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

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version 1 – 27/10/2010

Catalytic N_2O destruction project in the tail gas of three Nitric Acid Plants at Hu-Chems Fine Chemical Corp.
Ref 0765
Monitoring Period 14: 01/07/2010 – 30/09/2010

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

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1. Carbon CDM Korea has implemented a project for GHG emission reduction by catalytic N_2O destruction in Yeosu, Republic of Korea. The project is categorized as large scale project under sectoral scope 5: "Chemical Industry". The Host Party for the project activity is the Republic of Korea. The Project Activity includes development, design, engineering, procurement, finance, construction, operation and maintenance of a system for catalytic reduction of N_2O in three Nitric Acid Plants (Hu-Chems II; Hu-Chems III; Hu-Chems IV) at Hu-Chems Fine Chemical Corp.

2. In this project, CARBON CDM Korea installed three EnviNOx® systems for catalytic reduction and decomposition of NO_x and N_2O additionally to the equipment at the three nitric acid manufacturing plants. The project activity reduces the GHG emissions, which would otherwise be released to the atmosphere, if the project was not implemented.
   The EnviNOx® process used in the **Hu-Chems II + III** nitric acid plants is based on the catalytic reduction of NO_x (NO and NO_2) with ammonia (NH_3) and of nitrous oxide (N_2O) with a hydrocarbon. The hydrocarbon used is propane gas of which the main constituent is propane (C_3H_8). The reactions take place over an iron zeolite catalyst bed.
   The EnviNOx® process used in the **Hu-Chems IV** nitric acid plant is based on the catalytic decomposition of nitrous oxide (N_2O) and the catalytic reduction of NO_x (NO and NO_2) with ammonia (NH_3). This process works very well at temperatures above about 425°C. The reactions take place over two iron zeolite catalyst beds.

3. The EnviNOx® system at Hu-Chems IV was installed in December 2006 and the catalytic reduction process of N_2O started in the beginning of January 2007.
   The EnviNOx® system at Hu-Chems II and Hu-Chems III was installed in February and March 2007 and the catalytic reduction process of N_2O started in the end of March 2007.

4. Total emission reductions achieved in this monitoring period: **395,194 tCO_2e**

A.2. Project Participants

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Name of Party involved	Project participants (as applicable)	Party involved considered as project participant
Republic of Korea (Host)	CARBON CDM Korea Ltd.	No
Federal Republic Germany	RWE Power AG	No

Project applicant, developer and sponsor is **CARBON CDM Korea Ltd.** (furthermore called "CARBON"). CARBON CDM KOREA Ltd. is registered under the laws of the Republic of Korea. The company is a subsidiary of CARBON Projektentwicklung GmbH, Austria, and RWE Power AG. It represents a foreign direct investment under the Foreign Investment Promotion Act (FIPA) of Korea. CARBON Projektentwicklung GmbH was founded as a limited liability company located and registered in Austria under Austrian law in order to develop, finance and operate high quality JI/CDM Projects. CARBON Projektentwicklung GmbH has vast experience with CDM-Project development in Africa, Latin America and Asia and is specialized on the catalytic N_2O destruction in the tail gas of nitric acid plants.

The RWE Group is one of Europe's leading integrated electricity and gas companies. **RWE Power AG** is the continental power generation company within the RWE Group and Germany's biggest power producer. RWE Power has a diverse generation portfolio including lignite, hard coal, nuclear energy, gas and renewable sources such as hydro, wind and biomass. RWE invests and participates actively in projects under the Clean Development Mechanism and Joint Implementation. The RWE team combines a track record in global commodities and emissions trading as well as risk management with broad experience and a deep understanding of specific risks inherent in CDM and JI projects.

Host Country is the Republic of Korea. The Republic of Korea ratified the Kyoto Protocol in November 2002. Subsequent to the registration of the Project, Federal Republic Germany has been added as a Party involved in the Project.

Focal point - The project participants agreed that CARBON CDM Korea Ltd. serves as focal point of communication with the Executive Board and the UNFCCC Secretariat.

A.3. Location of the project activity:

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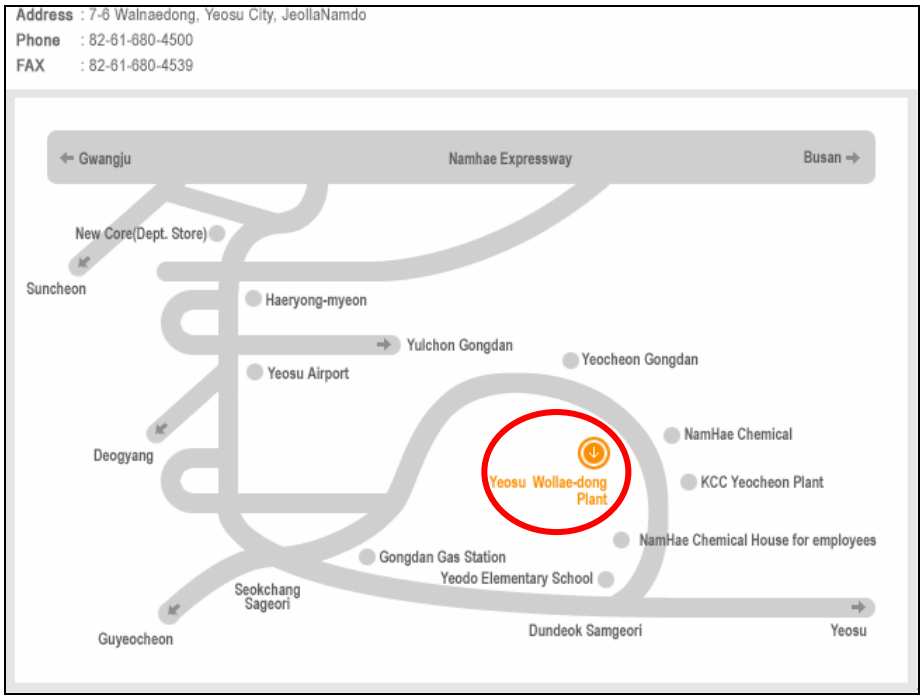
Country: Republic of Korea
Province: Jeollanam-do
Town: Yeosu
GPS coordinates: N34.848686° E127.743198°



The production site of Hu-Chems is located in Yeosu (southern coast of the republic of Korea) in the second biggest industrial complex of Korea consisting of oil, petrochemical, chemical and steel industry.
Hu-Chems is situated on the shores of the Yellow Sea. The company has road and rail access as well as a nearby ship loading terminal.

A.4. Technical description of the project

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General Introduction:

Nitrous oxide (N_2O) is an unwanted, invisible and previously neglected by-product of the manufacture of nitric acid. It is formed alongside the main, desired product nitric oxide (NO) during the catalytic oxidation of ammonia in air over noble metal gauzes. The production of nitric acid takes place in three main process steps as indicated by the following reactions:

1. Ammonia (NH_3) combustion to form nitric oxide (NO)[1]:

   $4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$ (main reaction 1) **(1)**

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

   $4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$ (side reaction 1) **(2)**
   $4\ NH_3 + 4\ O_2 \rightarrow 2\ N_2O + 6\ H_2O$ (side reaction 2) **(3)**

   NO yield mainly depends on pressure and temperature in the ammonia oxidation process and is usually in a range of 95% to 97%.

2. NO is oxidised to nitrogen dioxide (NO_2):

   $2\ NO + O_2 \rightarrow 2\ NO_2$ (main reaction 2) **(4)**

3. (According to the technical process) Absorption of NO_2 in water to form nitric acid (HNO_3):
   $3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$ (main reaction 3) **(5)**
   (NO is oxidised to NO_2 according to main reaction 2)

Description of catalytic reduction process:

[1] Ammonia is reacted with air on noble metal catalyst in the oxidation section of nitric acid plants. Nitric oxide and water are formed in this process according to the above mentioned main equation.

Although the term catalytic reduction nowadays has a more general definition in terms of the transfer of electrons, the following definition is sufficient for present purposes: catalytic reduction of N_2O occurs when reactions take place between N_2O and other substances in contact with a catalyst, such that the oxygen is removed from the N_2O molecule and forms one or more compounds with other species. The substance or substances that react with N_2O to remove oxygen are termed reducing agent. A general reaction equation for the catalytic reduction of N_2O can be given as:

$$n\ N_2O + x\ RA \rightarrow n\ N_2 + y_1\ P(1)O_A + y_2\ P(2)O_B + ...+ z_1\ Q(1) + z_2\ Q(2) + ... \quad \textbf{(6)}$$

where RA is a molecule of the reducing agent, $P(1)O_A$, $P(2)O_B$ are the compound formed by reaction with the oxygen of the N_2O and Q(1), Q(2) represent further products of the oxidation reaction, n, x, y_1, y_2, z_1, z_2 are the appropriate stoichiometric coefficients.

Equations reduction N_2O with propane:

$$C_3H_8 + 7\ N_2O \rightarrow 3\ CO + 4\ H_2O + 7\ N_2 \quad \textbf{(7)}$$

or

$$C_3H_8 + 10\ N_2O \rightarrow 3\ CO_2 + 4\ H_2O + 10\ N_2 \quad \textbf{(8)}$$

The definition does not exclude the possibility of side reactions resulting in consumption of reducing agent without any reduction of N_2O, for example with propane:

$$2\ C_3H_8 + 7\ O_2 \rightarrow 6\ CO + 8\ H_2O \quad \textbf{(9)}$$

or

$$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O \quad \textbf{(10)}$$

Description of catalytic decomposition process:

Catalytic decomposition of N_2O occurs when the N_2O is split into its constituent elements by contact with a catalyst. A catalyst is a material which accelerates the speed of the reaction without itself being transformed or consumed by the reaction.

Overall reaction:

$$2\ N_2O \rightarrow 2\ N_2 + O_2 \quad \textbf{(11)}$$

The products of N_2O decomposition are the substances that result from decomposition reaction (N_2 and O_2)

Project Specific description:

Principles of the EnviNOx® process Hu-Chems II + III:

The EnviNOx® process used in the Hu-Chems II + III nitric acid plants is based on the catalytic reduction of NO_x (NO and NO_2) with ammonia (NH_3) and of nitrous oxide (N_2O) with a hydrocarbon. The hydrocarbon used is propane gas of which the main constituent is propane (C_3H_8). The reactions take place over an iron zeolite catalyst bed.

First the NO_x is reduced with ammonia according to such reactions as:

$$6\ NO_2 + 8\ NH_3 \rightarrow 7\ N_2 + 12\ H_2O \quad \textbf{(12)}$$

$$6\ NO + 4\ NH_3 \rightarrow 5\ N_2 + 6\ H_2O \quad \textbf{(13)}$$

$$NO + NO_2 + 2\ NH_3 \rightarrow 2\ N_2 + 3\ H_2O \quad \textbf{(14)}$$

$$4\ NO + O_2 + 4\ NH_3 \rightarrow 4\ N_2 + 6\ H_2O \quad \textbf{(15)}$$

Effectively all the NOx is removed. Some destruction of N_2O also occurs.

Secondly the nitrous oxide is reduced with hydrocarbons over the iron zeolite according to such reactions as:

$$7\ N_2O + C_3H_8 \rightarrow 7\ N_2 + 4\ H_2O + 3\ CO \quad \textbf{(16)}$$

$$10\ N_2O + C_3H_8 \rightarrow 10\ N_2 + 4\ H_2O + 3\ CO_2 \quad \textbf{(17)}$$

$$5\ O_2 + C_3H_8 \rightarrow 4\ H_2O + 3\ CO_2 \quad \textbf{(18)}$$
$$7\ O_2 + 2\ C_3H_8 \rightarrow 8\ H_2O + 6\ CO \quad \textbf{(19)}$$

Similar reactions take place between nitrous oxide and the small quantities of other hydrocarbons such as butane (C_4H_{10}) that are present in the commercial propane used. N_2O reduction by these reactions is much more effective when NO_x is absent.

A large proportion of the carbon monoxide that is formed is further oxidised to carbon dioxide over a second EnviCat®-CO / CH catalyst installed in the EnviNOx® reactor downstream of the first catalyst:

$$2\ CO + O_2 \rightarrow 2\ CO_2 \quad \textbf{(20)}$$

All the above reactions are exothermic and cause a temperature rise over the EnviNOx® reactor. Compared with the reduction in greenhouse gas emission achieved by the destruction of N_2O the additional greenhouse gas emissions (CO_2) caused by the use of hydrocarbons in the process are insignificant but are monitored.

Principles of the EnviNOx® process Hu-Chems IV:

The EnviNOx® process used in the Hu-Chems IV nitric acid plant is based on the catalytic decomposition of nitrous oxide (N_2O) and the catalytic reduction of NO_x (NO and NO_2) with ammonia (NH_3). This process works very well at temperatures above about 425°C. The reactions take place over two iron zeolite catalyst beds.

In the first bed N_2O is catalytically decomposed into its elements:

$$2\ N_2O \rightarrow 2\ N_2 + O_2 \quad \textbf{(21)}$$

This rate of this reaction is enhanced by high concentrations of NO_X.

Before the tail gas enters the second catalyst bed, a small quantity of ammonia vapour is added. In the second bed a large part of the NO_x is reduced with ammonia according to such reactions as:

$$6\ NO_2 + 8\ NH_3 \rightarrow 7\ N_2 + 12\ H_2O \quad \textbf{(22)}$$
$$6\ NO + 4\ NH_3 \rightarrow 5\ N_2 + 6\ H_2O \quad \textbf{(23)}$$
$$NO + NO_2 + 2\ NH_3 \rightarrow 2\ N_2 + 3\ H_2O \quad \textbf{(24)}$$
$$4\ NO + O_2 + 4\ NH_3 \rightarrow 4\ N_2 + 6\ H_2O \quad \textbf{(25)}$$

Some further destruction of N_2O also occurs. All the above reactions are exothermic and cause a temperature rise over the EnviNOx® reactor. The consumption of ammonia corresponds to the stoichiometric ratio given in the reaction equations above and does not differ significantly from the consumption of a conventional DeNOx unit.

Technology employed by the project activity:

In this project, CARBON CDM Korea installed three EnviNOx® systems for catalytic reduction and decomposition of NOx and N_2O additionally to the equipment at the three nitric acid manufacturing plants. The project activity reduces the GHG emissions, which would otherwise be released to the atmosphere, if the project was not implemented. The implementation of the N_2O destruction project at Hu-Chems II and Hu-Chems III involves that propane is employed as a reducing agent for N_2O removal.

Location of the EnviNOx®-Systems:

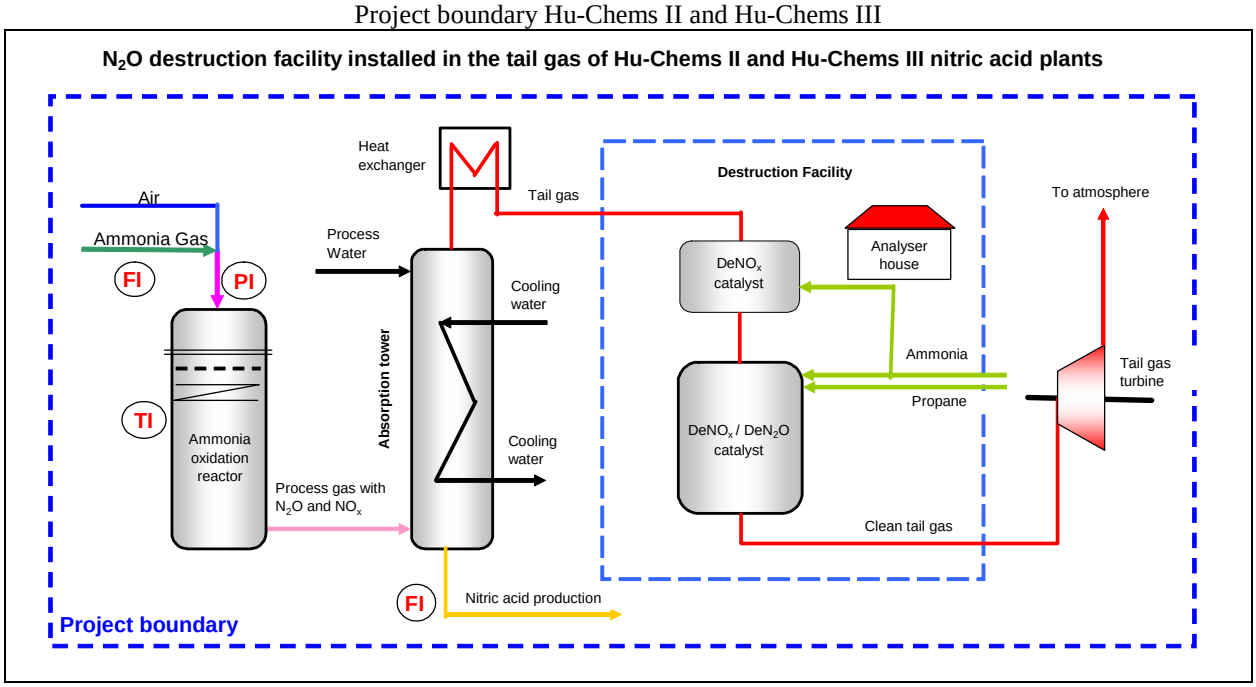
Hu-Chems II: The new EnviNOx® reactor (322-R-202) is located between the existing SCR DeNOx reactor (322-R-201) and the tail gas turbine (322-C-201-T2) which is the position with the highest tail gas temperature in the nitric acid production process at Hu-Chems II.

Hu-Chems III: The new EnviNOx® reactor (323-R-302) is located between the existing SCR DeNOx reactor (323-R-301) and the tail gas turbine (323-C-301-T2) of Hu-Chems III which is the position with the highest tail gas temperature in the nitric acid production process at Hu-Chems III.

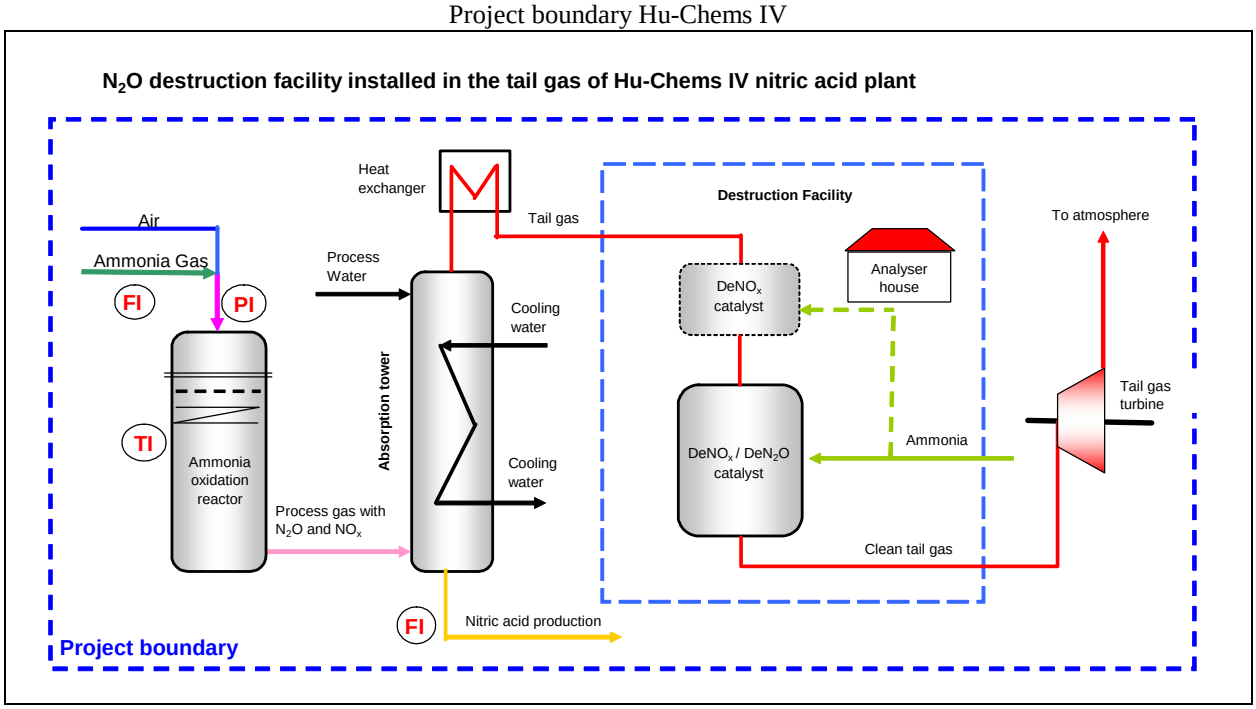
Hu-Chems IV: The new EnviNOx® reactor (324-R-402) is located upstream of the tail gas turbine (324-C-401-T2) at the position with the highest tail gas temperature in the nitric acid production process at Hu-Chems IV. The priorly operational SCR DeNOx reactor has been de-commissioned.

The following figures show the spatial extent of the project boundary:

Project boundary Hu-Chems II and Hu-Chems III



Project boundary Hu-Chems IV



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

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Applied Baseline methodology:
AM0028, Version 1: "Catalytic N_2O destruction in the tail gas of Nitric Acid Plants"; submitted by Carbon Projektentwicklung GmbH

Applied Monitoring methodology:
AM0028, Version 1: "Catalytic N_2O destruction in the tail gas of Nitric Acid Plants"; submitted by Carbon Projektentwicklung GmbH

A.6. Registration date of the project activity:

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22/01/2007 (CDM Reference Number: 0765)

Title of the project activity according to the PDD: "Catalytic N_2O destruction project in the tail gas of three Nitric Acid Plants at Hu-Chems Fine Chemical Corp."

Date of Completion of PDD: 22/07/2006 (PDD Version 2)

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

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Starting date of the first crediting period:	22/01/2007
End date of the first crediting period:	21/01/2014
Length of the first crediting period:	7 years (renewable)

Dates regarding first crediting period were changed from:

Expected starting date of first crediting period:	15/12/2006
Expected end date of first crediting period:	14/12/2013

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

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Responsible for completing the CDM-MR:

On behalf of CARBON CDM Korea Ltd.		
Name	Andreas Rammelmüller	Franz Zaiser
Position	Project Manager	Project Assistant
Email	rammelmueller@carbon-austria.com	zaiser@carbon-austria.com
Phone Number	+43 2734 322 70	+43 2734 322 70

Supervision:

CARBON Austria	
Name	Gerald Dunkel
Position	JI/CDM Director
Email	dunkel@carbon-austria.com
Phone Number	+43 2734 322 70

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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1. Project implementation status and operational status

The operation of the projected activity started in the beginning of January 2007 at Hu-Chems IV and in the end of March 2007 at Hu-Chems II and Hu-Chems III. The project has been implemented and is operated as per the registered PDD with all physical features (technology, project equipment, and monitoring and metering equipment) in place, monitoring is done according to the registered monitoring plan (as per the revision approved by the CDM EB on 18/03/2010).

2. Actual operation of the Project Activity during the covered monitoring period

Downtimes & Campaigns of the Nitric Acid Plants

During the below mentioned periods, the Nitric Acid Plants were out of operation due to the given reasons.

Downtimes of the nitric acid plants

Nitric Acid Plant downtimes					
Plant	**Downtime - Start**		**Downtime - End**		**Downtime Reason**
Plant II	**Date**	**Time**	**Date**	**Time**	**Description**
II	19.07.2010	21:00	22.07.2010	02:00	Catalyst exchange
Plant III	**Date**	**Time**	**Date**	**Time**	**Description**
III	19.08.2010	03:00	20.08.2010	02:00	Catalyst exchange
III	22.08.2010	22:00	23.08.2010	13:00	Programmable Logic Control (PLC) Maintenance
III	26.08.2010	04:00	27.08.2010	03:00	PLC Maintenance
III	29.08.2010	19:00	30.08.2010	02:00	PLC Maintenance
III	13.09.2010	02:00	17.09.2010	00:00	General Plant Maintenance works
Plant IV	**Date**	**Time**	**Date**	**Time**	**Description**
IV	09.07.2010	04:00	09.07.2010	15:00	Plant instrumental maintenance works

Summary on catalyst gauze campaigns

Nitric Acid plant	**Hu-Chems II**	**Hu-Chems III**	**Hu-Chems IV**
Duration of campaign 1 (=campaign operative at the beginning of the monitoring period)	**Campaign start:** 08/04/2010 **Campaign end:** 21/07/2010	**Campaign start:** 17/05/2010 **Campaign end:** 19/08/2010	**Campaign start:** 04/05/2010 **Campaign end:** Ongoing at the end of the Monitoring Period
Duration of campaign 2 (applicable, if new campaign started during monitoring period)	**Campaign start:** 21/07/2010 **Campaign end:** Ongoing at the end of the Monitoring Period	**Campaign start:** 19/08/2010 **Campaign end:** Ongoing at the end of the Monitoring Period	-

The table above displays the starting dates and end dates of the ammonia oxidation catalyst gauze campaigns of a nitric acid plant. Campaigns start when new gauzes are installed and end, when the gauzes are removed and new gauzes are installed again.

Downtimes of EnviNOx® Systems

During the below mentioned periods, the EnviNOx® Systems were out of operation due to the given reasons. No Emission Reduction is claimed during these downtimes.

Downtimes of the EnviNOx® Systems

EnviNOx® System downtimes					
Plant	**Downtime - Start**		**Downtime - End**		**Downtime Reason**
Plant II	**Date**	**Time**	**Date**	**Time**	**Description**
II	19.07.2010	21:00	22.07.2010	06:00	Shutdown of NA Plant (Catalyst exchange)
Plant III	**Date**	**Time**	**Date**	**Time**	**Description**
III	18.08.2010	22:00	20.08.2010	04:00	Shutdown of NA Plant (Catalyst exchange)
III	22.08.2010	22:00	23.08.2010	18:00	Shutdown of NA Plant (PLC Maintenance)
III	26.08.2010	04:00	27.08.2010	06:00	Shutdown of NA Plant (PLC Maintenance)
III	29.08.2010	19:00	30.08.2010	06:00	Shutdown of NA Plant (PLC Maintenance)
III	12.09.2010	20:00	17.09.2010	01:00	Shutdown of NA Plant (Maintenance work)
Plant IV	**Date**	**Time**	**Date**	**Time**	**Description**
IV	09.07.2010	04:00	09.07.2010	16:00	Shutdown of NA Plant (Plant maintenance works)

Observations during the monitoring period relevant calculation of ER

During the below mentioned periods, observations related to the operation of the EnviNOx® system and the AMS have been made.

EnviNOx® System at Nitric Acid Plant #3

The tail gas flow is measured by means of venturi tube method, whereas two independent and redundant measurement sets (i.e. consisting of differential pressure, pressure and temperature transmitters) are installed. On 02/09/2010, the pressure transmitter of the second tail gas measurement (323-PT-3-3134) malfunctioned, hence standard volume flow was incorrectly determined until the shut-down on 12/09/2010. A working and calibrated pressure transmitter was newly installed during the shut-down period on 15/09/2010, resulting in correct measurements again. During the whole event period, values from the correctly working first tail gas flow measurement were applied for calculation of emission reductions.

Other observations during the monitoring period

Regular health check and inspection visit services related (see “Calibration and Maintenance” below and section C – 3) have been conducted by Emerson Process Management Korea in July 2010, August 2010 and September 2010 and attest good condition and availability of the whole system (i.e. Sampling sytem, analysers as well as AMS hard- and software).

General maintenance and calibration services (see “Calibration and Maintenance” below and section C – 3) have been conducted for plant III in September and attest good condition and calibrations of all instruments (see details in section D – 2).

Reports of all conducted services are made available to the DOE for verification.

Calibration and Maintenance

All measuring and analytical instruments are being calibrated as defined in the Approved Methodology AM0028 and the monitoring plan in its present version (revision approved by the CDM EB on 18/03/2010). The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures, and form an integral part of the systems and procedures of HU-CHEMS. QA/QC of monitoring equipments is in full compliance with the monitoring methodology and the monitoring plan of the registered PDD in its present version (revision approved by the CDM EB on 18/03/2010). Records of conducted maintenance activities are available and submitted to the DOE for verification.

As pointed out in section C - 3 Carbon CDM Korea has contracted Emerson Process Management Korea to execute monthly on-site **Health Checks** and quarterly on-site **Inspection Visits**. System components, sampling system, measurement devices and the automated monitoring system required for the monitoring of the CDM project are covered by these contracts. Service reports of conducted health checks, inspection visits and further maintenance activities and checks, respectively are available and submitted to the DOE for verification.

Instrument calibration and maintenance scheme is performed according to Hu-Chems quality management procedures. Maintenance procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures. Carbon CDM Korea has mandated Emerson Process Management Korea to execute additional **regular calibration services** and **regular general maintenance services** to safeguard accuracy and availability of all monitoring instruments related to the CDM Project.

3. Situations with impact on the applicability of the methodology

No such situations occurred during the covered monitoring period.

B.2. Revision of the monitoring plan

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Upon a request by the CDM EB, a revision of the monitoring has been requested in November 2009 and has been approved by the CDM EB on the 18/03/2010. Monitoring of the project is done according to the monitoring plan in its present version.

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

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No deviation has applied to this monitoring period.

B.4. Notification or request of approval of changes

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No notification or requeste of approval of changes from the project activity as described in the registered CDM PDD applies to this monitoring period or has been done in past monitoring periods.

SECTION C. Description of the monitoring system

1. Information flow

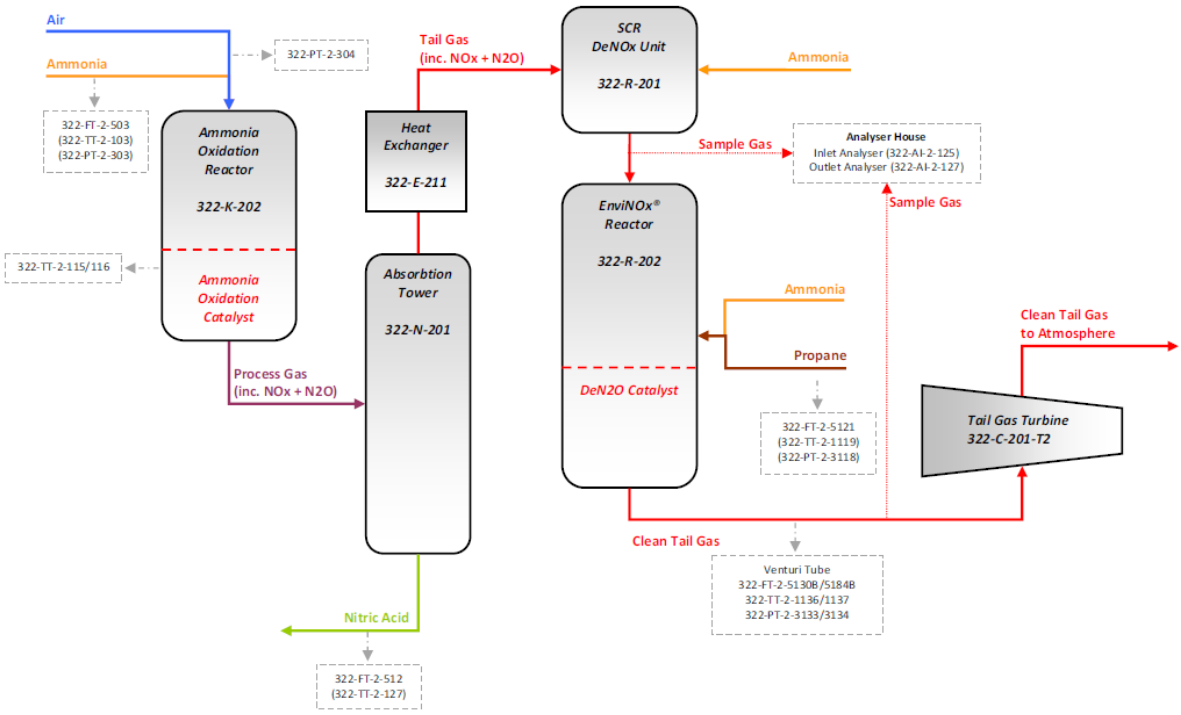
The instruments transmitters continuously provide a 4 - 20 mA analogue signal according to range and units configured. These signals are transmitted to I/O cards (analogue input/output cards) and collected by the DeltaV Processor. Resulting digital values are made available in the network to be further processed (e.g. in controller blocks, calculation of other variables) and stored uncompressed in the protected continuous historian server (CHS) continuously.

Following calculations, relevant for the calculation of emission reductions, are already conducted on a continuous basis and also stored as data in the CHS:

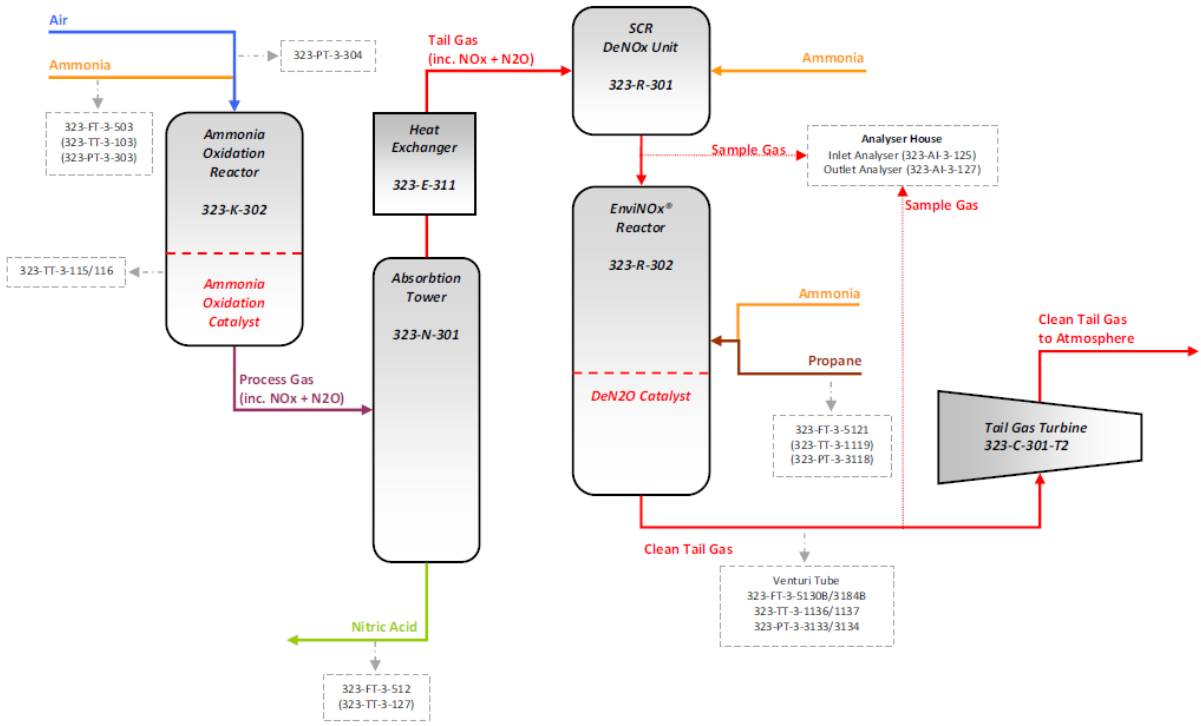
- Conversion of volume flows (Tail gas, Propane, Ammonia to AOR) into standard conditions (based on temperature and pressure measurement)
- N2O at the inlet and outlet of the destruction facility (QI_N2O and PE_N2O)

Modifications of the Delta V, which are protected by security levels by the supplier, are tracked by a Version Control Tool.

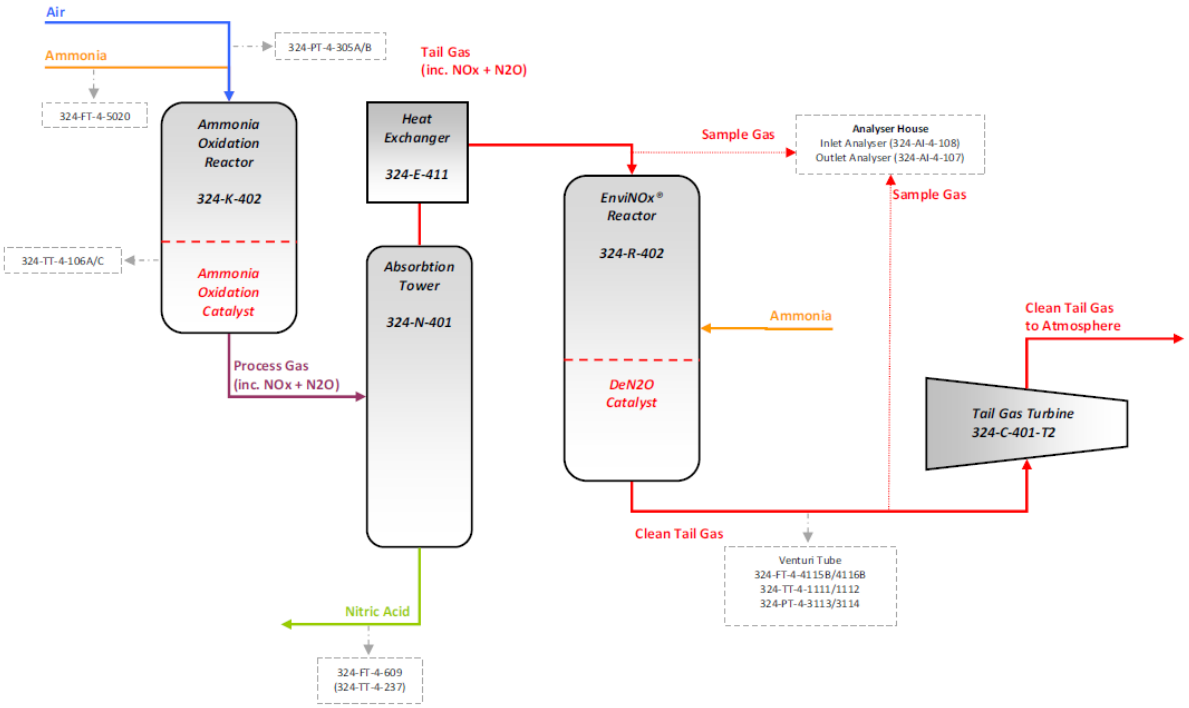
Line-Diagram including the location of the monitoring instruments / Hu-Chems II



Line-Diagram including the location of the monitoring instruments / Hu-Chems III



Line-Diagram including the location of the monitoring instruments / Hu-Chems IV



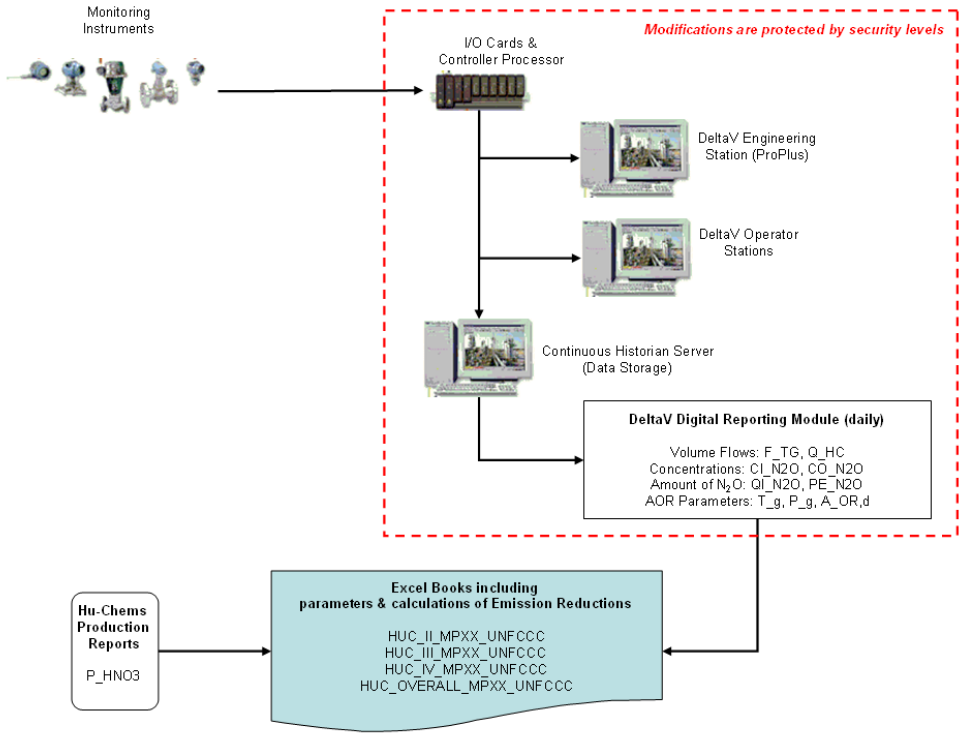
The reporting module of the DeltaV system automatically generates aggregated daily reports based on the stored raw data from the continuous historian server, including totals (flows) and averages (concentrations). Daily reports contain following kinds of data (separately for each plant):

- Concentrations of N_2O at the inlet and outlet of the EnviNOx® systems (CI_N2O, CO_N2O)
- Volume Flows (F_TG; Q_HC)
- Amount of N_2O at the inlet and outlet of the EnviNOx® systems (QI_N2O, PE_N2O)
- Operating parameters of the nitric acid plant (T_g, P_g, A_OR,d)

Relevant parameters as above (Concentrations, Volume Flows, Amounts of N_2O, Operating parameters of the nitric acid plant) are exported from the digitally available daily reports to excel sheets (separately for each plant) for presentation of required parameters and calculation of baseline emissions (BE, BE_N2O, SE_N2O), project emissions (PE, PE_ND, PE_DF, PE_HC, HCE_C), and emission reductions (ER) according to the formulae as required per the methodology and the PDD. Daily production of nitric acid plant is obtained from Hu-Chems daily production reports and transferred to these excel sheets (Please see *Annex 2* (Excel books)).

The above methods apply to all three nitric acid plants and EnviNOx® systems.

Information flow diagram



This approach and all implemented formulas in the Delta V system fully comply with the approved Monitoring Methodology AM0028 Version 1 “Catalytic N_2O destruction in the tail gas of Nitric Acid Plants”, the registered PDD and the Monitoring Plan (in its present version as approved on 18/03/2010 by the CDM EB). The above methods apply to all three nitric acid plants and EnviNOx® systems.

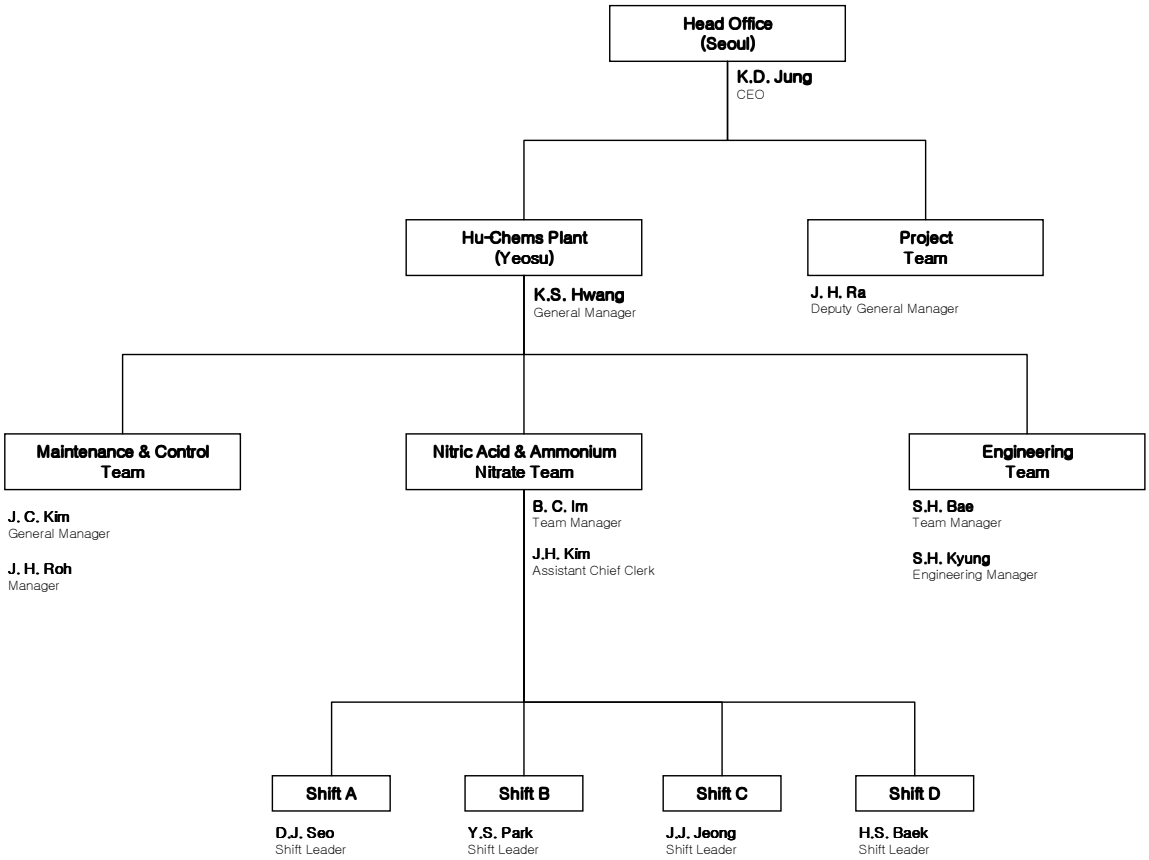
2. Roles and responsibilities of personnel

Project Operator is Hu-Chems Fine Chemical Corp. (HU-CHEMS). HU-CHEMS operates several production units which produce fine chemical products. HU-CHEMS is ISO 9001 and 14001 certified and received the Korean safety and health management system certificate (KGS18001 & OHSAS18001). The company has received the Grand Prize of Korea Valuable Management Award in 2005, the President of Korea's medal in an Energy Saving Promote Contest as well as the Korean Marketing Best Award (KMAC) in 2004 as well as other awards.

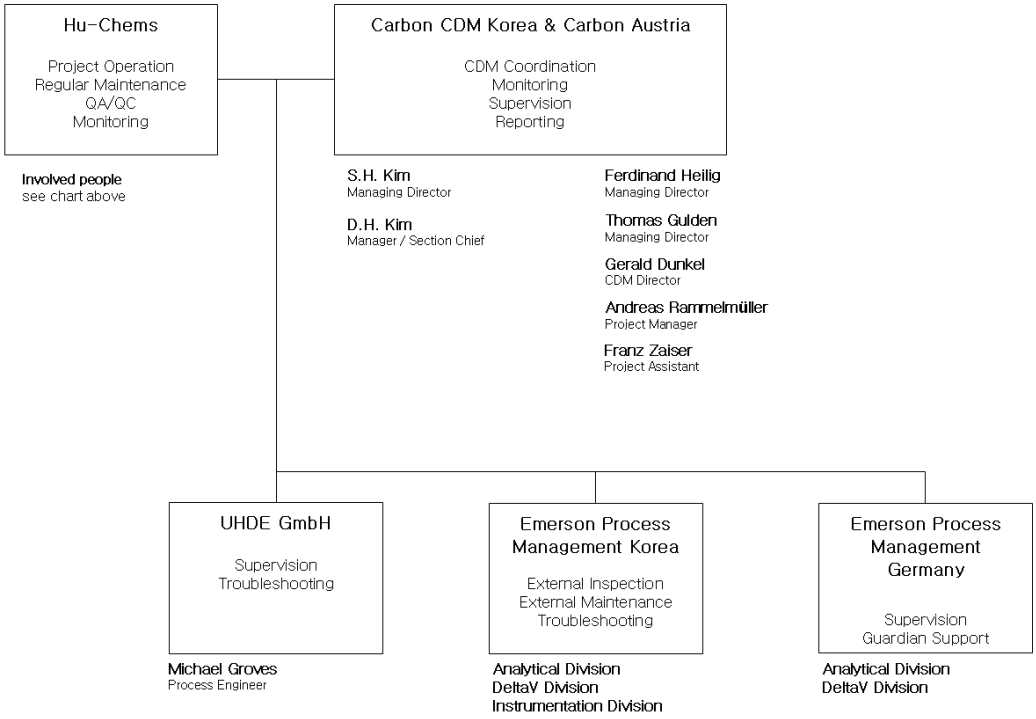
The operating and maintenance personal of the EnviNOx® system have been trained by the technology provider UHDE and the supplier of the digital process control system (Delta V, M/s. process management), further Hu-Chems has established internal training plans on the CDM procedures, operation of the EnviNOx® system and the monitoring system to train staffs who are assigned to the project during the crediting period. Training records are available and submitted to the DOE for verification.

Carbon CDM Korea is responsible for reporting of data under the CDM Project. In terms of performing general supervision and cross-checks of monitoring and reporting data Carbon Austria supports Carbon CDM Korea. Carbon Austria gives their final approval on the supporting documents as well as the CDM-MR before submitting to the respective DOE for quarterly verification.

Hu-Chems Organisational & Responsibility Diagram



CDM Project: Involved entities & Project responsibilities



3. Back up plans / Emergency procedures for monitoring system

Back Up Plans for measuring systems / Periodically observation of the automated monitoring system

EnviNOx® – Automatic DCS system:

The EnviNOx® systems are designed for automatic operation, so that activities by the operation personnel are not required during normal operation. However, all alarms and any action taken by the operating personnel (events) are automatically logged at the computer station (Alarm & Event List) of the DCS system. All log sheets for **Alarm & Events** are exported and therefore digital available (Excel Files) and can be analysed and evaluated.

Malfunction of system components is indicated on the operator console in the control room as an alarm. Occurrence of such an alarm requires the operator to immediately take measures to remedy the problem. This is done by informing Hu-Chems instrument department and Carbon CDM Korea. It is then deciding whether the problem can be fixed immediately by themselves, or whether external support from Emerson Korea/Emerson Germany/Uhde is required.

Back Up – Regular on-site inspection:

In addition to the automatic error indication by the automatic DCS system, the project operator Hu-Chems is carrying out visual **on-site analyser cabinet inspections** as well as related installations on a shift basis (3 times daily). Relevant data related to the analysers and sampling system are logged on the ISO Document HCSEF-448-1 “CDM Analyzer/Reactor Check List”. Actions are defined in case of abnormal observations.

Further, Hu-Chems is carrying out a **visual on-site check of the EnviNOx® reactor and tail gas line** as well as related installations once per day. Relevant data are logged on the ISO Document HCSEF-448-1 “CDM Analyzer/Reactor Check List”. Actions are defined in case of abnormal observations.

Back Up – System support & Preventive maintenance: DeltaV

The DeltaV automatic measuring system (AMS) used for plant operation & CDM Monitoring was designed by the company Emerson, the overall supplier of components related to the monitoring system.

In order to ensure maximum availability of the DeltaV automatic measuring system and to prevent deficient handling of data, Carbon CDM Korea has contracted Emerson Process Management Korea to execute **monthly** on-site **Health Checks** and **quarterly** on-site **Inspection Visits**. Furthermore a **24 hours emergency service** and the **24 hours DeltaV Guardian Support** are covered by the contract. The contracted services comprise error diagnostics, measures for system stability, updates as well as preventive maintenance for the DeltaV System and related technical components. The contract was coming into force after the start-up period of the project activity. Health check reports and inspection visit reports are available and submitted to the DOE for verification.

Back Up – Support & Preventive maintenance: EnviNOx®-System/Analysers,Instruments
The instruments for CDM Monitoring (i.e. Sampling system and the continuously measuring non-dispersive-infrared (NDIR) analysers used for N_2O detection as well as further instruments) were designed and supplied by the company Emerson Process Management, the general supplier of components related to the monitoring system.

In order to enable high levels of availability and accuracy of instruments, Carbon CDM Korea has contracted Emerson Process Management Korea to execute **monthly** on-site **Health Checks** and **quarterly** on-site **Inspection Visits**. Furthermore a **24 hours emergency service** is covered by the contract. The contracted regular, services comprise error diagnostics of analysers, component updates of the analysers and the sampling system, in-depth inspections of analysers and the sampling system as well as preventive maintenance services for the analysers, the sampling system and technical components/instruments of the CDM Monitoring System. The contract was coming into force after the start-up period of the project activity. Exception handling for CDM Monitoring Instruments is covered by the 24 hours emergency service with guaranteed short-term on-site availability of Emerson experts. Health check reports and inspection visit reports are available and submitted to the DOE for verification.

Supervision is done based on the daily reports by the technology provider Uhde and Emerson.

Back Up – Calibration and General Maintenance: Instruments
In order to safeguard availability and accuracy of instruments, Carbon CDM Korea has contracted Emerson Process Management Korea to execute **regular general calibration services** and **regular general maintenance services** for all related monitoring instruments on a regular basis (adopted to the shut-down and maintenance schedule of the nitric acid plants and adopted to plant requirements). The service inter alia consists, besides calibrations, of hardware and connection maintenance as well as software checks and error diagnostics. Service reports of performed services are submitted to the DOE for verification.

Back Up – On-site spare part stock:
As further important contribution to the availability of the monitoring system (e.g. in the event of failure of the measuring equipment), Hu-Chems stores a comprehensive range of spare parts at the project site. The types and amount of stored spare parts meet the recommendations of the supplier. The majority of spare part types are re-purchased after consumption, some other spare part types are re-purchased after their stock has reached a defined reorder level, in both cases Hu-Chems is following the recommendation of the supplier.
The spare part stock includes inter alia filter elements, valves and pressure controllers for the sample handling system and filter elements, analysis cells (crucial part for analyzers), flow sensors and several electrical parts for the analyzers. An overview on available parts is made available to the DOE for verification.

Back Up – Certified standard gases
Pressure levels of standard gases used for the regular, automatic calibration of the inlet and outlet analysers are constantly monitored during the regular on-site inspection. Spare bottles of test gases are purchased in proper time. Specifications and certification of test gases are made available to the DOE for verification.

Back Up – Procedures:
In addition to the quality control and quality assurance procedures according to the Hu-Chems quality management system and in order to avoid possible failures of the automated monitoring system, procedures are implemented for the project activity. The approach by Carbon CDM Korea was to ensure immediate response to such special events in the system.

The following table summarizes the periodical observations of the AMS.

Periodical observation of the AMS

Organization	Action	Frequency	Output
DeltaV	Events & Alarm List	Continuously	Txt-files, Excel files
Hu-Chems	Shift Inspection	3 times per day	Protocol/Check List
Hu-Chems	Daily Inspection	Daily	Protocol/Check List
Emerson Process Management Korea (EPMK)	Health check of AMS System (Hardware & Software)	Monthly	Health Check Report
EPMK	Health Check of Sampling & Analyser system	Monthly	Health Check Report
EPMK	Inspection check of AMS System (Hardware & Software)	Quarterly	Inspection Check Report
EPMK	Inspection check of Sampling & Analyser system	Quarterly	Inspection Report
EPMK	General Maintenance & Calibration Service of instruments	Regularly, adopted to shut-down schedule of plants	Service Reports & Calibration records
UHDE	Supervision	Continuously	Plausibility Check

All resulting documents are analysed and evaluated by Carbon CDM Korea under supervision of Carbon Austria. In case of any upcoming problem or failure of the EnviNOx® system and/or the automated monitoring system Carbon CDM Korea immediately takes measure to remedy the problem. The provider of the automated monitoring system is available 24 hours a day via Hotline. Furthermore Emerson Korea is committed to be onsite within 24 hours.

4. Systematic measures for QA for monitoring data during AMS down times

In order to ensure data quality, back up plans (see above) are in place. In case of (scheduled or unscheduled) AMS down times, demonstration of normal plant operation and estimation of emission reductions are conducted according to the PDD. The procedure how to determine the Emissions Reductions during AMS down times and to ensure suitability and conservativeness is a multi-step approach. Related data and documents are provided to the DOE for verification, if applicable in the covered monitoring period:

(1) Demonstration, that Nitric Acid plant is under normal operation
Suitable operating parameters are provided, in order to demonstrate that the nitric acid plant is operating under normal conditions.

(2) Demonstration, that EnviNO_X® system is under normal operation
Suitable operating parameters are provided, in order to demonstrate that the EnviNO_X® system is operating under normal conditions.

(3) Correlation method

The systematic estimation of a missing parameter is based on correlation methods applying available relevant parameters historically maximally correlating with the missing parameter (e.g. efficiency of the EnviNO_X® system; the flow of N_2O reducing agent to the reactor; the tail gas volume flow, N_2O concentration etc.).

(4) Conservativeness check

Additional conservativeness is ensured by considering limiting values when determining the missing parameter. Such are based upon an observation period of 24 hours prior and 24 hours after the AMS downtime. Project emission parameters are limited to the observed maximum value in the observation period (and can not fall below this value), baseline emission parameters are limited to the observed minimum value in the observation period (and can not rise above this value). Given a positive outcome of step (1) and step (2), a 24 hours cycle duly represent regular operation and values are deemed representative.

(5) Recalculation

Determination of emission reductions for hours during AMS downtimes is based on the result of step (3) and step (4) in a conservative way.

This multi-step approach guarantees a conservative estimation of Emissions Reductions during AMS downtimes.

In the covered monitoring period, no such AMS downtime occurred.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data and parameter not monitored for Hu-Chems II

Data / Parameter:	**EF_HC,II**
Data unit:	tCO_2e/t
Description:	Hydrocarbon CO_2 emission factor Hu-Chems II
Source of data used:	According to the PDD
Value(s) :	**3.0 tCO_2e/tPropane**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	The hydrocarbon CO_2 emission factor is given by the molecular weights and the chemical reaction when hydrocarbons are converted.

Data / Parameter:	**OXID_HC,II**
Data unit:	%
Description:	Hydrocarbon oxidation factor Hu-Chems II
Source of data used:	Value is not monitored, instead conservative option according to AM0028v1 (complete conversion of hydrocarbon to CO_2) is applied per default.
Value(s) :	**100%**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	Applied assumption of full conversion (OXID_HC = 100%) of hydrocarbon (Propane) to CO_2 leads to maximum theoretical project emissions possible in the emission reduction calculation (Conservative approach).

Data / Parameter:	**Type_HC,II**
Data unit:	-
Description:	Type of hydrocarbon used in Hu-Chems II
Source of data used:	According to the PDD
Value(s) :	**Propane**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	-

Data / Parameter:	**P_HNO3,hist,II**
Data unit:	$tHNO_3$
Description:	Design capacity of Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**116,800 $tHNO_3$**
Indicate what the data are used for (Baseline/ Project/	Baseline emission calculations

Leakage emission calculations)	
Additional comment:	-

Data / Parameter:	**T_g,hist,II**
Data unit:	°C
Description:	Historical operating temperature of the ammonia oxidation reactor Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**880 – 910 °C**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**P_g,hist,II**
Data unit:	barg
Description:	Historical operating pressure of the ammonia oxidation reactor Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**5.0 – 9.8 barg**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_sup,hist,II**
Data unit:	-
Description:	Historical supplier of the ammonia oxidation catalyst Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**Johnson Matthey** and/or **Umicore**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_com,hist,II**
Data unit:	%
Description:	Historical composition of the ammonia oxidation catalyst Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**90% Pt** **5% Rh** **5% Pd**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**A_OR,hist,II**
Data unit:	tNH_3/d

Description:	Max. historical ammonia flow rate to the ammonia oxidation reactor Hu-Chems II
Source of data used:	According to PDD
Value(s) :	**91.82 tNH_3/d**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data and parameter not monitored for Hu-Chems III

Data / Parameter:	**EF_HC,III**
Data unit:	tCO_2e/t
Description:	Hydrocarbon CO_2 emission factor Hu-Chems III
Source of data used:	According to the PDD
Value(s) :	**3.0 tCO_2e/tPropane**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	The hydrocarbon CO_2 emission factor is given by the molecular weights and the chemical reaction when hydrocarbons are converted.

Data / Parameter:	**OXID_HC,III**
Data unit:	%
Description:	Hydrocarbon oxidation factor Hu-Chems III
Source of data used:	Value is not monitored, instead conservative option according to AM0028v1 (complete conversion of hydrocarbon to CO_2) is applied per default.
Value(s) :	**100%**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	Applied assumption of full conversion (OXID_HC = 100%) of hydrocarbon (Propane) to CO_2 leads to maximum theoretical project emissions possible in the emission reduction calculation (Conservative approach).

Data / Parameter:	**Type_HC,III**
Data unit:	-
Description:	Type of hydrocarbon used in Hu-Chems III
Source of data used:	According to the PDD
Value(s) :	**Propane**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Additional comment:	-

Data / Parameter:	**P_HNO3,hist,III**
Data unit:	$tHNO_3$
Description:	Design capacity of Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**116,800 $tHNO_3$**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**T_g,hist,III**
Data unit:	°C

Description:	Historical operating temperature of the ammonia oxidation reactor Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**880 – 910 °C**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**P_g,hist,III**
Data unit:	barg
Description:	Historical operating pressure of the ammonia oxidation reactor Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**5.0 – 9.8 barg**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_sup,hist,III**
Data unit:	-
Description:	Historical supplier of the ammonia oxidation catalyst Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**Johnson Matthey** and/or **Umicore**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_com,hist,III**
Data unit:	%
Description:	Historical composition of the ammonia oxidation catalyst Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**90% Pt** **5% Rh** **5% Pd**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**A_OR,hist,III**
Data unit:	tNH_3/d
Description:	Max. historical ammonia flow rate to the ammonia oxidation reactor Hu-Chems III
Source of data used:	According to PDD
Value(s) :	**92.57 tNH_3/d**
Indicate what the data are	Baseline emission calculations

used for (Baseline/ Project/ Leakage emission calculations)	
Additional comment:	-

Data and parameter not monitored for Hu-Chems IV

Data / Parameter:	**P_HNO3,hist,IV**
Data unit:	$tHNO_3$
Description:	Design capacity of Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**467,200 $tHNO_3$**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**T_g,hist,IV**
Data unit:	°C
Description:	Historical operating temperature of the ammonia oxidation reactor Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**860 – 910 °C**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**P_g,hist,IV**
Data unit:	barg
Description:	Historical operating pressure of the ammonia oxidation reactor Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**2.2 barg – 4.4 barg**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_sup,hist,IV**
Data unit:	-
Description:	Historical supplier of the ammonia oxidation catalyst Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**Johnson Matthey** and/or **Umicore**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**G_com,hist,IV**
Data unit:	%
Description:	Historical composition of the ammonia oxidation catalyst Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**95% Pt**

	5% Rh and / or **92% Pt** **8% Rh**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

Data / Parameter:	**A_OR,hist,IV**
Data unit:	tNH_3/d
Description:	Max. historical ammonia flow rate to the ammonia oxidation reactor Hu-Chems IV
Source of data used:	According to PDD
Value(s) :	**355.50 tNH_3/d**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Additional comment:	-

D.2. Data and parameters monitored

A comprehensive overview on monitoring data, calculations and calculation methods for the monitoring period is provided in *Annex 2* (Excel books) of this monitoring report.

Data and parameter monitored relevant for all plants (Hu-Chems II, Hu-chems III and Hu-Chems IV)

Data / Parameter:	**PE_y**
Data unit:	tCO_2e
Description:	Project emissions
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**9,757 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_ND,y**
Data unit:	tCO_2e
Description:	Project emissions from N_2O not destroyed
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**9,310 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial	-

number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_DF,y**
Data unit:	tCO_2e
Description:	Project emissions from destruction facility
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**447 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**BE_y**
Data unit:	tCO_2e
Description:	Baseline emissions
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**404,951 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**REG_NOx**
Data unit:	$tNOx/m^3$
Description:	National regulation on NO_x emissions
Measured /Calculated /Default:	-
Source of data:	National regulations
Value(s) of monitored parameter:	**200 ppmv** National regulation provide limits in ppmv, thus ppmv is used as data unit. The clean air conservation act (year 1990) limits NOx emissions at nitric acid plants at 200 ppmv. NO_x emissions are measured at the outlet of the EnviNOx® systems. The continuous measurement of the NO_x concentration reports the following average concentrations over the monitoring period. • Hu-Chems II: 5.0 ppmv • Hu-Chems III: 3.2 ppmv • Hu-Chems IV: 24.7 ppmv Hence, emissions of NOx are well below the allowed limits.
Indicate what the data are used for (Baseline/Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Date of regulation
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**QR_N2O,y** **RSE_N2O,y** **CR_N2O**

Data unit:	tN_2O $tN_2O/t\ HNO_3$ tN_2O/m^3
Description:	National regulation on N_2O emissions
Measured /Calculated /Default:	Actual no regulations on N_2O emissions are in place
Source of data:	National legislation
Value(s) of monitored parameter:	Actual no regulations on N_2O emissions are in place, therefore **no regulation is applicable**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Date of regulation
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data and parameter monitored Hu-Chems II:

Data / Parameter:	**PE_y,II**
Data unit:	tCO_2e
Description:	Project emissions Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**3,430 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_ND,II**
Data unit:	tCO_2e
Description:	Project emissions from N_2O not destroyed Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**3,207 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is

	attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_DF,II**
Data unit:	tCO_2e
Description:	Project emissions from destruction facility Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**223 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_N_2O,II**
Data unit:	tN_2O
Description:	N_2O not destroyed by facility Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**10.34 tN_2O** An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-

Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**F_TG,II**
Data unit:	Nm^3/h
Description:	Volume flow tail gas at N_2O destruction facility interval i Hu-Chems II
Measured /Calculated /Default:	Measured
Source of data:	Flow meter (Please refer to monitoring equipment below; Flow metering system automatically records volume flow adjusted to standard temperature and pressure) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**83,413,920 Nm^3** **(38,779 Nm^3/h)** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Venturi tube, designed and manufactured in accordance with ISO 5167-4:2003 Meter location: Located in the tail gas line, downstream of the $EnviNO_X$® reactor (322-R-202). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-FT-2-5130B/5184B** Type: Differential pressure transmitters Accuracy class: ± 0.1% of span Serial numbers: 01990156/01990157 Calibration frequency: 24 months Date of last calibration: 15/06/2010 Validity: 14/06/2012 **322-TT-2-1136/1137** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial numbers: 01990158/ 01990159 Calibration frequency: 24 months Date of last calibration: 15/06/2010 Validity: 14/06/2012

	322-PT-2-3133/3134 Type: Pressure transmitters Accuracy class: ± 0.1% of span Serial numbers: 5435394/5435395 Calibration frequency: 24 months Date of last calibration: 15/06/2010 Validity: 14/06/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility check of measured values is regularly done with recorded values of the redundantly installed instruments.

Data / Parameter:	**CO_N2O,II**
Data unit:	tN_2O/ Nm^3
Description:	N_2O concentration at destruction facility outlet Hu-Chems II
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**1.24E-07 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, downstream of the EnviNO_X® reactor (322-R-202), and leads (via sample gas line) to the locked analyser house II (located closely to the EnviNOx® reactor of Hu-Chems plant II), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report.

	322-AI-2-0127 Type: NDIR Analyzer Accuracy class: ±1% (zero/span) Serial number: 990861497812 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically) Third party analyser certification frequency: 24 months Latest third party analyser certification: 12/05/2010 (by governmental Korean Testing laboratory) Validity: 11/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest tests have been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**M_i,II**
Data unit:	H

Description:	Measuring Interval
Measured /Calculated /Default:	Measured
Source of data:	Data management system (DeltaV)
Value(s) of monitored parameter:	**10 sec**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Emerson Process Management Korea has been mandated to conduct monthly DeltaV-System health checks and quarterly inspection checks to ensure good system condition and to conduct regular system updates.

Data / Parameter:	**PE_HC,II**
Data unit:	tCO_2e
Description:	Emissions from hydrocarbon use in destruction facility Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**223 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration	-

frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**HCE_C, II**
Data unit:	tCO_2e
Description:	Converted hydrocarbon emissions Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**223 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**Q_HC,II**
Data unit:	Nm^3
Description:	Hydrocarbon input (propane as reducing agent) Hu-Chems II
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below; Flow metering system automatically records volume flow adjusted to standard temperature and pressure) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**37,110 Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this

	monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the propane gas line, upstream of the EnviNO_X® reactor (322-R-202). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-FT-2-5121** Type: Coriolis flow meter Accuracy class: ± 0.35% Serial number: 14126211 Calibration frequency: 60 months Date of last calibration: 16/02/2009 Validity: 15/02/2014 **322-TT-2-1119** Type: Temperature transmitter Accuracy class: ± 0.15% of span Serial number: 01545263 Calibration frequency: 48 months Date of last calibration: 15/06/2010 Validity: 14/06/2014 **322-PT-2-3118** Type: Pressure transmitter Accuracy class: ± 0.1% of span Serial number: 5239384 Calibration frequency: 48 months Date of last calibration: 15/06/2010 Validity: 14/06/2014
Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**ρ_HC,II**
Data unit:	t / Nm^3
Description:	Hydrocarbon density Hu-Chems II
Measured /Calculated /Default:	Default

Source of data:	Default value / Certificate hydrocarbon supplier
Value(s) of monitored parameter:	**2.00E-03 t/Nm³** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) For calculation of project emissions, a hydrocarbon density value of 2.00E-03 t/Nm³ is applied (as traceable in the excel books, *Annex 2*). According to supplier certificates, actual density of the delivered hydrocarbon is below the applied density. Thus, applied density is conservative.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Yearly
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**P_HNO3,II**
Data unit:	$tHNO_3$
Description:	Plant output of HNO_3 Hu-Chems II
Measured /Calculated /Default:	Measured
Source of data:	Production reports The nitric acid produced (recorded as 100% nitric acid) is determined from the volume flow measured with a flow meter. The hourly volume flow rate is available in the Hu-Chems Fine Chemical distributed control system (DCS). The concentration and density of the acid is determined by laboratory analysis three times daily following the respective ISO QM procedure. The daily average of the nitric acid concentration and density are calculated and used for the specific day. The DCS generates daily reports including the daily nitric acid production whereas the data from the daily reports generated by the DCS are transferred to an excel sheet in order to present all parameters as required by AM0028 in an overall format. The excel book containing daily values and an automatic check, if the production during the monitoring period is below the designed capacity is attached as *Annex 2* to this Monitoring Report.
Value(s) of monitored parameter:	**26,802 $tHNO_3$** Nitric Acid produced from: **84,434**

	<table><tr><td>22/01/2009* until 21/01/2010</td><td></td></tr><tr><td>Nitric Acid produced from 22/01/2010* until 30/09/2010</td><td>71,198</td></tr><tr><td>Limit of annual Nitric Acid Production according to PDD</td><td>116,800</td></tr></table> * The calendar day, on which the crediting period has started is the 22/01/2007, therefore a year between 22/01 of a year and 21/01 of the subsequent year is considered as a "*Crediting Year*". The nitric acid production within the most recently started Crediting Year prior to the start of the covered monitoring period is compared with the limit of annual Nitric Acid Production as established in the PDD (P_HNO3,hist,II). In the present case, the produced amount of nitric acid in the ongoing crediting year, between 22/01/2010 until 30/09/2010 (end of monitoring period) has been compared with P_HNO3,hist,II. The production in this crediting year is below the limit in Hu-Chems II. Furthermore, the production in the crediting year from 22/01/2009 until 21/01/2010 was clearly below the limit in Hu-Chems II. The assessment duly represents the production within a one-year production cycle. An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the nitric acid line, downstream of the absorbtion tower (322-N-201). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-FT-2-512** Type: Magnetic Flowmeter Accuracy class: ± 0.25% Serial number: 0880153845 Calibration frequency: Instrument applied requires no regular calibration after factory calibration Date of last calibration: 25/05/2009 (Factory calibration) General maintenance frequency: 48 months from commissioning or latest general maintenance Latest general maintenance: 15/06/2010 Validity of maintenance status: 14/06/2014 **322-TT-2-127** Type: Temperature Sensor Accuracy class: ± 0.15% of span Serial number has not been issued Calibration frequency: 48 months Date of last calibration: 15/06/2010 Validity: 14/06/2014

Measuring/ Reading/ Recording frequency:	Recorded: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of nitric acid production data is regularly checked by nitrogen balance.

Data / Parameter:	**QI_N2O,II**
Data unit:	tN_2O
Description:	Quantity of N_2O at inlet of destruction facility Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**347.34 tN_2O** An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**CI_N2O,II**
Data unit:	tN_2O/ Nm^3

Description:	N_2O concentration at destruction facility inlet Hu-Chems II
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**4.16E-06 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, upstream of the EnviNO_X® reactor (322-R-202), and leads (via sample gas line) to the locked analyser house II (located closely to the EnviNOx® reactor of Hu-Chems plant II), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-AI-2-0125** Type: NDIR Analyzer Accuracy class: ±1% (zero/span) Serial number: 370861495671 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically) Third party analyser certification frequency: 24 months Latest third party analyser certification: 12/05/2010 (by governmental Korean Testing laboratory) Validity: 11/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment

	procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest test has been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**T_g,II**
Data unit:	°C
Description:	Actual operating temperature ammonia oxidation reactor Hu-Chems II during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**901.5 °C** The temperature in the ammonia oxidation reactor (AOR) is monitored by two thermocouples. The average operating temperatures in the AOR are collected, subsequently the Delta-V system automatically calculates and reports the daily average temperature. An excel book containing daily values and automatic checks, if daily average values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual average daily operating temperature in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration	Meter location: Located in the ammonia oxidation reactor (322-K-202). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report.

frequency, date of last calibration, validity)	**322-TT-2-115/116** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial numbers: 1820884 / 1784582 Calibration frequency: 48 months Date of last calibration: 15/06/2010 Validity: 14/06/2014
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**P_g,II**
Data unit:	Barg
Description:	Actual operating pressure ammonia oxidation reactor Hu-Chems II during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**8.93 barg** The pressure in the ammonia oxidation reactor (AOR) is monitored by a pressure transmitter. The pressure in the AOR is collected and subsequently the Delta-V system automatically reports the daily average pressure. An excel book containing daily values and automatic checks, if daily values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual average daily operating pressure in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission	Baseline emission calculations

calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the air compressor discharge line, upstream of the ammonia oxidation reactor (322-K-202). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-PT-2-304** Type: Pressure transmitter Accuracy class: : ± 0.25% of span Serial number: 1094015 Calibration frequency: 48 Months Date of last calibration: 15/06/2010 Validity: 14/06/2014
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**G_sup,II**
Data unit:	-
Description:	Supplier of the ammonia oxidation catalyst Hu-Chems II
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**Johnson Matthey** The supplier of the ammonia oxidation catalyst is the same as prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change Latest gauze changes, relevant to the monitoring period: 08/04/2010 21/07/2010

Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**G_com,II**
Data unit:	%
Description:	Composition of the ammonia oxidation catalyst Hu-Chems II
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**90% Pt** **5% Rh** **5% Pd** The composition of the ammonia oxidation catalyst during the whole monitoring period is the same kind of catalyst composition already in use prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change (this comprises the date of changing gauze composition, if applicable) Latest gauze changes, relevant to the monitoring period: 08/04/2010 21/07/2010
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**SE_N2O,II**
Data unit:	$tN_2O/tHNO_3$
Description:	N_2O emission rate per ton of nitric acid Hu-Chems II
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring report (i.e. *Annex 2* to this Monitoring Report) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**0.013 $tN_2O/tHNO_3$**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial	-

number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Recording: Yearly / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**A_OR,d,II**
Data unit:	tNH_3/d
Description:	Actual ammonia flow rate to the ammonia oxidation reactor Hu-Chems II during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**84.19 tNH_3/d** An excel book containing daily values and automatic checks, if daily values are below historical maximum ammonia flow rate to the AOR (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual daily ammonia flow rate to the AOR is below the historical maximum ammonia flow rate to the AOR for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the ammonia supply line, upstream of the ammonia oxidation reactor (322-K-202). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **322-FT-2-503** Type: Differential pressure transmitter Accuracy class: ± 0.5% of span Serial number: 2052133 Calibration frequency: 48 Months Date of last calibration: 15/06/2010 Validity: 14/06/2014 **322-TT-2-103** Type: Temperature transmitter Accuracy class: : ± 0.15% of span Serial number: 1784187 Calibration frequency: 48 Months Date of last calibration: 16/06/2010 Validity: 15/06/2014

	322-PT-2-303 Type: Pressure transmitter Accuracy class: : ± 0.1% of span Serial number: 2052135 Calibration frequency: 48 Months Date of last calibration: 15/06/2010 Validity: 14/06/2014
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of ammonia input data is regularly checked by nitrogen balance.

Data and parameter monitored Hu-Chems III:

Data / Parameter:	**PE_y,III**
Data unit:	tCO_2e
Description:	Project emissions Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**2,088 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_ND,III**
Data unit:	tCO_2e
Description:	Project emissions from N_2O not destroyed Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**1,864 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Anually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is

	attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_DF,III**
Data unit:	tCO_2e
Description:	Project emissions from destruction facility Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**224 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Anually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_N_2O,III**
Data unit:	tN_2O
Description:	N_2O not destroyed by facility Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**6.01 tN_2O** An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-

Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**F_TG,III**
Data unit:	Nm^3/h
Description:	Volume flow tail gas at N_2O destruction facility interval i Hu-Chems III
Measured /Calculated /Default:	Measured
Source of data:	Flow meter (Please refer to monitoring equipment below; Flow metering system automatically records volume flow adjusted to standard temperature and pressure) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**78,237,664 Nm^3** **(38,732 Nm^3/h)** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Venturi tube, designed and manufactured in accordance with ISO 5167-4:2003 Meter location: Located in the tail gas line, downstream of the $EnviNO_X$® reactor (323-R-302). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-FT-3-5130B/3184B** Type: Differential pressure transmitters Accuracy class: ± 0.1% of span Serial numbers: 01885789/ 01885790 Calibration frequency: 24 months Date of last calibration: 29/12/2008 and 15/09/2010 Validity: 28/12/2010 and 14/09/2012, respectively **323-TT-3-1136/1137** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial numbers: 01885793/ 01885794 Calibration frequency: 24 months Date of last calibration: 09/03/2009 and 15/09/2010 Validity: 08/03/2011 and 14/09/2012, respectively

	323-PT-3-3133 Type: Pressure transmitter Accuracy class: ± 0.1% of span Serial number: 5389822 Calibration frequency: 24 months Date of last calibration: 29/12/2008 and 15/09/2010 Validity: 28/12/2010 and 14/09/2012, respectively **323-PT-3-3134** (New, calibrated instrument of the same type and specifications was installed on 15/09/2010) Type: Pressure transmitter Accuracy class: ± 0.1% of span Serial number: 5389823 (New instrument: 5239390) Calibration frequency: 24 months Date of last calibration: 29/12/2008 (New instrument: 15/09/2010) Validity: 28/12/2010 (New instrument: 14/09/2012)
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility check of measured values is regularly done with recorded values of the redundantly installed instruments.

Data / Parameter:	**CO_N2O,III**
Data unit:	tN_2O/ Nm^3
Description:	N_2O concentration at destruction facility outlet Hu-Chems III
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**7.68E-08 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, downstream of the EnviNO_X® reactor (323-R-302), and leads (via sample gas line) to the locked analyser house III (located closely to the EnviNOx® reactor of Hu-Chems plant III), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-AI-3-0127** Type: NDIR Analyzer Accuracy class: ±1% (zero/span) Serial number: 990861497815 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically) Third party analyser certification frequency: 24 months Latest third party analyser certification: 13/05/2010 (by governmental Korean Testing laboratory) Validity: 12/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest tests have been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct

	monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**M_i,III**
Data unit:	H
Description:	Measuring Interval
Measured /Calculated /Default:	Measured
Source of data:	Data management system
Value(s) of monitored parameter:	**10 sec**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	**-**
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Emerson Process Management Korea has been mandated to conduct monthly DeltaV-System health checks and quarterly inspection checks to ensure good system condition and to conduct regular system updates.

Data / Parameter:	**PE_HC,III**
Data unit:	tCO_2e
Description:	Emissions from hydrocarbon use in destruction facility Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system

	Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**224 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**HCE_C, III**
Data unit:	tCO_2e
Description:	Converted hydrocarbon emissions Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**224 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**Q_HC,III**
Data unit:	Nm^3
Description:	Hydrocarbon input (propane as reducing agent) Hu-Chems III
Measured /Calculated /Default:	Measured

Source of data:	Measuring device (please refer to Monitoring equipment below; Flow metering system automatically records volume flow adjusted to standard temperature and pressure) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**37,173 Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the propane gas line, upstream of the EnviNO_X® reactor (323-R-302). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-FT-3-5121** Type: Coriolis flow meter Accuracy class: ± 0.35% Serial number: 14125454 Calibration frequency: 60 months Date of last calibration: 13/02/2009 Validity: 12/02/2014 **323-TT-3-1119** Type: Temperature transmitter Accuracy class: ± 0.15% of span Serial number: 01545265 Calibration frequency: 48 months Date of last calibration: 09/03/2009 and 15/09/2010 Validity: 08/03/2013 and 14/09/2014, respectively **323-PT-3-3118** Type: Pressure transmitter Accuracy class: ± 0.1% of span Serial number: 5239388 Calibration frequency: 48 months Date of last calibration: 29/12/2008 and 15/09/2010 Validity: 28/12/2012 and 14/09/2014, respectively
Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and

	respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**ρ_HC,III**
Data unit:	t / Nm³
Description:	Hydrocarbon density Hu-Chems III
Measured /Calculated /Default:	Default
Source of data:	Default value / Certificate hydrocarbon supplier
Value(s) of monitored parameter:	**2.00E-03 t/Nm³** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) For calculation of project emissions, a hydrocarbon density value of 2.00E-03 t/Nm³ is applied (as traceable in the excel books, *Annex 2*). According to supplier certificates, actual density of the delivered hydrocarbon is below the applied density. Thus, applied density is conservative.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Yearly
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**P_HNO3,III**
Data unit:	tHNO_3
Description:	Plant output of HNO_3 Hu-Chems III
Measured /Calculated /Default:	Measured
Source of data:	Production reports The nitric acid produced (recorded as 100% nitric acid) is determined from the volume flow measured with a flow meter. The hourly volume flow rate is available in the Hu-Chems Fine Chemical distributed control system (DCS). The concentration and density of the acid is determined by laboratory analysis three times daily following the respective ISO QM procedure. The daily average of the nitric acid concentration and density are calculated and used for the specific day. The DCS generates daily reports including the daily nitric acid production whereas the data from the daily reports generated by the

<table>
<tr><td></td><td>DCS are transferred to an excel sheet in order to present all parameters as required by AM0028 in an overall format.

The excel book containing daily values and an automatic check, if the production during the monitoring period is below the designed capacity is attached as Annex 2 to this Monitoring Report.</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>25,032 tHNO_3

<table>
<tr><td>Nitric Acid produced from 22/01/2009* until 21/01/2010</td><td>92,985</td></tr>
<tr><td>Nitric Acid produced from 22/01/2010* until 30/09/2010</td><td>72,032</td></tr>
<tr><td>Limit of annual Nitric Acid Production according to PDD</td><td>116,800</td></tr>
</table>

* The calendar day, on which the crediting period has started is the 22/01/2007, therefore a year between 22/01 of a year and 21/01 of the subsequent year is considered as a “Crediting Year”.

The nitric acid production within the most recently started Crediting Year prior to the start of the covered monitoring period is compared with the limit of annual Nitric Acid Production as established in the PDD (P_HNO3,hist,III).

In the present case, the produced amount of nitric acid in the ongoing crediting year, between 22/01/2010 until 30/09/2010 (end of monitoring period) has been compared with P_HNO3,hist,III. The production in this crediting year is below the limit in Hu-Chems III. Furthermore, the production in the crediting year from 22/01/2009 until 21/01/2010 was clearly below the limit in Hu-Chems III.

The assessment duly represents the production within a one-year production cycle.

An excel book containing daily values (for all days covered by this monitoring period), is attached as Annex 2 to this Monitoring Report.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Baseline emission calculations</td></tr>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>Meter location: Located in the nitric acid line, downstream of the absorbtion tower (323-N-301). Please refer also to Section C – 1 (Line diagram) of this Monitoring Report.

323-FT-3-512
Type: Magnetic Flowmeter
Accuracy class: ± 0.25%
Serial number: 06011873
Calibration frequency: Instrument applied requires no regular calibration after factory calibration
Date of last calibration (Factory calibration): 19/01/2010
General maintenance frequency: 48 months from commissioning or latest general maintenance</td></tr>
</table>

	Commissioning: 10/02/2010, latest general maintenance: 15/09/2010 Validity of maintenance status: 09/02/2014 and 14/09/2014, respectively **323-TT-3-127** Type: Temperature Sensor Accuracy class: ± 0.15% of span Serial number has not been issued Calibration frequency: 48 months Date of last calibration: 23/07/2009 and 15/09/2010 Validity: 22/07/2013 and 14/09/2014, respectively
Measuring/ Reading/ Recording frequency:	Recorded: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of nitric acid production data is regularly checked by nitrogen balance.

Data / Parameter:	**QI_N2O,III**
Data unit:	tN_2O
Description:	Quantity of N_2O at inlet of destruction facility Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**280.93 tN_2O** An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/	Recording: Daily

Recording frequency:	
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**CI_N2O,III**
Data unit:	tN_2O/ Nm^3
Description:	N_2O concentration at destruction facility inlet Hu-Chems III
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**3.59E-06 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, upstream of the EnviNO_X® reactor (323-R-302), and leads (via sample gas line) to the locked analyser house III (located closely to the EnviNOx® reactor of Hu-Chems plant III), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-AI-3-0125** Type: NDIR Analyzer Accuracy class: ±1% (zero/span) Serial number: 370861497814 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically) Third party analyser certification frequency: 24 months Latest third party analyser certification: 13/05/2010 (by governmental Korean Testing laboratory) Validity: 12/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS.

	Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest test has been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**T_g,III**
Data unit:	°C
Description:	Actual operating temperature ammonia oxidation reactor Hu-Chems III during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**899.5 °C** The temperature in the ammonia oxidation reactor (AOR) is monitored by two thermocouples. The average operating temperatures in the AOR are collected, subsequently the Delta-V system automatically calculates and reports the daily average temperature. An excel book containing daily values and automatic checks, if daily values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.

	The actual average daily operating temperature in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the ammonia oxidation reactor (323-K-302). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-TT-3-115/116** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial numbers: 1730211/ 1784581 Calibration frequency: 48 months Date of last calibration: 09/03/2009 and 15/09/2010 Validity: 08/03/2013 and 14/09/2014, respectively
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**P_g,III**
Data unit:	barg
Description:	Actual operating pressure ammonia oxidation reactor Hu-Chems III during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**8.69 barg** The pressure in the ammonia oxidation reactor (AOR) is monitored by a pressure transmitter. The pressure in the AOR is collected and subsequently the Delta-V system automatically reports the average pressure.

	An excel book containing daily values and automatic checks, if daily values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual average daily operating pressure in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the air compressor discharge line, upstream of the ammonia oxidation reactor (323-K-302). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-PT-3-304** Type: Pressure transmitter Accuracy class: : ± 0.25% of span Serial number: 720761910698 Calibration frequency: 48 Months Date of last calibration: 09/05/2009 and 15/09/2010 Validity: 08/05/2013 and 14/09/2014, respectively
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**G_sup,III**
Data unit:	-
Description:	Supplier of the ammonia oxidation catalyst Hu-Chems III
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**Johnson Matthey** The supplier of the ammonia oxidation catalyst is the same as prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change Latest gauze changes, relevant to the monitoring period: 17/05/2010 19/08/2010
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**G_com,III**
Data unit:	%
Description:	Composition of the ammonia oxidation catalyst Hu-Chems III
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**90% Pt** **5% Rh** **5% Pd** The composition of the ammonia oxidation catalyst during the whole monitoring period is the same kind of catalyst composition already in use prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change (this comprises the date of changing gauze composition, if applicable) Latest gauze changes, relevant to the monitoring period: 17/05/2010 19/08/2010
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**SE_N2O,III**
Data unit:	$tN_2O/tHNO_3$
Description:	N_2O emission rate per ton of nitric acid Hu-Chems III
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring report (i.e. *Annex 2* to this Monitoring Report)

	Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**0.011 $tN_2O/tHNO_3$**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Yearly / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**A_OR,d,III**
Data unit:	tNH_3/d
Description:	Actual ammonia flow rate to the ammonia oxidation reactor Hu-Chems III during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**80.18 tNH_3/d** An excel book containing daily values and automatic checks, if daily values are below historical maximum ammonia flow rate to the AOR (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual daily ammonia flow rate to the AOR is below the historical maximum ammonia flow rate to the AOR for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the ammonia supply line, upstream of the ammonia oxidation reactor (323-K-302). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **323-FT-3-503** Type: Differential pressure transmitter Accuracy class: : ± 0.5% of span Serial number: 2052134 Calibration frequency: 48 Months Date of last calibration: 25/06/2009 and 15/09/2010

	Validity: 24/06/2013 and 14/09/2014, respectively **323-TT-3-103** Type: Temperature transmitter Accuracy class: : ± 0.15% of span Serial number: 1809794 Calibration frequency: 48 Months Date of last calibration: 18/03/2009 and 15/09/2010 Validity: 17/03/2013 and 14/09/2014, respectively **323-PT-3-303** Type: Pressure transmitter Accuracy class: : ± 0.1% of span Serial number: 2052136 Calibration frequency: 48 Months Date of last calibration: 25/06/2009 and 15/09/2010 Validity: 24/06/2013 and 14/09/2014, respectively
Measuring/ Reading/ Recording frequency:	Recording: continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of ammonia input data is regularly checked by nitrogen balance.

Data and parameter monitored Hu-Chems IV:

Data / Parameter:	**PE_y,IV**
Data unit:	tCO_2e
Description:	Project emissions Hu-Chems IV
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**4,239 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_ND,IV**
Data unit:	tCO_2e
Description:	Project emissions from N_2O not destroyed Hu-Chems IV
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**4,239 tCO_2e**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Annually / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is

	attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**PE_DF,IV**
Data unit:	tCO_2e
Description:	Project emissions from destruction facility Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	-
Value(s) of monitored parameter:	**Not applicable (no hydrocarbon used)**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**PE_N_2O,IV**
Data unit:	tN_2O
Description:	N_2O not destroyed by facility Hu-Chems IV
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**13.67 tN_2O** An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding

	continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**F_TG,IV**
Data unit:	Nm^3/h
Description:	Volume flow tail gas at N_2O destruction facility interval i Hu-Chems IV
Measured /Calculated /Default:	Measured
Source of data:	Flow meter (Please refer to monitoring equipment below; Flow metering system automatically records volume flow adjusted to standard temperature and pressure) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**345,005,582 Nm^3** **(157,106 Nm^3/h)** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Venturi tube, designed and manufactured in accordance with ISO 5167-4:2003 Standard Normal Conditions: 1,013.25 hPa, 273.15K) Meter location: Located in the tail gas line, downstream of the EnviNO_X® reactor (324-R-402). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-FT-4-4115B/4116B** Type: Differential pressure transmitters Accuracy class: ± 0.1% of span Serial number: 01885787/ 01885788 Calibration frequency: 24 months Date of last calibration: 06/05/2010 Validity: 05/05/2012 **324-TT-4-1111/1112** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial number: 01885791 / 01885792 Calibration frequency: 24 months Date of last calibration: 06/05/2010 Validity: 05/05/2012 **324-PT-4-3113/3114** Type: Pressure transmitters Accuracy class: ± 0.1% of span

	Serial number: 5389820/5389821 Calibration frequency: 24 months Date of last calibration: 06/05/2010 Validity: 05/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility check of measured values is regularly done with recorded values of the redundantly installed instruments.

Data / Parameter:	**CO_N2O,IV**
Data unit:	tN_2O/ Nm^3
Description:	N_2O concentration at destruction facility outlet Hu-Chems IV
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**3.96E-08 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, downstream of the EnviNO_X® reactor (324-R-402), and leads (via sample gas line) to the locked analyser house IV (located closely to the EnviNOx® reactor of Hu-Chems plant IV), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-AI-4-0107** Type: NDIR Analyzer Accuracy class: ±1% (zero/span)

	Serial number: 990861497818 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically) Third party analyser certification frequency: 24 months Latest third party analyser certification: 11/05/2010 (by governmental Korean Testing laboratory) Validity: 10/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest test has been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**M_i,IV**
Data unit:	H
Description:	Measuring Interval
Measured /Calculated /Default:	Measured

Source of data:	Data management system (DeltaV)
Value(s) of monitored parameter:	**10 sec**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Measured: Continuously Recorded: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Emerson Process Management Korea has been mandated to conduct monthly DeltaV-System health checks and quarterly inspection checks to ensure good system condition and to conduct regular system updates.

Data / Parameter:	**PE_HC,IV**
Data unit:	tCO_2e
Description:	Emissions from hydrocarbon use in destruction facility Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	-
Value(s) of monitored parameter:	**Not applicable (no hydrocarbon used)**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-

QA/QC procedures applied:	-

Data / Parameter:	**HCE_C, IV**
Data unit:	tCO_2e
Description:	Converted hydrocarbon emissions Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	-
Value(s) of monitored parameter:	**Not applicable (no hydrocarbon used)**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**Q_HC,IV**
Data unit:	Nm^3
Description:	Hydrocarbon input Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	-
Value(s) of monitored parameter:	**Not applicable (no hydrocarbon used)**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	-
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**P_HNO3,IV**
Data unit:	$tHNO_3$
Description:	Plant output of HNO_3 Hu-Chems IV
Measured /Calculated /Default:	Measured
Source of data:	Production reports

<table>
<tr><td></td><td>The nitric acid produced (recorded as 100% nitric acid) is determined from the volume flow measured with a flow meter. The hourly volume flow rate is available in the Hu-Chems Fine Chemical distributed control system (DCS).

The concentration and density of the acid is determined by laboratory analysis three times daily following the respective ISO QM procedure. The daily average of the nitric acid concentration and density are calculated and used for the specific day.

The DCS generates daily reports including the daily nitric acid production whereas the data from the daily reports generated by the DCS are transferred to an excel sheet in order to present all parameters as required by AM0028 in an overall format.

The excel book containing daily values and an automatic check, if the production during the monitoring period is below the designed capacity is attached as Annex 2 to this Monitoring Report.</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>111,582 tHNO_3

<table><tr><td>Nitric Acid produced from 22/01/2009* until 21/01/2010</td><td>424,070</td></tr><tr><td>Nitric Acid produced from 22/01/2010* until 30/09/2010</td><td>304,428</td></tr><tr><td>Limit of annual Nitric Acid Production according to PDD</td><td>467,200</td></tr></table>
* The calendar day, on which the crediting period has started is the 22/01/2007, therefore a year between 22/01 of a year and 21/01 of the subsequent year is considered as a “Crediting Year”.

The nitric acid production within the most recently started Crediting Year prior to the start of the covered monitoring period is compared with the limit of annual Nitric Acid Production as established in the PDD (P_HNO3,hist,IV).

In the present case, the produced amount of nitric acid in the ongoing crediting year, between 22/01/2010 until 30/09/2010 (end of monitoring period) has been compared with P_HNO3,hist,IV. The production in this crediting year is below the limit in Hu-Chems IV. Furthermore, the production in the crediting year from 22/01/2009 until 21/01/2010 was clearly below the limit in Hu-Chems IV.

The assessment duly represents the production within a one-year production cycle.

An excel book containing daily values (for all days covered by this monitoring period), is attached as Annex 2 to this Monitoring Report.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Baseline emission calculations</td></tr>
</table>

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the nitric acid line, downstream of the absorbtion tower (324-N-401). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324FT-4-609** Type: Magnetic Flowmeter Accuracy class: ± 0.5% Serial number: 0870173774 Calibration frequency: Instrument applied requires no regular calibration after factory calibration Date of last calibration: 26/05/2009 (Factory calibration) General maintenance frequency: 48 months from commissioning or latest general maintenance Latest General Maintenance: 06/05/2010 Validity of maintenance status: 05/05/2014 **324-TT-4-237** Type: Temperature Transmitter Accuracy class: ± 0.15% of span Serial number: 966595 Calibration frequency: 48 months Date of last calibration: 06/05/2010 Validity: 05/05/2014
Measuring/ Reading/ Recording frequency:	Recorded: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of nitric acid production data is regularly checked by nitrogen balance.

Data / Parameter:	**QI_N2O,IV**
Data unit:	tN_2O
Description:	Quantity of N_2O at inlet of destruction facility Hu-Chems IV
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring system Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored	**678.03 tN_2O**

parameter:	An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Daily
Calculation method (if applicable):	Calculated according to formulae given in PDD by the monitoring system on a continuous basis. An excel book including daily values, a description of the applied formulae as well as clarification regarding continuous calculation is attached as *Annex 2* to this Monitoring Report. Please refer also to section E.4. (Plausibility Check) of this monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**CI_N2O,IV**
Data unit:	tN_2O/ Nm^3
Description:	N_2O concentration at destruction facility inlet Hu-Chems IV
Measured /Calculated /Default:	Measured
Source of data:	Non-dispersive infrared (NDIR) photometry analyser Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**1.97E-06 tN_2O/Nm^3** (Standard temperature: 273.15K, standard pressure: 1,013.25 hPa) An excel book containing daily values (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Sample take-off is located in the tail gas line, upstream of the EnviNO_X® reactor (324-R-402), and leads (via sample gas line) to the locked analyser house IV (located closely to the EnviNOx® reactor of Hu-Chems plant IV), where analysers and standard gases for calibrations are installed. Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-AI-4-0108** Type: NDIR Analyzer Accuracy class: ±1% (zero/span) Serial number: 370861497817 Calibration frequency: Zero calibration daily (automatically) Span calibration every two days (automatically)

	Third party analyser certification frequency: 24 months Latest third party analyser certification: 11/05/2010 (by governmental Korean Testing laboratory) Validity: 10/05/2012
Measuring/ Reading/ Recording frequency:	Measuring: Continuously Recording: Daily
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Accuracy-safeguarding instructions from Emerson Process Management, the manufacturer of the equipment, related to regular self-calibration and quality of used standard gases, are followed. The analyzers need a calibration on a regular basis. This adjustment procedure is done automatically and can be triggered manually from the operating console or automatically on a time basis (Zero calibration: daily, span calibration: every two days). Certified (Certificates confirming stability of standard gas during monitoring period and 1% uncertainty) standard gases are used for self calibration. Sample line testing is done annually by applying certified standard gas at the beginning of the sample line. Latest test has been conducted on 29/06/2009 and 16/06/2010, with positive results. Emerson Process Management Korea has been mandated to conduct monthly analyser health checks and quarterly inspection checks to ensure good instrument condition. Extended general maintenance service by Emerson Process Management Germany has been conducted in January 2010. Plausibility check is regularly done with laboratory gas chromatography analysis.

Data / Parameter:	**$T_{g,IV}$**
Data unit:	°C
Description:	Actual operating temperature ammonia oxidation reactor Hu-Chems IV during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this

	Monitoring Report.
Value(s) of monitored parameter:	**887.6 °C** The temperature in the ammonia oxidation reactor (AOR) is monitored by two thermocouples. The average operating temperatures in the AOR are collected, subsequently the Delta-V system automatically calculates and reports the daily average temperature. An excel book containing daily values and automatic checks, if daily values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual average daily operating temperature in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the ammonia oxidation reactor (324-K-402). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-TT-4-106A/C** Type: Temperature transmitters Accuracy class: ± 0.15% of span Serial numbers: 966596 / 966598 Calibration frequency: 48 months Date of last calibration: 06/05/2010 Validity: 05/05/2014
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**P_g,IV**
Data unit:	Barg
Description:	Actual operating pressure ammonia oxidation reactor Hu-Chems IV during a day d

Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**3.71 barg** The pressure in the ammonia oxidation reactor (AOR) is monitored by a two pressure transmitters. The average pressure in the AOR is collected and subsequently the Delta-V system automatically reports the daily average pressure. An excel book containing daily values and automatic checks, if daily values are within the permitted range (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual average daily operating pressure in the AOR is within the permitted range for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the air compressor discharge line, upstream of the ammonia oxidation reactor (324-K-402). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-PT-4-305A/B** Type: Pressure transmitters Accuracy class: ± 0.1% of span Serial number: RS0966518/ RS0966519 Calibration frequency: 48 Months Date of last calibration: 06/05/2010 Validity: 05/05/2014
Measuring/ Reading/ Recording frequency:	Recording: Continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*.

Data / Parameter:	**G_sup,IV**
Data unit:	-

Description:	Supplier of the ammonia oxidation catalyst Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**Johnson Matthey** The supplier of the ammonia oxidation catalyst is the same as prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change Latest gauze changes, relevant to the monitoring period: 04/05/2010
Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**G_com,IV**
Data unit:	%
Description:	Composition of the ammonia oxidation catalyst Hu-Chems IV
Measured /Calculated /Default:	-
Source of data:	Supplier information (i.e. commercial invoice)
Value(s) of monitored parameter:	**95% Pt** **5% Rh** The composition of the ammonia oxidation catalyst during the whole monitoring period is the same kind of catalyst composition already in use prior to the start of the project activity.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Every gauze change (this comprises the date of changing gauze composition, if applicable) Latest gauze changes, relevant to the monitoring period: 04/05/2010

Calculation method (if applicable):	-
QA/QC procedures applied:	-

Data / Parameter:	**SE_N2O,IV**
Data unit:	$tN_2O/tHNO_3$
Description:	N_2O emission rate per ton of nitric acid Hu-Chems IV
Measured /Calculated /Default:	Calculated
Source of data:	Monitoring report (i.e. *Annex 2* to this Monitoring Report) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**0.006 $tN_2O/tHNO_3$**
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	-
Measuring/ Reading/ Recording frequency:	Recording: Yearly / Periodically
Calculation method (if applicable):	Calculated according to formulae given in PDD. An excel book containing the calculation and a description of the applied formulae is attached as *Annex 2* to this Monitoring Report.
QA/QC procedures applied:	-

Data / Parameter:	**A_OR,d,IV**
Data unit:	tNH_3/d
Description:	Actual ammonia flow rate to the ammonia oxidation reactor Hu-Chems IV during a day d
Measured /Calculated /Default:	Measured
Source of data:	Measuring device (please refer to Monitoring equipment below) Please refer also to *Section C – 1 (Information Flow)* of this Monitoring Report.
Value(s) of monitored parameter:	**348.06 tNH_3/d** An excel book containing daily values and automatic checks, if daily values are below historical maximum ammonia flow rate to the AOR (for all days covered by this monitoring period), is attached as *Annex 2* to this Monitoring Report. The actual daily ammonia flow rate to the AOR is below the historical maximum ammonia flow rate to the AOR for all days covered by this monitoring period.
Indicate what the data are used for (Baseline/ Project/	Baseline emission calculations

Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Meter location: Located in the ammonia supply line, upstream of the ammonia oxidation reactor (324-K-402). Please refer also to *Section C – 1 (Line diagram)* of this Monitoring Report. **324-FT-4-5020** Type: Coriolis flowmeter Accuracy class: : ± 0.35% of span Serial number: 14137655 Calibration frequency: 60 Months Date of last calibration: 05/06/2009 Validity: 04/06/2014
Measuring/ Reading/ Recording frequency:	Recording: continuously
Calculation method (if applicable):	-
QA/QC procedures applied:	The maintenance methods and procedures for monitoring instruments used for CDM Monitoring have been incorporated as part of the ISO 9001 procedures of HU-CHEMS. Accordingly, calibration and maintenance are part of regular QA/QC of the nitric acid plant (please refer also to section C-3). Please refer also to *Section C – 3. Back Up plans / Emergency procedures for monitoring system* of this Monitoring Report and respective subitems *Back Up Plans for measuring systems / Periodically observation of the automated monitoring system* and *Systematic measures for QA for monitoring data during AMS down times*. Plausibility of ammonia input data is regularly checked by nitrogen balance.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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It has been checked that there are no Korean regulations in place that would limit the quantity of N_2O that can be taken into account for the calculation of baseline emissions. Baseline emissions of the project activity are determined based on the quantity of N_2O emitted in the baseline scenario, taking national regulations, production levels and operating conditions into consideration. The quantity of N_2O is determined based on the measurements of the N_2O at the inlet of the EnviNOx®-Systems.

BE_y = BE_y,II + BE_y,III + BE_y,IV = BE_N2O,y x GWP_N2O **(26)**

e.g.
BE_y,II = BE_N2O,II x GWP_N2O **(27)**

where:

BE_y	Baseline emissions in year y (tCO_2e)
BE_y,II	Baseline emissions Hu-Chems II in year y (tCO_2e)
BE_y,III	Baseline emissions Hu-Chems III in year y (tCO_2e)
BE_y,IV	Baseline emissions Hu-Chems IV in year y (tCO_2e)
BE_N2O,y	Baseline emissions of N_2O in year y (tN_2O)
GWP_N2O	Global warming potential of N_2O = 310
BE_N2O,II	Baseline emissions of N_2O in year y at Hu-Chems II (tN_2O)
BE_N2O,III	Baseline emissions of N_2O in year y at Hu-Chems III (tN_2O)
BE_N2O,IV	Baseline emissions of N_2O in year y at Hu-Chems IV (tN_2O)

BE_y,II = BE_N2O,y,II x GWP_N2O = [347.34 tN2O x 310 tCO2e / tN2O]

= $\sum_i^n F\_TG,i,II$ x CI_N2O,i,II x M_i,II x GWP_N2O =

= **107,674 tCO_2e**

BE_y,III = BE_N2O,y,III x GWP_N2O = [280.93 tN2O x 310 tCO2e / tN2O]

= $\sum_i^n F\_TG,i,III$ x CI_N2O,i,III x M_i,III x GWP_N2O =

= **87,089 tCO2e**

BE_y,IV = BE_N2O,y,IV x GWP_N2O = [678.03 tN2O x 310 tCO2e / tN2O]

= $\sum_i^n F\_TG,i,IV$ x CI_N2O,i,IV x M_i,IV x GWP_N2O =

= **210,188 tCO2e**

BE_y = BE_y,II + BE_y,III + BE_y,IV = [107,674 tCO2e + 87,089 tCO2e + 210,188 tCO2e]

= **404,951 tCO2e**

Excel spreadsheets including a comprehensive calculation of baseline emissions and traceable implementation of formulae are attached in Annex 2 to this Monitoring Report.

E.2. Project emissions calculation

>>

The emissions due to the project activity are composed of (a) the emissions of not destroyed N_2O and (b) emissions from the operation of the EnviNOx® systems at Hu-Chems II and III.

N_2O emissions not destroyed by the project activity are calculated based on the continuous measurement of the N_2O concentration in the tail gas of the EnviNOx® systems and the volume flow rates of the tail gas streams. The emissions related to the operation of the N_2O destruction facility are given by on-site emissions due to the hydrocarbons used as input to the EnviNOx® systems (Hydrocarbons are used in plant Hu-Chems II and Hu-Chems III only. No hydrocarbons are used in plant Hu-Chems IV).

PE_y = PE_y,II + PE_y,III + PE_y,IV **(28)**

e.g.
PE_y,II = PE_ND,y,II + PE_DF,y,II **(29)**

where:
PE_y Project emissions in year y (tCO_2e)
PE_y,II Project emissions Hu-Chems II in year y (tCO_2e)
PE_y,III Project emissions Hu-Chems III in year y (tCO_2e)
PE_y,IV Project emissions Hu-Chems IV in year y (tCO_2e)
PE_ND,y Project emissions from N_2O not destroyed in year y(tCO_2e)
PE_DF,y Project emissions related to the operation of the destruction facility in year y (tCO_2e)
PE_ND,y,II Project emissions from N_2O not destroyed in year y Hu-Chems II (tCO_2e)
PE_ND,y,III Project emissions from N_2O not destroyed in year y Hu-Chems III (tCO_2e)
PE_ND,y,IV Project emissions from N_2O not destroyed in year y Hu-Chems IV (tCO_2e)
PE_DF,y,II Project emissions from the operation of the destruction facility in year y Hu-Chems II (tCO_2e)
PE_DF,y,III Project emissions from the operation of the destruction facility in year y Hu-Chems III (tCO_2e)
PE_DF,y,IV Project emissions from the operation of the destruction facility in year y Hu-Chems IV (tCO_2e)

PE_y,II = PE_ND,y,II + PE_DF,y,II = [3,207 tCO2e + 223 tCO2e]
= PE_N2O,y,II x GWP_N2O + PE_HC,y,II =
= $\sum_i^n F\_TG,i,II$ x CO_N2O,i,II x M_i,II x GWP_N2O + HCE_C,y,II =
= $\sum_i^n F\_TG,i,II$ x CO_N2O,i,II x M_i,II x GWP_N2O +
ρ_HC,II x Q_HC,y,II x EF_HC,II x OXID_HC,II/100 =
= 3,430 tCO2e

PE_y,III = PE_ND,y,III + PE_DF,y,III = [1,864 tCO2e + 224 tCO2e]
= PE_N2O,y,III x GWP_N2O + PE_HC,y,III =
= $\sum_i^n F\_TG,i,III$ x CO_N2O,i,III x M_i,III x GWP_N2O + HCE_C,y,III =
= $\sum_i^n F\_TG,i,III$ x CO_N2O,i,III x M_i,III x GWP_N2O +
ρ_HC,III x Q_HC,y,III x EF_HC,III x OXID_HC,III/100 =
= 2,088 tCO_2e

PE_y,IV = PE_ND,y,IV + PE_DF,y,IV = [4,239 tCO2e + 0 tCO2e]
= PE_N2O,y,IV x GWP_N2O =
= $\sum_i^n F\_TG,i,IV$ x CO_N2O,i,IV x M_i,IV x GWP_N2O =

= **4,239 tCO_2e**

PE_y = PE_y,II + PE_y,III + PE_y,IV = [3,430 tCO2e + 2,088 tCO2e + 4,239 tCO2e]
= **9,757 tCO_2e**

Excel spreadsheets including a comprehensive calculation of project emissions and traceable implementation of formulae are attached in Annex 2 to this Monitoring Report.

E.3. Leakage calculation

>>
As described the project activity does not result in any relevant leakage emission, therefore:

LE_y = 0 . **(30)**

E.4. Emission reductions calculation / table

>>
The total emission reduction achieved by this project activity during the monitoring period is therefore:

ER_y = BE_y – PE_y – LE_y . **(31)**

where:

ER_y	Emissions reductions of the project activity during the year y (tCO2e)
BE_y	Baseline emissions during the year y (tCO2e)
PE_y	Project emissions during the year y (tCO2e)
LE_y	Leakage emissions in year y (tCO2e)

ER_y = BE_y – PE_y – LE_y

= 404,951 tCO2e – 9,757 tCO2e – 0 =

= **395,194 tCO2e**

Total baseline emissions:	404,951 tCO2e
Total project emissions:	9,757 tCO2e
Total leakage:	0 tCO2e
Total emission reductions:	395,194 tCO2e

Plausibility Check

Calculation of Baseline Emissions (QI_N2O) and of Project Emissions (PE_N2O) is done on a continuous basis by the DeltaV system, in order follow the respective formula according to the PDD (based on measuring interval). Direct implementation of formula in excel books on a continuous basis would lead to enormous, unprocessable data volumes. In order to assess this automatic calculation of these parameters in the DeltaV system, a plausibility check was performed. For that purpose, the calculation of Project and Baseline Emission Parameters has been conducted manually, based on daily average (concentrations) and total values (Flows) and using the same formulas implemented in the DeltaV system. The result clearly shows plausible data with only slight variations (all plants <0.01%) in the overall Emission Reduction calculation, compared to the applied calculation based on continuous values.

Applied calculations of relevant parameters (PE_N2O, QI_N2O) on a continuous basis guarantee a highly representative and accurate (almost real time) approach. The applied approach is in full compliance with methodology AM0028 Version 1, the registered PDD and the monitoring plan in its

present version (revision as approved by the CDM EB on 18/03/2010). Traceable plausibility check is to prove correct and transparent application of formulas and clearly shows plausible data.

Excel spreadsheets including a comprehensive calculation of emission reductions, traceable implementation of formulae and plausibility checks are attached in *Annex 2* to this Monitoring Report.

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**Hu-Chems II: 83,026 Hu-Chems III: 83,026 Hu-Chems IV: 156,686 Total: 322,738**	**Hu-Chems II: 104,244 Hu-Chems III: 85,001 Hu-Chems IV: 205,949 Total: 395,194**

Reason for the increase in actual emission reductions achieved during the current monitoring period compared to ex-ante calculation of the registered CDM-PDD is given in section E.6. below. It should be noted that the ex-ante estimation of emissions reductions in the PDD was generally based on conservative assumptions.

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

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Comparison of emission reductions with PDD values – Hu-Chems II

Comparison of ER with PDD values: Hu-Chems II	
Source	**Value**
Emission reduction estimation according to PDD (one year)	329,397 tCO2e
Corresponding PDD estimation (over 92 days)	83,026 tCO2e
Actual calculation of emission reduction in monitoring period (over 92 days)	104,244 tCO2e

The increase of the actual emission reduction during the monitoring period compared to the corresponding ex-ante estimation according to the PDD in nitric acid plant II is caused by following reasons:

- For the PDD calculation, a destruction rate of [94.00%] was used, the actual destruction rate reaches an average level of about [97.02%];
- Due to the absence of actual values, an inlet concentration of [3.5E-06 tN_2O / Nm^3] for baseline emission estimation in the PDD was used. Actual concentrations measured reach an average level of [4.2E-06 tN_2O / Nm^3] and therefore lead to higher baseline emissions;

It should be noted that the ex-ante estimation of emissions reductions in the PDD was generally based on conservative assumptions.

Comparison of emission reductions with PDD values – Hu-Chems III

Comparison of ER with PDD values: Hu-Chems III	
Source	**Value**
Emission reduction estimation according to PDD (one year)	329,397 tCO2e
Corresponding PDD estimation (over 92 days)	83,026 tCO2e
Actual calculation of emission reduction in monitoring period (over 92 days)	85,001 tCO2e

The increase of the actual emission reduction during the monitoring period compared to the corresponding ex-ante estimation according to the PDD in nitric acid plant III is caused by following reasons:

- For the PDD calculation, a destruction rate of [94.00%] was used, the actual destruction rate reaches an average level of about [97.86%];

- Due to the absence of actual values, an inlet concentration of [3.5E-06 tN_2O / Nm^3] for baseline emission estimation in the PDD was used. Actual concentrations measured reach an average level of [3.6E-06 tN_2O / Nm^3] and therefore lead to higher baseline emissions;

It should be noted that the ex-ante estimation of emissions reductions in the PDD was generally based on conservative assumptions.

Table 1: Comparison of emission reductions with PDD values – Hu-Chems IV

Comparison of ER with PDD values: Hu-Chems IV	
Source	**Value**
Emission reduction estimation according to PDD (one year)	621,634 tCO2e
Corresponding PDD estimation (over 92 days)	156,686 tCO2e
Actual calculation of emission reduction in monitoring period (over 92 days)	205,949 tCO2e

The increase of the actual emission reduction during the monitoring period compared to the corresponding ex-ante estimation according to the PDD in nitric acid plant IV is caused by following reasons:

- For the PDD calculation, a destruction rate of [94.00%] was used, the actual destruction rate reaches an average level of about [97.98%];
- Due to the absence of actual values, an inlet concentration of [1.7E-06 tN_2O / Nm^3] for baseline emission estimation in the PDD was used. Actual concentrations measured reach an average level of [2.0E-06 tN_2O / Nm^3] and therefore lead to higher baseline emissions;
- Due to the absence of tail gas flow measurement, the tail gas flow used for emission reduction determination in the PDD was estimated with [149,675 Nm^3 / h]. Actual flows measured reach an average level of [157,106 Nm^3 / h] and therefore contribute to a higher emission reduction than estimated.

It should be noted that the ex-ante estimation of emissions reductions in the PDD was generally based on conservative assumptions.

ANNEX 1

Social Fund

As described in the PDD a social fund was established by the project developer and the project operator. This fund will contribute to the social benefit of the people living in the area of the project activity by financing projects and social activities. The contribution to the Social Fund in 2009 was about 583,000,000 Korean WON, equivalent to about 320,000 Euro. Projects and Organizations supported by the CDM Social Fund are the Yeodo Academy, the Endowment of In-Company welfare fund and the Sang am village fund. The Yeodo Academy intends to improve the basic elementary and secondary education and the objective of the Welfare Fund is to contribute to working employees' life stabilization and welfare improvement.

- Social Fund 2007: 250,931,278 WON (~ 150,000 Euro)
- Social Fund 2008: 854,902,652 WON (~ 530,000 Euro)
- Social Fund 2009: 582,706,027 WON (~ 320,000 Euro)

ANNEX 2

Excel books containing monitored data and calculations of baseline emissions, project emissions and emission reductions as well as daily values of operating parameters (including automatic checks) of the nitric acid plants are attached as separate files:

HUC_II_MP14_UNFCCC
HUC_III_MP14_UNFCCC
HUC_IV_MP14_UNFCCC
HUC_OVERALL_MP14_UNFCCC

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History of the document

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