL 100 transmitter for differential pressure FL 100 DDM/H; pressure transmitter type: AMD 210	Physical	900–1200 hPa	