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

CONTENTS

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

MONITORING REPORT
Version 4, 06/12/2012

Project Title : N_2O abatement in HP Nitric Acid plants at Rashtriya Chemicals & Fertilizers Limited, India
Reference Number : 2792
Monitoring Period : 20th November 2009 to 12th February 2010 (Both dates inclusive)

SECTION A. General description of the project activity

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

RCF is a Public sector undertaking of Government of India. It is one of the leading producers of fertilizer in the country. The fertilizer production facility of RCF is located in Trombay near Mumbai in the state of Maharashtra. The two units are medium pressure unit at 5 – 6 bar (absolute) and High pressure unit at 7-8 bar (absolute) respectively, both the units are located at Trombay. The current project activity is based in the high pressure Nitric Acid unit of the fertilizer plant of RCF.

This project activity is in the process of nitric acid production which involves oxidation of ammonia on precious metal gauze of essentially platinum – rhodium in ammonia burner in the presence of air. This is an exothermic reaction which releases substantial heat. In the process, ammonia is oxidized to form NO, which is further oxidized to form NO_2, which is converted into Nitric Acid by absorbing NO_2 in water. N_2O is an undesirable and unavoidable by product resulted during this process which is potent GHG and do not possess any economic value.

The project activity entails installation of secondary DeN2O catalyst in the ammonia reactors of HP nitric acid plant of Rashtriya Chemicals and Fertilizers Limited (Hereafter referred as RCF) in India. The HP Nitric acid plant was commissioned in1968. The plant was subsequently revamped and restarted in Jan. 2005 with annual capacity of 1,28,480 MT (352 MT per day) of 100 % Nitric Acid. The specialized catalyst was procured from well known supplier M/s BASF Germany. EN14181 compliant continuous emission monitoring system was procured from M/s ABB Germany. The project activity helps in catalytic reduction of N_2O which is an undesirable by product of nitric acid production process and so emission reductions of it. N_2O is potent greenhouse gas with a very high global warming potential of 310.

Particulars	Details
Installation and commissioning of DeN_2O catalyst	31st March 2009
Commissioning of AMS	24th July 2008
QAL 2 Test	21st to 23rd October 2008
AST for the year 2010	4th and 5th March 2010
AST for the year 2011	1st, 2nd and 3rd March 2011 #
Annual Maintenance of AMS (During the Monitoring Period)	ABB Engineer visited on 16/12/09 & 27/01/10 routine maintenance job of AMS.
Date of Replacement of Primary Catalyst (During Monitoring Period)	10th October 2009
Jobs pertaining to Secondary Catalyst	Nil

Further the details of relevant dates of calibration and validity of each of the monitoring instruments are separately mentioned under Appendix-III.

The Purpose of this monitoring report is to calculate and clarify the GHG emission reduction quantity achieved by this project for periodic verifications. The total emission reduction during the monitoring period through this project activity is 78,457 tCO_{2e} [1].

A.2. Project Participants

Rashtriya Chemicals & Fertilizers Ltd. (Public Entity), Host Country: India

Other involved Parties: Switzerland

Authorized Participant: Rashtriya Chemicals & Fertilizers Limited, India.

A.3. Location of the project activity:

Host Country	:	India
State	:	Maharashtra
Town	:	Trombay, Sion
Latitude	:	$18^0$56'33" N
Longitude	:	$72^0$50'9" E

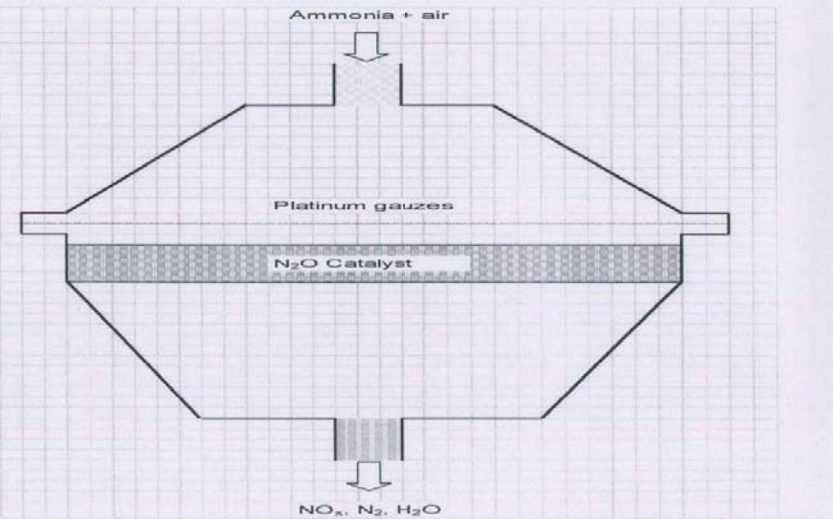
A.4. Technical description of the project

Nitric Acid (HNO_3) is produced through the oxidation of ammonia (NH_3) on precious metal catalyst gauze in the ammonia burner of a nitric acid plant. Nitrous Oxide (N_2O) is an undesirable by-product gas produced in the manufacture of nitric acid. Waste N_2O from nitric acid production was typically released into the atmosphere as it does not have any economic value at emission levels typical of nitric acid manufacture.

RCF has installed secondary catalyst in the ammonia burner of nitric acid unit after primary catalyst, which has resulted in reduction of N_2O emission.

Technical Specifications:
RCF has purchased the catalyst from one of the reputed internationally well known catalyst suppliers M/s BASF. In presence of the catalyst N_2O is reduced to harmless N_2. The catalyst has been installed just below the primary catalyst in place of rasching rings installed initially as shown below.

[1] This monitoring report covers the period from 20th November 2009 to 12th February 2010. The total period for this campaign is from 10th October 2009 to 12th February 2010.



The technology is based on selective reduction of N_2O. The reduction is done as below in an exothermic reaction.

$$N_2O \rightarrow N_2 + ½\ O_2 \qquad \Delta H = -82\ kJ/\ mol$$

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

- Approved baseline methodology AM0034 **"Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants"**
  Reference: Version 03.2, Sectoral Scope 05, EB 41

- **Tool for the demonstration and assessment of additionality**
  Reference: Version 05.2, EB39

A.6. Registration date of the project activity:

20th November 2009

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

Crediting Period: Renewable Period, 7 Years

Crediting Period Starts from 20th November 2009

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

Mr. A.B.Khare
Rashtriya Chemicals and Fertilizers Limited
10th Floor, Priyadarsini,

Eastern Express Highway,
Sion – Mumbai 400 022
Maharashtra, India.

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

Start date of operation of project activity:
The starting date of operation of this project activity is 31.03.2009
The DeN_2O catalyst was in operation during whole campaign period ie from 10th October 2009 to 12th Feb 2010 including current monitoring period from 20th November 2009 to 12th Feb 2010.

There was no exchange/replacement of equipment since installation of DeN_2O catalyst**.**

Shutdown details of equipment:
Please refer Appendix II for details.

Events that may impact the applicability of methodology:
There are no events or situation which impacts the applicability of the methodology during the monitoring period.

How the issues resulting from the events are being addressed:
Not applicable.

B.2. Revision of the monitoring plan

The request for revision in the Monitoring plan was submitted to UNFCCC and has been approved by UNFCCC on 15th November 2012.

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

The operating hour for the plant can in principle be monitored by using either of two independent methods viza:

1. Based on the temperature limits of the Reactor as described in the PDD.

   The plant is considered operational only when the temperature of the ammonia reactor is ≥860 °C. The temperature measurement is at the interval of every 2 seconds.

2. Based on the ammonia flow to the reactor.

   The plant is considered to be operational during the ammonia flow is introduced in the pre-heated reactor.

Both the methods are equality good to record operating hours of the plant.

It was decided by RCF to implement first method for HP Plant.
However the logic was configured on 2nd method and this remained applicable during 20/11/2009 to 09/07/2010. The same was switched over to 1st method on 09/07/2010.

The deviation I-DEV0395 was requested for the period from 20/11/2009 to 09/07/2010.

UNFCCC has accepted the request for deviation to the monitoring and reporting process for the project campaigns included in the 1st and 2nd monitoring periods, provided that a revision of monitoring plan is requested in order to continue applying the procedure of monitoring the operating hours based on the ammonia flow to be consistent with the implemented procedure in the baseline campaign where operating hours were also determined as per the ammonia flow.

The deviation regarding the baseline campaign is accepted for the
deviation period requested until the revision of the monitoring plan is approved, provided that the operating hours are monitored based on the flow of ammonia during the deviation period.

In line with above recommendation from UNFCCC, procedure for monitoring the operating hours is changed from "procedure based on the reactor temperature" to "procedure based on ammonia flow to the reactor" on 07.01.2012 when plant was shut-down for primary catalyst replacement job.

B.4. Notification or request of approval of changes

NA

SECTION C. Description of the monitoring system

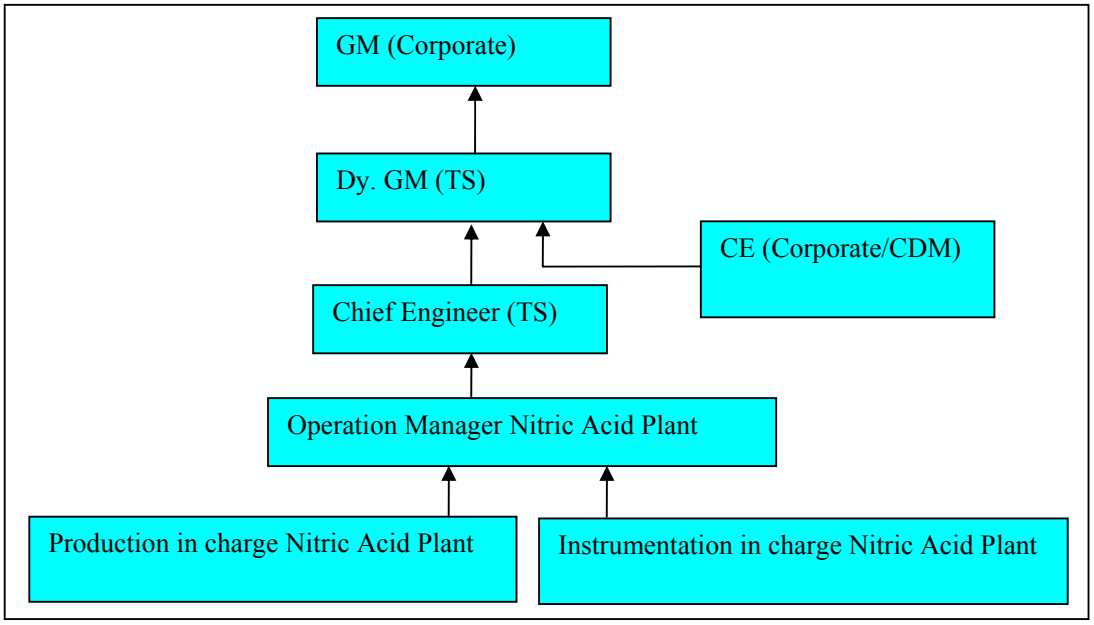
RCF is an ISO 9001 certified company and has procedure for monitoring and recording of data on operation of the plant/ equipments. ISO 9001 procedures have been formulated for all new monitoring instruments. All instruments used for CDM project monitoring are calibrated as per ISO 9001 procedures.

1. CDM Team for monitoring & recording of data:

A CDM project team is constituted with participation from relevant sections. This team is responsible for data collection and archiving. This team is periodically reviewing CDM project activity, check data collected and estimate emissions reduced. On a monthly basis, the monitoring reports are checked and discussed by the senior CDM team members. In case of any irregularity observed by any of the CDM team members, it is informed to the concerned person for necessary actions. Further these reports will then be forwarded to the management monthly basis.

Daily report (Hourly average, in pdf format) from CEM system is archived by plant personnel and forwarded to CDM team members. Corporate CDM team member convert these PDF file in excel format and consolidate the data for entire campaign. Consolidated data is used for emission reduction calculation for final verification by verifier.

Organizational structure for monitoring plan



Detailed description of responsibility of monitoring is available in CDM Manual.

1.1 Data collection and record keeping:

Frequency of data monitoring and recording
The frequency for data monitoring is as per the monitoring details in section 6 of the document.

Archiving of data
Data shall be kept for two years after the crediting period or the last issuance whichever is later

CDM data is archived in electronic and paper form.

1.2 Quality Control and Quality Assurance

RCF has installed a monitoring system which complies with EN 14181. As per the system detailed out in the methodology AM0034, a three level quality assurance has been implemented. These three levels are QAL1, QAL2 and QAL3.

QAL1 precisely ensures the suitability of the CEM to meet the requirements. CEM system has already undergone this level and a report has been availed from reputed certifying agency TUV SUD, Germany.

The monitoring system has been installed in the plant and QAL2 procedure has been carried out by M/s TUV SUD, Germany to ensure the correctness of installations

Under QAL 3, the analyzer carries out auto calibration on weekly basis.

Annual Surveillance test (AST) is also carried out by third party as per EN14181. AST was carried out by SGS Netherland.

1.3 Span Gas Details

Exact Concentration	560 PPM
Supplier	Chemtron Science Laboratories Pvt. Ltd.
Concentration Valid till	07/08/2010

2. Description of the CEM installed at RCF HP Nitric Acid plant -

2.1 Components of CEM

RCF has installed in its HP Nitric Acid plant an Continuous Emission Monitoring (CEM) system from M/s ABB AO2000 URAS 26 comprising of Continuous Emissions Analyser (for N_2O concentration of stack gas), Sample probe, Sample Conditioning System, SDF Flow Sensor (for stack gas flow measurement).

Datalogger: Beckhoff DATA Logger
Data Acquisition System: ITBK EMI3000

2.2 Selection of Sample points

RCF has selected sample points for collection of samples to meet the requirements of EN 14181. The sample points have been selected as advised by the supplier ensuring its correctness,

2.3 Analyser System

The ABB AO2000 URAS 26 is capable of analysing N_2O concentration in gas mixtures on continuous basis. The URAS 26 is continuous NDIR industrial photometer that can selectively measure concentrations of up to four sample components. In this case it is equipped for the measurement of N_2O only. The analyzer features gas-filled opto-pneumatic detectors. Detector is filled with corresponding gas being measured. This means that the detector provides optimum sensitivity and high selectivity compared with the other gas components in the sample. Gas-filled calibration cells are used for automatic calibration. The Analyser is QAL1 tested for the measurement of N_2O.

2.4 Sample Conditioning System

The gas sample is extracted at the sampling point, particles are removed by the heated filter unit and the clean sample gas is delivered through a heated sampling line to the analyser cabinet. Before being fed to the analyser, moisture is removed by the sample gas cooler and sample gas feed unit installed side-by-side in the analyser cabinet. This sample gas cooler unit maintains a constant dew point of the sample gas of 3°C and efficiently separates the moisture from the sampling gas. The minimum flow rate to the analyser is controlled and connected to an alarm. The dry gas after the cooler is controlled for moisture break through. In case of moisture leaks in due to a failure of the cooler, the sampling pump will be stopped automatically and an alarm is given to the EMI3000 system.

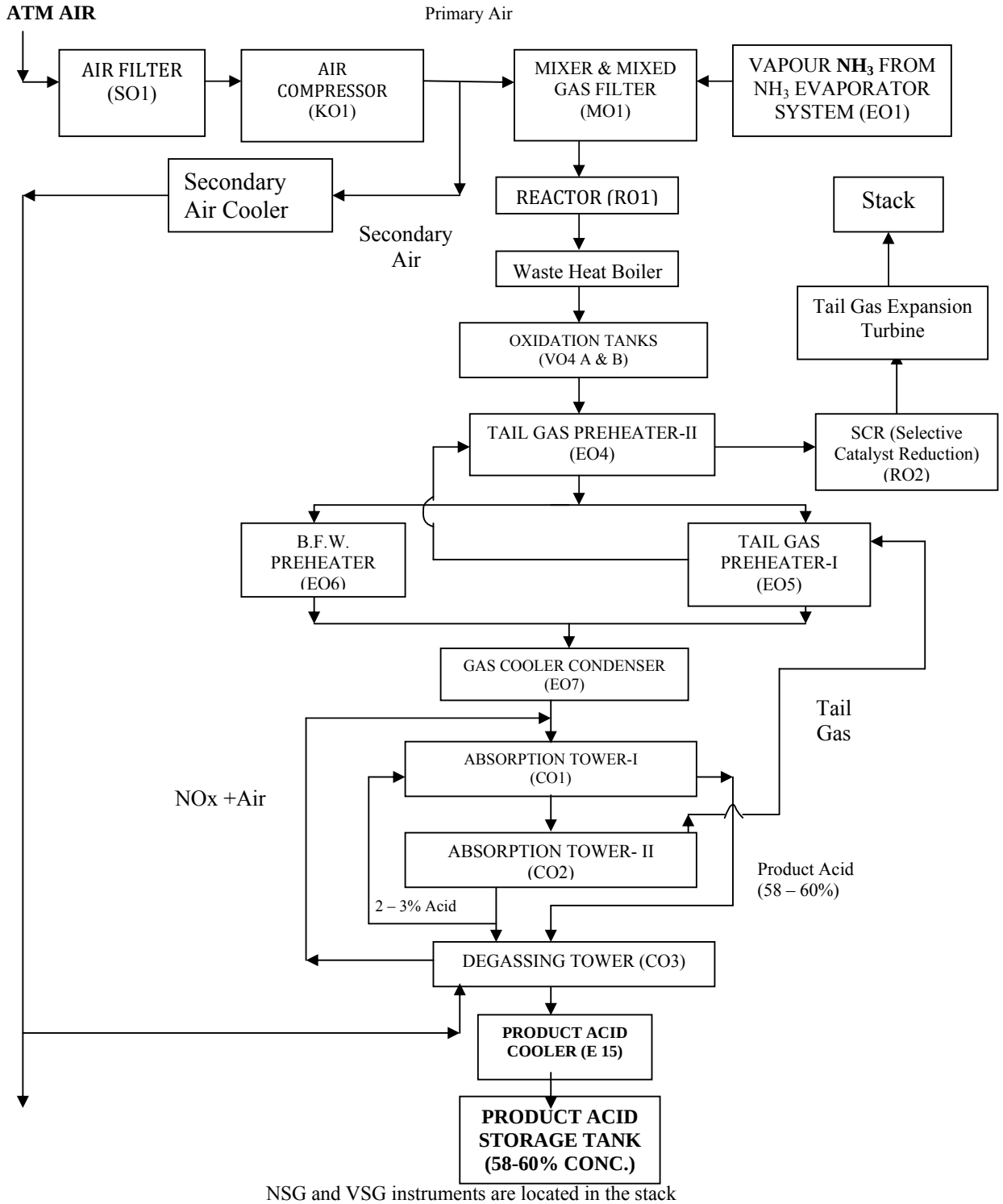
2.5 Flow Meter

The SDF Flow measuring system allows continuous determination of the flow rate of stack gas. It is performance tested according to 17. BImSchV and "TA Luft" (test report No. 936/802015, TUV Rheinland 1993) for use in plants. The unit's suitability was tested by TUV Rheinland Germany.
The SDF flow sensor which is a flow measuring device is a highly sensitive system for continuous, in-situ flow measurement. The stack gas flow is measured in the stack by measuring the dynamic differential pressure generated by the SDF flow sensor probe rod and using ABB's Differential pressure transmitter. Thereby the differential pressure is continuously measured and the signal is feed to Beckhoff DATA Logger and ITBK EMI3000 – CDM Data acquisition and data evaluation system. The Data Logger has

been caliberated by ABB Germany during manufacturing stage and calibration was again rechecked during QAL2 test by TUV SUD Germany.

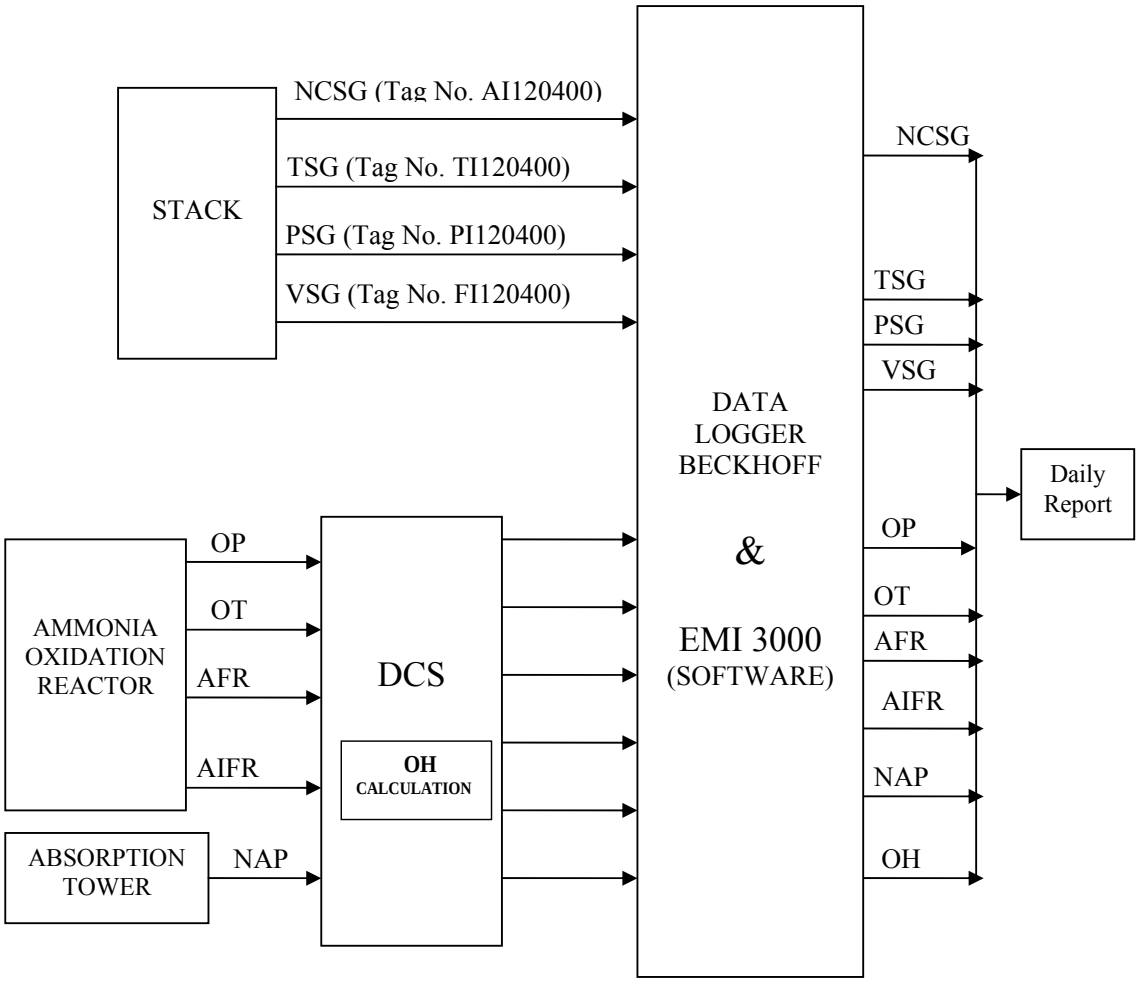
PROCESS BLOCK DIAGRAM

(HP Nitric Acid Plant)



NSG and VSG instruments are located in the stack

The individual monitoring parameters with respect to each equipment are described below:



The ABB's Differential pressure type transmitter is used for stack gas flow measurement which gives 4-20 mA signal which is directly proportional to the stack gas flow. The differential pressure transmitter signal is fed to the Beckhoff DATA Logger. The stack gas pressure and temperature is also measured separately by transmitters and the corresponding 4 – 20 mA signal generated is fed to DATA Logger as input for further converting the stack flow from operating to standard conditions. This is done by EMI3000 by compensating the flow for pressure and temperature and correcting the volume flow.

2.6 The data acquisition system

The RCF HP nitric acid plant is equipped with a data communication unit that collects and stores all the raw values for NCSG, VSG, TSG, PSG, OT_h, OP_h, AFR, AIFR and NAP as well as different status signals from the AMS. From the data communication unit the data is transferred to the ITBK EMI3000 server grade PC in Analyser room. In the EMI3000 PC all data evaluation and storage takes place. The data is stored simultaneously on different hard disks to prevent the loss of data in case one hard disk fails.

3. Emergency preparedness

The maximum emissions possible during the crediting period, in case of emergency situation like complete deactivation of DeN2O catalyst shall be same as that of base line emissions.

The emissions are monitored using CEM system which complies with EN14181 as required by the methodology in the project activity.

It is expected that all the instruments shall be functioning continuously for recording data. However in case of emergency of breakdown of Automated monitoring system (AMS) RCF will follow the procedure mentioned in the methodology

Failure of Data Acquisition System	A Provision of auto backup of data is provided in the system so that data is retrieved even if the system is down for 22 days. In case, due to any reason data is not available due to failure of data recording following shall be considered.
Failure of N_2O Analyzer (NCSG)	In case N_2O analyzer is not functioning, data for the period shall be taken as highest measured value during the campaign for calculating the campaign average.
Failure of Stack gas Flow meter (VSG)	In case Stack gas flow meter is not functioning, data for this period shall be replaced with highest measured value during the campaign for calculating the campaign average.
Failure of Stack Gas Pressure (PSG)	In case Stack gas pressure meter is not functioning, Hourly average of measured data for next hour shall be considered for the down period, for taking further processing.
Failure of Stack gas Temperature (TSG)	In case Stack gas Temperature meter is not functioning, Hourly average of measured data for next hour shall be considered for the down period, for taking further processing.
Operating Hours OH	In case Operating hours counter is not functioning, data from Shift log book shall be taken after ascertaining for how many hours the plant has run.
Failure of Mass Flow meter (NAP)	In case Mass flow meter is not functioning any time during the day, Nitric acid Production for the day shall be calculated using Average Ammonia Specific consumption for previous three operating days and Ammonia consumption for plant for the day from meter no FI 120101. The production data for the day shall be used for further processing; all other data from the Nitric acid mass flow meter for this day shall be ignored. In case concentration of nitric acid has not been determine for the day due to any reasons like shutdown, start-up etc, then: ➢ In case of shut down data for concentration shall be taken from previous day. ➢ In case of start-up data for concentration shall be taken from next day. ➢ In case of shut down and start-up both data for concentration shall be taken from average of previous available day and next available day. ➢ For any other reason not foreseen now decision from

	production in charge of the plant shall be taken for correctness of data based on reason of not availability. He will give decision whether previous day data to be used or next day data to be used.
Operating Temperature(OT)	In case operating Temperature meter is not functioning, average of measured data for previous hour and next available hours, shall be considered for the down period, for taking further processing.
Operating Pressure(OP)	In case operating Pressure meter is not functioning, average of measured data for previous hour and next available hours, shall be considered for the down period, for taking further processing.
Ammonia Flow (AFR)	In case Ammonia Flow meter is not functioning, Hourly average of measured data for previous hour shall be considered for the down period, for taking further processing.
Ammonia to Air Ratio (AIFR)	In case Ammonia to Air Ratio meter is not functioning, Hourly average of measured data for previous hour shall be considered for the down period, for taking further processing.

SECTION D. Data and parameters

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

Data / Parameter:	**AFR_{max}**
Data unit:	**Nm^3/hr**
Description:	Maximum Ammonia Flow Rate
Source of data used:	Plant Records
Value(s) :	6,725 (This is equivalent to 5.113 tNH_3/h)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	The methodology gives the unit of measurement in tNH_3/h but RCF have been measuring the parameter in Nm3/h in the past. The conversion factor from Nm^3/h to Kg/h is 0.7602 (which is 17. 03/22.4). RCF has converted this measured value in Kg/h for the project activity.

Data / Parameter:	**$AIFR_{max}$**
Data unit:	**%**
Description:	Maximum ammonia to air ratio
Source of data used:	Calculated
Value(s) :	11.5
Indicate what the data are used for (Baseline/ Project/	Baseline Emission/Project Campaign

Leakage emission calculations)	
Additional comment:	-

Data / Parameter:	**OT normal**
Data unit:	**Deg C**
Description:	Normal Operating Temperature
Source of data used:	Monitored
Value(s) :	Max = 900 Min = 863
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	-

Data / Parameter:	**OP_{normal}**
Data unit:	**Bar (gauge)**
Description:	Normal operating pressure
Source of data used:	Monitored
Value(s) :	Max = 6.60 (660 kPa) (gauge) Min = 6.26 (626 kPa) (gauge)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	1 Pa = 10^-5 bar. Methodology gives unit of measurement in Pa. But RCF were measuring this parameter in bar. In the project activity however, RCF has converted this measuring value in kPa for the project activity

Data / Parameter:	**GS_{BL}**
Data unit:	-
Description:	Gauze Supplier for the baseline campaign
Source of data used:	Monitored
Value(s) :	Rashtriya Chemicals & Fertilizer Ltd
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	Rashtriya Chemicals & Fertilizers limited is getting fabricated the catalyst gauze from three vendors (Baseline Vendor RHPL) RHPL/ HPL/ Aurora Mathey, on labour charge basis, giving them metal and specification of catalyst.

Data / Parameter:	**GC_{BL}**
Data unit:	-
Description:	Gauze Composition during Baseline Campaign
Source of data used:	Monitored
Value(s) :	Pt – 92%, Rh – 8%

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	-

Data / Parameter:	**$NCSG_{BC}$**
Data unit:	**mgN_2O/Nm^3**
Description:	N2O Concentration in the stack gas
Source of data used:	N2O analyser
Value(s) :	For the baseline campaign run by RCF during 01/07/2008 and 07/11/2008, the N_2O concentration values comes at 4,054.1 mg N_2O/Nm^3
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	Regular Calibration is done according to ISO 9001 procedure. This analyser is tested as per QAL 2 test of recognised industry standards (EN 14181) by third party TUV SUD, Germany. Staff has been trained in maintenance of monitoring Instrument. Staff is also trained in monitoring procedures and a reliable technical support infrastructure is set up.

Data / Parameter:	**VSG_{BC}**
Data unit:	**Nm^3/h**
Description:	Volume flow rate of the stack gas
Source of data used:	From CEM system supplied by M/s. ABB along with analyser
Value(s) :	For the baseline campaign run by RCF during 01/07/2008 and 07/11/2008, the volume flow rate of the stack gas comes at 49,077.4 Nm3/h
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	Regular Calibration is done according to ISO 9001 procedure. This analyser is tested as per QAL 2 test of recognised industry standards (EN 14181) by third party TUV SUD, Germany. Staff is also trained in monitoring procedures and a reliable technical support infrastructure is set up.

Data / Parameter:	**OH_{BC}**
Data unit:	**Hours**
Description:	Operating Hours
Source of data used:	From CEM System
Value(s) :	For the baseline campaign run by RCF during 01/07/2008 and 07/11/2008, the operating hours comes at 2,861 hours.
Indicate what the data are used for (Baseline/ Project/ Leakage emission	Baseline Emission

calculations)	
Additional comment:	Included in evaluation by third party validator.

Data / Parameter:	**NAP_{BC}**
Data unit:	**$tHNO_3$**
Description:	Nitric Acid (as 100%) over baseline campaign
Source of data used:	This is calculated data based on the following- 1) Quantity of dilute nitric acid from mass flow meter. 2) Average concentration of nitric acid determined by the plant laboratory for the day.
Value(s) :	For the baseline campaign run by RCF during 01/07/2008 and 07/11/2008, the nitric acid comes at 43,326 $tHNO_3$.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	**Nitric Acid Flow:** Calibration of flow meter once in three years as per OEM Recommendation. **Nitric Acid Concentration:** Calibration of Hydrometer and Thermometer shall be ensured by ISO 9001 procedures. In case mass flow meter is not functioning for any period during the day, Nitric acid production for the day is calculated using average ammonia specific consumption for previous operating days and ammonia consumption for plant for the day from meter no FI 120101. The calculated production value for the day is used for further processing; all other data from nitric acid mass flow meter for this day is ignored. In case concentration of nitric acid has not been determined for the day due to any reason like shut down, start up etc, then; • In case of shut down data for concentration is taken from previous day • In case of start up data for concentration is taken from next day. • In case of shut down and start up both data for concentration is taken from average of previous available day and next available day. • For any other reason not foreseen now decision from production in charge of the plant is taken for correctness of data based on reason of not availability. He gives decision whether previous day data to be used or next day data to be used. Conservativeness of the value will be maintained Operations Manager nitric acid plant takes appropriate decision for replacing the mass flow meter with similar or better instrument, if they are made available by instrument vendors in future.

Data / Parameter:	**CL_{BL}**
Data unit:	**$tHNO_3$**
Description:	Length of Baseline Campaign
Source of data used:	As per the Production Data
Value(s) :	43,326
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	-

Data / Parameter:	**CL_{Normal}**
Data unit:	**$tHNO_3$**
Description:	Normal Campaign Length
Source of data used:	Calculated from nitric acid production data
Value(s) :	44,435
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	-

Data / Parameter:	**GS_{Normal}**
Data unit:	**-**
Description:	Normal gauze supplier for the operating conditions campaigns, there are three gauge fabricators for RCF, they work on labour charge basis for gauze fabrication, precious metal and specification is given by RCF. Hence RCF is the gauze supplier.
Source of data used:	Plant Data
Value(s) :	Rashtriya Chemicals and Fertilizer Ltd.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	Frequency of recording: Each Campaign (Rashtriya Chemicals & Fertilizers limited is getting fabricated the catalyst gauze from any one of the three parties RHPL/ HPL/ Aurora Mathey, on labour charge basis, giving them metal and specification of catalyst)

Data / Parameter:	**GC_{Normal}**
Data unit:	**-**
Description:	Gauze Composition during the operating campaign
Source of data used:	Monitored
Value(s) :	Pt – 92%, Rh – 8%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Additional comment:	-

D.2. Data and parameters monitored

Data / Parameter:	NCSG
Data unit:	mgN_2O/m^3
Description:	N_2O concentration in the stack gas
Measured /Calculated /Default:	Measured
Source of data:	N_2O Analyser
Value(s) of monitored parameter:	1,062.53 (for monitoring period)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every second
Description of measurement methods and procedures to be applied:	N_2O analyzer to be used for the data measurement proceeds using appropriate software. RCF have in place a Continuous Emission Monitoring (CEM) system from ABB. The repeatability of this instrument is < 0.5% of span.
Calculation method (if applicable):	-
QA/QC procedures applied:	N_2O monitor have auto calibration feature. Regular Calibrations according to ISO 9001 procedure and this analyzer was tested as per QAL2 test of recognized industry standards (EN 14181) by third party TUV SUD, Germany. Staffs have been trained in monitoring procedures and a reliable technical support infrastructure has been set up. In AST 2011, SGS has recommended that measuring inaccuracy constants for NCSG which is 62 should not be subtracted and the value of this constant should be made zero in the system. Accordingly, to comply with the recommendation of SGS, all NCSG readings during the monitoring period are added with 62 and further used for CER calculation.

Data / Parameter:	VSG
Data unit:	Nm^3/h
Description:	Volume flow rate of the stack gas
Measured /Calculated /Default:	Measured
Source of data:	From CEM System
Value(s) of monitored parameter:	51,891.53 (for monitoring period)
Indicate what the data are	Project Emission

used for (Baseline/ Project/ Leakage emission calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every second
Description of measurement methods and procedures to be applied:	The data output from the stack flow meter is processed using appropriate software. RCF have in place a Continuous Emission Monitoring (CEM) System from ABB. The base accuracy of this instrument is ± 0.04%.
Calculation method (if applicable):	-
QA/QC procedures applied:	Regular Calibrations according to ISO 9001 procedure and this instrument was tested as per QAL2 test of recognized industry standards (EN14181) by third party TUV SUD, Germany.

Data / Parameter:	**OH**
Data unit:	Hours
Description:	Operating hours
Measured /Calculated /Default:	Calculated
Source of data:	From CEM system
Value(s) of monitored parameter:	1,929 (for Monitoring period)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of recording: Hourly compiled for entire campaign
Description of measurement methods and procedures to be applied:	As soon as ammonia is introduced in the reactor OH counter starts automatically. Similarly when ammonia flow to reactor is cut off OH counter is stopped automatically.
Calculation method (if applicable):	-
QA/QC procedures applied:	Included in evaluation by third party validator.

Data / Parameter:	**NAP**
Data unit:	$tHNO_3$
Description:	Nitric Acid (As 100%)
Measured /Calculated	Calculated

/Default:	
Source of data:	This is a calculated data based on the following 1. Quantity of dilute nitric acid from mass flow meter. 2. Average Concentration of nitric acid determined by the plant laboratory for the day.
Value(s) of monitored parameter:	28,755.66 (for monitoring period)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Hourly Compiled for entire campaign
Description of measurement methods and procedures to be applied:	**Nitric Acid Flow:** Mass flow meter installed at project site and displayed on CEM system shall give hourly average flow of dilute nitric acid (from the day report of CEM system). Plant laboratory will determine the average concentration of nitric acid for the day. Hourly value shall be multiplied with average concentration to arrive at hourly nitric acid production. The sum of hourly production shall be used to calculate day production. **Nitric Acid Concentration:** Concentration will be determined by measuring specific gravity by hydrometer and temperature by thermometer. Chart indicating concentration at various temperatures and specific gravity, available with production department shall be used for determining concentration of product nitric acid. In case Mass flow meter is not functioning for any period during the day, Nitric acid Production for the day shall be calculated using Average Ammonia Specific consumption for previous three operating days and Ammonia consumption for plant for the day from meter no FI 120101. The calculated production value for the day shall be used for further processing; all other data from the Nitric acid mass flow meter for this day shall be ignored. In case concentration of nitric acid has not been determine for the day due to any reasons like shutdown, start-up etc, then: • In case of shut down data for concentration shall be taken from previous day. • In case of start-up data for concentration shall be taken from next day. • In case of shut down and start-up both data for concentration

	shall be taken from average of previous available day and next available day. • For any other reason not foreseen now decision from production in charge of the plant shall be taken for correctness of data based on reason of not availability. He will give decision whether previous day data to be used or next day data to be used. Conservativeness of the value will be maintained. Operation manager Nitric acid plant shall take appropriate decision for replacing the mass flow meter with similar or better instrument, if they are made available by instrument vendors in future The NAP value is calculated based on the mass flow of dilute Nitric acid and the acid concentration. The Concentration of Nitric acid is determined by using Hydrometer and Thermometer. The instrument accuracy of Mass flow measurement of dilute Nitric acid is ± 0.1% of rate.
Calculation method (if applicable):	-
QA/QC procedures applied:	**Nitric Acid Flow:** Calibration of flow meter once in three years as per OEM recommendation. **Nitric Acid Concentration:** Calibration of Hydrometer and Thermometer shall be ensured by ISO 9001 Procedures.

Data / Parameter:	**TSG**
Data unit:	Deg C
Description:	Temperature of stack gas
Measured /Calculated /Default:	Measured
Source of data:	Continuous Emission Monitoring system from ABB
Value(s) of monitored parameter:	Continuously Monitored
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)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every second
Description of measurement methods and procedures to	Temperature transmitter (TI 120400) is used for measurement of stack gas

be applied:	temperature. The accuracy of this instrument is ≤ 0.1 % of FS.
Calculation method (if applicable):	-
QA/QC procedures applied:	Regular calibrations according to ISO 9001 procedure and this instrument were tested as per QAL2 test of recognized industry standards (EN 14181) by Third Party TUV SUD, Germany.

Data / Parameter:	**PSG**
Data unit:	hPa
Description:	Pressure of stack gas
Measured /Calculated /Default:	Measured
Source of data:	Continuous Emission monitoring system from ABB
Value(s) of monitored parameter:	Continuously Monitored
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)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of recording: Every second
Description of measurement methods and procedures to be applied:	Pressure transmitter (PI 120400) is used for measurement of stack gas pressure. The accuracy of this instrument is 0.5 % of FSO.
Calculation method (if applicable):	.
QA/QC procedures applied:	Regular calibrations according to ISO 9001 procedure and this instrument were tested as per QAL2 test of recognized industry standards (EN 14181) by Third Party TUV SUD, Germany.

Data / Parameter:	**AFR**
Data unit:	Kg NH_3/h
Description:	Ammonia gas flow rate to AOR
Measured /Calculated /Default:	Measured
Source of data:	From CEM System
Value(s) of monitored parameter:	Continuously Monitored
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission
Monitoring equipment (type, accuracy class, serial number, calibration	Given in Appendix III

frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Continuous.
Description of measurement methods and procedures to be applied:	To be obtained from operating condition campaign. Ammonia flow meter is used. Transmitted from DCS. The accuracy of this instrument is ± 0.075 % of span.
Calculation method (if applicable):	-
QA/QC procedures applied:	Included in evaluation by third party validator

Data / Parameter:	**UNC**
Data unit:	%
Description:	Overall measurement uncertainty of the monitoring system
Measured /Calculated /Default:	Calculated
Source of data:	Calculated combined uncertainty factor determined by M/s TUV SUD, during QAL2 Test of monitoring equipment as per EN14181 guide line.
Value(s) of monitored parameter:	4.52
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline Emission
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable
Measuring/ Reading/ Recording frequency:	Frequency of recording: Once after monitoring system is commissioned.
Description of measurement methods and procedures to be applied:	QAL2 test by third party validator M/s. TUV SUD, Germany of Instrument as per guideline of EN14181
Calculation method (if applicable):	UNC value was calculated as part of QAL2 procedures of EN14181.
QA/QC procedures applied:	This value is calculated by Third party TUV SUD, Germany

Data / Parameter:	**AIFR**
Data unit:	-
Description:	Ammonia to Air ratio
Measured /Calculated /Default:	Measured
Source of data:	From CEM System
Value(s) of monitored parameter:	Obtained from DCS
Indicate what the data are used for (Baseline/ Project/ Leakage emission	Project

calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of recording: Every Hour.
Description of measurement methods and procedures to be applied:	Ammonia to Air ratio is calculated in DCS using signals transmitted from Ammonia flow transmitters (Tag no. FI 120211) and Air Flow transmitters (Tag no FI 120213). This signal is transmitted to CEM system. Accuracy of ammonia flow transmitter is ± 0.075% of span and that of Air Flow Transmitter is ± 0.1% of span.
Calculation method (if applicable):	Ratio is obtained from Ammonia flow Tag no FY 120211-M and Air Flow tag no FI 120213, transmitted from DCS
QA/QC procedures applied:	Regular calibrations are carried out for Ammonia Flow meter FY 120211-M and Air Flow meter FI 120213 as per ISO 9001 procedure.

Data / Parameter:	**OT_h**
Data unit:	Deg C
Description:	Oxidation temperature of each hour
Measured /Calculated /Default:	Measured
Source of data:	Continuous Emission Monitoring (CEM) system from ABB.
Value(s) of monitored parameter:	Continuously monitored
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every hour
Description of measurement methods and procedures to be applied:	Transmitted from DCS. There are three duplex K type thermocouples are installed in reactor. These are used for temperature measurement, with Tag No. TI120332A, TI120333A and TI120334A. The D/A accuracy of this instrument is ± 0.03 % of span.
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	Instruments are regularly calibrated as per ISO 9001 procedure.

Data / Parameter:	**OP_h**
Data unit:	kPa (guage)
Description:	Oxidation pressure of each hour

Measured /Calculated /Default:	Measured
Source of data:	Continuous Emission Monitoring (CEM) system from ABB.
Value(s) of monitored parameter:	Continuously monitored
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Given in Appendix III
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every hour
Description of measurement methods and procedures to be applied:	Oxidation Pressure is measured by pressure transmitter tag no PT 120212A/B/C. The accuracy of this instrument is ± 0.075 % of span.
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	Instruments are regularly calibrated as per ISO 9001 procedure.

Data / Parameter:	**$GS_{project}$**
Data unit:	-
Description:	Gauze Supplier for project campaign
Measured /Calculated /Default:	Measured
Source of data:	Plant Data
Value(s) of monitored parameter:	Rashtriya Chemicals & Fertilizer Ltd.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not applicable
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every Campaign
Description of measurement methods and procedures to be applied:	Rashtriya Chemicals & Fertilizers limited is getting fabricated the catalyst gauze from any one of the three parties RHPL/ HPL/ Aurora Mathey, on labour charge basis, giving them metal and specification of catalyst
Calculation method (if applicable):	Not Applicable

QA/QC procedures applied:	Not applicable.

Data / Parameter:	**$GC_{project}$**
Data unit:	-
Description:	Gauze Composition during project campaign
Measured /Calculated /Default:	Measured
Source of data:	Monitored
Value(s) of monitored parameter:	Pt - 92%, Rh - 8%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable
Measuring/ Reading/ Recording frequency:	Frequency of monitoring: Every Campaign
Description of measurement methods and procedures to be applied:	Rashtriya Chemicals & Fertilizers limited is getting fabricated the catalyst gauze from any one of the three parties RHPL/ HPL/ Aurora Mathey, on labour charge basis, giving them metal and specification of catalyst
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	Precious metal composition is checked by Third Party Ledoux & Company

Data / Parameter:	**EF_{reg}**
Data unit:	
Description:	Emissions level set by incoming policies or regulations
Measured /Calculated /Default:	Not Applicable
Source of data:	Maharashtra Pollution Control Board
Value(s) of monitored parameter:	Currently India does not have any regulation w.r.t. N_2O emissions
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not Applicable
Measuring/ Reading/ Recording frequency:	-

Description of measurement methods and procedures to be applied:	Currently there is no regulation for N_2O emission. The new regulation will get reflected in consent to operate the plants. Consent to operate will be checked for N_2O emission applicability for each campaign
Calculation method (if applicable):	Not Applicable
QA/QC procedures applied:	Updated when new regulations comes into force

QAL 2 Correction Factors:
(As per QAL 2 test August 2008)

Measuring Parameter	Correction Factor	
	a	b
N_2O	-1979.8	494.9
Volume Flow	-29898	7474.5
Temperature	-63.2	15.8
Pressure	-398	99.6

There is no change in the QAL2 Correction Factors.
In AST 2011, SGS has recommended that measuring inaccuracy constants for NCSG which is 62 should not be subtracted and the value of this constant should be made zero in the system. Accordingly, to comply with the recommendation of SGS, all NCSG readings during the monitoring period are added with 62 and further used for CER calculation.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

As per the registered PDD, the baseline emission factor is 0.0125 tCO_2e/ $tHNO_3$

Particulars	Unit	Value
Volume flow rate of stack gas	Nm^3/h	49,077
N_2O concentration in stack gas - baseline	mg N_2O/ Nm^3	4,054.10
Operating hours	h/campaign	2,861
Baseline emissions	tN_2O/ campaign	569.23
Uncertainty UNC	%	4.52%
HNO_3 production	$tHNO_3$/ campaign	43,326
N_2O emission factor – baseline	**tN_2O/ $tHNO_3$**	**0.0125***

* *As per the methodology, in the event that the monitoring system is down, the lowest between the conservative IPCC (4.5 kgN_2O/ ton of nitric acid) or the last measured value will be valid and applied for the down time period for the baseline emission factor, and the highest measured value in the campaign will be applied for the downtime period for the campaign emission factor.*

The CEM down time details is given in Annexure II. The lowest value between the IPCC default value and the last measured value is used in the down time period for the baseline emission factor. There is no change in the baseline emission factor as given in the registered PDD while considering the lowest value in the down time period.

Adjustment of baseline:

As per the methodology, baseline emission factor is to be adjusted in following cases –

If $CL_n < CL_{normal}$, recalculate EF_{BL} by eliminating those N_2O values that were obtained during the production of tonnes of nitric acid beyond the CL_n (i.e. the last tonnes produced) from the calculation of EF_n.

Project Campaign 1:

No.	Description	Unit	Value
1	CL_n	$tHNO_3$	43,449[2]
2	CL_{normal}	$tHNO_3$	44,435
3	CL_{BL}	$tHNO_3$	43,326

CL_n is less than CL_{normal}. However, the CL_{BL} is even less than CL_n and hence adjustment of Baseline EF is not possible. This is also in compliance of "CLARIFICATION TO AM0034 (VERSION 02): CATALYTIC REDUCTION OF N2O INSIDE THE AMMONIA BURNER OF NITRIC ACID PLANTS" given in EB 51 Annex 12.

E.2. Project emissions calculation

Over the duration of the project activity, N_2O concentration and gas volume flow in the stack of the nitric acid plant as well as the temperature and pressure of ammonia gas flow and ammonia-to-air ratio have been measured continuously. The daily report comprising of the data for the day is generated by N2O Automated Measuring System (AMS). The daily reports for the campaign period are compiled. The data pertaining to shut-down period of the plant is deleted form this compiled data and procedures defined under emergency preparedness are applied wherever applicable. The data so obtained is called Base data.

All the individual data readings where parameters are not within the specification of the facility are deleted. The data so obtained is called valid data.

Sample mean i.e. average value and standard deviation is determined for VSG and NCSG values in valid data sheet. 95% confidence level value is determined by multiplying standard deviation value by 1.96. This value is then added and subtracted from the sample mean value to arrive at new maximum and minimum limits. The new sample mean is determined by taking average of the NCSG and VSG values which are within these maximum and minimum limits.

Estimation of campaign-specific project emissions:

$$PE_n = VSG * NCSG * OH * 10^{-9}$$

Where
VSG = Mean Stack Gas volume flow rate for the project campaign (m^3/h)
NCSG = Mean concentration of N_2O in the stack gas for the project campaign

[2] The CL_n Value is for full Campaign period. As per recommendation by the Meth Panel (Date of Meth Panel meeting: 7 - 11 March 2011) on request for clarification (AM_CLA_0204) on Approved Methodologies (reference 'F-CDM-AM-Clar_Resp_ver 01.1 '). "For comparison with the normal campaign length CLnormal and the baseline campaign length CLBL, the project campaign length CLn will be determined by the duration of the corresponding production run, with the respective set of gauze pack, including the time that may be outside the crediting periods."

(mg N_2O/Nm^3)

OH = is the number of hours of operation in the specific monitoring period (h)

PE_n = Total N_2O emissions of the n^{th} project campaign (tN_2O)

Derivation of a moving average emission factor

Step 1:
Campaign specific emissions factor for each campaign is estimated during the project's crediting period by dividing the total mass of N_2O emissions during that campaign by the total production of 100% concentrated nitric acid during that same campaign

$EF_n = PE_n / NAP_n$

Results:

Parameter	Unit	Values During Monitoring Period
VSG	Nm^3/h	51,860.23
NCSG	mgN_2O/ Nm^3	1,062.53
OH	Hours	1,929
NAP	$tHNO_3$	28,755.66
PE n	tN_2O	106.36
EF	**$tN_2O/tHNO_3$**	0.0037

Step 2: Estimate a moving average emissions factor is calculated at the end of a campaign 'n' as follows:

$EF_{ma,n} = (EF_1+EF_2+……..EF_n) / n$

And consider the maximum of $EF_{ma,\,n}$ and EF_n for estimation of project emissions.

Results:

Project Campaign 1:
As this is the first campaign in the project activity,

$EF_{ma,\,n} = EF_1$

E.3. Leakage calculation

No leakage calculation is required.

E.4. Emission reductions calculation / table

The emission reduction is calculated by baseline emissions minus the project emissions. The following formula is adopted for calculating emission reductions generated by the project activity:

Emission Reductions:

$$ER = (EF_{BL} - EF_p) * NAP * GWP_{N2O}$$

Where

ER = Emission reductions of the project for the specific Monitoring period (tCO2e)

EF_{BL} = Baseline Emission Factor ($tN_2O/tHNO_3$)

EF_P = Emission Factor used to calculate the emissions from this particular Monitoring Period (i.e the higher of $EF_{ma,\ n\ and}\ EF_n$)

NAP = Nitric Acid production for the Monitoring Period ($tHNO_3$). The Maximum Value of NAP shall not exceed the design capacity

GWP_{N2O}= Global Warming Potential for the N_2O as per IPCC default value.

Results:

Parameter	Unit	Values During Monitoring Period
NAP	$tHNO_3$	28,755.66
EF_{BL}	$tN_2O/tHNO_3$	0.0125
EF_p	$tN_2O/tHNO_3$	0.0037
GWP_{N2O}	tCO_2/tN_2O	310

ER = (0.0125 - 0.0037) * 28,755.66* 310
= 78,457 tCO_2

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

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**104,167 (447,305 * 85 days / 365 days)**	**78,457**

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

The monitoring period is from 20th November 2009 to 12th February 2010. The total period for this campaign is from 10th October 2009 to 12th February 2010.

The emission reduction during this monitoring period is 78,457 tCO_2e which is less than the ex – ante value of 104,167 tCO_2e. This is due to lower catalyst efficiency during the campaign (78%) as compared to estimated catalyst efficiency of 90% considered while calculating ex-ante values. Further, during the Monitoring Period, there were in all 60 readings in the Excel work sheet (valid data sheet) where the analyser was not working or has given erroneous readings and maximum NCSG value has been substituted. As per methodology for all these readings highest measured value of NCSG is taken for CER calculation. This has resulted in to reduction in number of CERs during the Monitoring Period as compared to ex-ante values for the same period.

Appendix-I

Base Data (As validated during validation)

Parameter	Unit	Value
AFR max	$kgNH_3$/ h	5,113
AIFR max	%	11.50%
OT normal	Deg C	863-900
OP normal	Bar (guage)	660 – 626
GS BL		RCF
GC BL	-	Pt - 92%, Rh – 8%
NCSG BC	mgN_2O/ Nm^3	4,054.1
VSG BC	Nm^3/h	49,077
OH BC	hours	2,861
NAP BC	$tHNO_3$	43,326
CL BL	$tHNO_3$	43,326
CL normal	$tHNO_3$	44,435
GS normal	-	Rashtriya Chemicals & Fertilizer Ltd
GC normal	-	Pt – 92%, Rh - 8%
Design Capacity	MT/ annum	128,480

Historical Data:

Unit 1 : 352 TPD(HP) Campaign 1	Catalyst Running Hrs. : 2,879
Date: 08.11.2005 to 12.03.2006	Production : 44,469

Unit 1 : 352 TPD (HP) Campaign 2	Catalyst Running Hrs. : 2,871
Date: 13.03.2006 to 14.11.2006	Production : 43,796

Unit 1 : 352 TPD(HP) Campaign 3	Catalyst Running Hrs. : 2,879
Date: 17/11/2006 to 17/06/2007	Production : 45,570

Unit 1 : 352 TPD(HP) Campaign 4	Catalyst Running Hrs. : 2880
Date: 21/06/2007 to 18/01/2008	Production : 43,715

Unit 1 : 352 TPD(HP) Campaign 5	Catalyst Running Hrs. : 2,902
Date: 20/01/2008 to 01/07/2008	Production : 44,625

Parameters	Unit	Historical Values (a)	Design Data (b)	Permitted Range
Oxidation Temp	Deg C	863-900	860-930	863-900
Oxidation Pr	bar(g)	6.60-6.26	7.65	6.60-6.26
Ammonia Flow Rate (Max)	Nm3/ h	6,725	7,992	6,725
Ammonia Flow Rate (Max)	kg/ h	5,113	6,076	5,113
Ammonia - air ratio (Max)	%	11.9	11.5	11.5

Apeendix: II

HP NA Plant shutdown/start-up and CEM System down time details

CEM system down time records during monitoring period:

The details for down time of CEM system for monitoring various parameters for HP Nitric acid Plant is as follows:

Sr. No.	From	To	Reason
1	03.12.2009 12:00 hrs	03.12.2009 15:00 hrs	Remote Login
2	25.01.2010 18:00 hrs	25.01.2010 23:00 hrs	Analyser Problem
3	26.01.2010 12:00 hrs	28.01.2010 17:00 hrs	Analyser Problem

Plant Shutdown / Start-up records during monitoring period:

HP Nitric acid Plant shutdown and start-up records during the monitoring period is as follows

Sr. No.	Plant Shutdown From	Plant Start up	Duration of S/d in Hours	Reason for Shutdown
1	-	10.10.2009 07:00 hrs (Campaign Start) 20.11.2009 00:00 hr (Start of Monitoring Period)		
2				
3	26.11.2009 02:00 hrs	27.11.2009 11:00 hrs	34	High Stock
4	28.11.2009 08:00 hrs	28.11.2009 11:00 hrs	4	Process Tripped
5	02.01.2010 09:00 hrs	03.01.2010 01:00 hrs	17	UPS failure
6	13.01.2010 09:00 hrs	14.01.2010 07:00 hrs	23	High Temp.
7	18.01.2010 13:00 hrs	18.01.2010 18:00 hrs	6	UPS failure
8	12.02.2010 03:00 hrs	12.02.2010 19:00hrs	17	Pri. Catalyst replacement
9	12.02.2010 19:00 (Campaign End)	-	-	-

Appendix: III
Technical Details of Monitoring Instruments:

Data Variable	Description	Data Unit	Instrument Type	Instrument Tag no.	Sr. No	Accuracy	Data of Previous calibration	Date of calibration	Calibration frequency	Due date of calibration	Agebncy of Caliberation
AFR	Amm gas to N 001	Nm3/ Hr	D.P Type Transmitter	FT120 211A	S198744	± 0.075% of span	16/08/2008	17/08/2009	1 Year	16/08/2010	Plant
AFR	Amm gas to N 001	Nm3/ Hr	D.P Type Transmitter	FT120 211B	S198745	± 0.075% of span	16/08/2008	17/08/2009	1 Year	16/08/2010	Plant
AFR	Amm gas to N 001	Nm3/ Hr	D.P Type Transmitter	FT120 211C	S198746	± 0.075% of span	16/08/2008	19/08/2009	1 Year	18/08/2010	Plant
OP	Amm - inlet to N001	Barg	Pressure Transmitter	PT 120212A	1209936	± 0.075% of span	16/08/2008	19/08/2009	1 Year	18/08/2010	Plant
OP	Amm - inlet to N001	Barg	Pressure Transmitter	PT 120212B	1209934	± 0.075% of span	16/08/2008	19/08/2009	1 Year	18/08/2010	Plant
OP	Amm - inlet to N001	Barg	Pressure Transmitter	PT 120212C	1209937	± 0.075% of span	14/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Amm - inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120212A	NA	Deviation after calibration: 0.1% of F.S. value	16/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Amm - inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120212B	NA	Deviation after calibration: 0.1% F.S. value	16/08/2008	17/08/2009	1 Year	16/08/2010	Plant
NA	Amm - inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120212C	NA	Deviation after calibration: 0.1% F.S. value	16/08/2008	17/08/2009	1 Year	16/08/2010	Plant
NA	Air Flow-N001	Nm3/ Hr	D.P Type Transmitter	FT 120213A	S198740	± 0.10% of span	14/08/2008	17/08/2009	1 Year	16/08/2010	Plant
NA	Air Flow-N001	Nm3/ Hr	D.P Type Transmitter	FT 120213B	S198741	± 0.10% of span	16/08/2008	17/08/2009	1 Year	16/08/2010	Plant
NA	Air Flow-N001	Nm3/ Hr	D.P Type Transmitter	FT 120213C	S198742	± 0.10% of span	16/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Air inlet to N001	Barg	Pressure Transmitter	PT120 214A	S0198760	± 0.075% of span	14/08/2008	17/08/2009	1 Year	16/08/2010	Plant

NA	Air inlet to N001	Barg	Pressure Transmitter	PT120214B	S0198761	± 0.075% of span	14/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Air inlet to N001	Barg	Pressure Transmitter	PT120214C	S0198762	± 0.075% of span	14/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Air inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120214A	NA	Deviation after calibration: 0.1% of F.S. value	14/08/2008	17/08/2009	1 Year	16/08/2010	Plant
NA	Air inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120214B	NA	Deviation after calibration: 0.1% of F.S. value	14/08/2008	19/08/2009	1 Year	18/08/2010	Plant
NA	Air inlet to N001 temp	Deg.cent	RTD with R/I converter	TT 120214C	NA	Deviation after calibration: 0.1% of F.S. value	14/08/2008	19/08/2009	1 Year	18/08/2010	Plant
OT	Catalyst Temp ROO1	Deg.cent	Temp. Transmitter	TT120332A	199556	D/A Accuracy ± 0.03% of span	14/08/2008	18/08/2009	1 Year	17/08/2010	Plant
OT	Catalyst Temp ROO1	Deg.cent	Temp. Transmitter	TT120333A	199558	D/A Accuracy ± 0.03% of span	14/08/2008	18/08/2009	1 Year	17/08/2010	Plant
OT	Catalyst Temp ROO1	Deg.cent	Temp. Transmitter	TT120334A	199560	D/A Accuracy ± 0.03% of span	16/08/2008	18/08/2009	1 Year	17/08/2010	Plant
NCSG	N2O Analyser	Mg/m3	N2O Analyser	AI 120400	02400 71228/2400	Repeatability ≤ 0.5% of span	10/10/2009	16/12/2009	3 Months	15/03/2010	Plant
VSG	Stack Flow	mBar	D.P Type Transmitter	FI120400	265DS 66000 28331	Base Accuracy ± 0.04%	01/07/2008	06/07/2009	1Year	05/07/2010	Plant
PSG	Stack Pressure	hPa	Pressure Transmitter	PI120400	1198949	0.5% of FSO	01/07/2008	06/07/2009	1Year	05/07/2010	Plant
TSG	Stack Temp	Deg.cent	RTD with R/I converter	TI120400	NA	Linearity error : <0.1 % FS	01/07/2008	06/07/2009	1Year	05/07/2010	Plant
NAP	Product acid flow	T/hr	Mass flow meter	FI10121	SEN.-12031565, TRAN	± 0.1% of rate	NA	24/06/2008	3 Years	23/06/2011	External Agency

					S.-37819 72						
NA	Acid Density	gm/cc	Hydrometer	NA	NA	Least count: 0.001	29/05/2009	30/11/2009	6 months	29/05/2010	Plant
NA.	Acid Temperature	Deg C	Thermometer	NAG/L/TM-1	NA	Least count: 1	29/09/2009	25/11/2009	1 Year	24/11/2010	Plant

Data Variable	Description	Data of Previous calibration	Date of calibration	Reason for delay
AFR	Amm gas to N 001	16/08/2008	17/08/2009	On 16/08/2009 it was a Sunday, a holiday. Therefore, the actual calibration was done on 17/08/2009 and 19/08/2009. Calibration certificates are submitted. It was found OK
AFR	Amm gas to N 001	16/08/2008	17/08/2009	
AFR	Amm gas to N 001	16/08/2008	19/08/2009	
OP	Amm - inlet to N001	16/08/2008	19/08/2009	On 16/08/2009 it was a Sunday, a holiday. Therefore, the actual calibration was done on 17/08/2009 and 19/08/2009. Calibration certificates are submitted. It was found OK
OP	Amm - inlet to N001	16/08/2008	19/08/2009	
OP	Amm - inlet to N001	14/08/2008	19/08/2009	
NA	Amm - inlet to N001 temp	16/08/2008	19/08/2009	On 16/08/2009 it was a Sunday, a holiday. Therefore, the actual calibration was done on 17/08/2009 and 19/08/2009. Calibration certificates are submitted. It was found OK
NA	Amm - inlet to N001 temp	16/08/2008	17/08/2009	
NA	Amm - inlet to N001 temp	16/08/2008	17/08/2009	
NA	Air Flow-N001	14/08/2008	17/08/2009	Plant was shutdown from 13.08.2009 to 21.08.2009. The actual calibration was done during shutdown on 17/08/2009 and 19/08/2009. Calibration certificates are submitted. It was found OK
NA	Air Flow-N001	16/08/2008	17/08/2009	
NA	Air Flow-N001	16/08/2008	19/08/2009	
NA	Air inlet to N001	14/08/2008	17/08/2009	Plant was shutdown from 13.08.2009 to 21.08.2009. The actual calibration was done during shutdown on 17/08/2009 and 19/08/2009. Calibration certificates are submitted. It was found OK
NA	Air inlet to N001	14/08/2008	19/08/2009	
NA	Air inlet to N001	14/08/2008	19/08/2009	
NA	Air inlet to N001 temp	14/08/2008	17/08/2009	Plant was shutdown from 13.08.2009 to 21.08.2009. The actual calibration was done during shutdown on 17/08/2009 and 19/08/2009. Calibration certificates are submitted.
NA	Air inlet to N001 temp	14/08/2008	19/08/2009	
NA	Air inlet to	14/08/2008	19/08/2009	

	N001 temp			It was found OK
OT	Catalyst Temp ROO1	14/08/2008	18/08/2009	Plant was shutdown from 13.08.2009 to 21.08.2009. Calibrations of temperature transmitter of catalyst was previously calibrated on 14/08/2008 &16/08/2008. Calibration frequency is of one year. Due to other instruments calibration, the actual calibration was done during shutdown on 18/08/2009. Calibration certificates are submitted. It was found OK.
OT	Catalyst Temp ROO1	14/08/2008	18/08/2009	
OT	Catalyst Temp ROO1	16/08/2008	18/08/2009	
VSG	Stack Flow	01/07/2008	06/07/2009	Calibrations of stack flow DP transmitter are previously calibrated on 01/07/2008. Calibration frequency is of one year. The HPNAP was shutdown on 05/07/2009, therefore the actual calibration was done on 06/07/2009. It was found OK
PSG	Stack Pressure	01/07/2008	06/07/2009	Calibrations of stack pressure transmitter are previously calibrated on 01/07/2008. Calibration frequency is of one year. The HPNAP was shutdown on 05/07/2009, therefore the actual calibration was done on 06/07/2009. It was found OK
TSG	Stack Temp	01/07/2008	06/07/2009	Calibrations of stack temp. are previously calibrated on 01/07/2008. Calibration frequency is of one year. The HPNAP was shutdown on 05/07/2009, therefore the actual calibration was done on 06/07/2009. It was found OK
NA	Acid Density	29/05/2009	30/11/2009	A calibration of hydrometer is previously calibrated on 29/05/2009. Calibration frequency is of six months. On 29/11/2009 it was a Sunday, a holiday. Therefore, the actual calibration was done on 30/11/2009 Calibration certificate is submitted. It was found OK
NA.	Acid Temperature	10/10/2008	25/11/2009	A calibration of thermometer for acid temperature was previously done on 10/10/2008. Calibration was again done on 29/09/2009. However the same thermometer was broken and then onward a new Thermometer with calibration date 25.11.2009 was used.

Appendix -IV

Abbreviations

AFR	Ammonia Gas Flow Rate to AOR
AIFR	Ammonia to Air Ratio
AOR	Ammonia Oxidation Reactor
BC	Baseline Campaign
BE	Baseline Emission
CDM	Clean Development Mechanism
CEM	Continuous Emission Monitoring
ER	Emission Reduction
FSO	Full Scale Operation
FS	Full Scale
GHG	Green House Gases
GWP	Global Warming Potential
MR	Monitoring Report
NAP	Nitric Acid Production
NH_3	Ammonia
N_2O	Nitrous Oxide
OH	Operating Hours
OP	Operating Pressure
OT	Operating Temperature
RCF	Rashtriya Chemicals and Fertilizers Limited
TSG	Temperature of Stack Gas
VSG	Volume flow rate of the Stack Gas